Criteria 6.5.2

Resubmission with additional updated information for all Six items of Quality Assurance initiatives

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

(I)

Academic and Administrative Audit (AAA) and follow up action taken

(No New Information Added)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

OFFICE OF DEAN FACULTY OF AGRICULTURE

Rajmata Vijyaraje Sindhia Krishi Vishwavidhyalaya

Raja Pancham Singh Marg, Gwalior-474002

No./DFA/PS/2023-24/ 1061 **Dated-** 22/11/2023

To,

Dean,

College of Agriculture/Horticulture,

Gwalior/Indore/Sehore/Khandwa/Mandsaur

Sub:Academic and Administrative Audit Report 2023-24- reg.

Please find enclosed herewith the Academic and Administrative Audit Report for the session 2023-24 for your information and necessary action as discussed in meeting.

Technical Officer to DFA

Endt.No./DFA/PS/2023-24/ 1062 **Dated-** 22/11/2023

Copy for Information-

1- Director Extension/Research/Instructions, RVSKVV, Gwalior.
2- Registrar/Comptroller, RVSKVV, Gwalior.
3- P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Technical Officer to DFA

Academic and Administrative Audit Report

Session: 2023-2024

Strength of colleges:

1) Specialized updated Faculty: Experts in Their Respective Domains
2) Committed, ambitious, goal oriented disciplined Students
3) Well maintained Department labs and Field labs for practical
4) Modernized Classrooms and Seminar Spaces
5) Computer lab with facility of statistical analysis
6) Well maintained Study material in Library
7) Availability of CeRA Consortium
8) Tech-Enabled Campus with Proficient Faculty and Students
9) Research Projects with host of crops available for practical
10) Availability of crop cafeteria
11) Germplasm accessions for research
12) Instructional farm with implements
13) Availability of student bus for local exposure visits to ICAR Institutes, various Agri based commodity Mandi etc.
14) Supportive Academic Environment with Administrative Backing

Roadmap for Quality Improvement:

"Charting the Path to Progress: A Strategic Roadmap for Improvement"

YEAR: 2023-2024

1) **Addressing Faculty Shortages**: Ensuring Academic Excellence Through Staffing Solutions
2) **Optimizing Operational Support:** Addressing Staffing Shortages for Enhanced Efficiency
3) **Streamlining Recruitment**: Implementing an Online Management System for Transparency, Efficiency, and Confidentiality
4) **Unlocking Career Pathways**: Expanding Opportunities for Job Placement and Campus Selection
5) **Setting Academic Standards**: Establishing Time Limits with an Academic Charter
6) **Empowering Innovation**: Raising Awareness on IPR Issues such as Patents, Copyrights, and Trademarks
7) **Fostering Research Excellence**: Encouraging Faculty to Publish in Prestigious National and International Journals
8) **Equipping Faculty for Success**: Training in Crafting Winning and Economically Viable Projects
9) **Enhancing Extramural Offerings**: Improving Facilities for Sports, gym, Yoga and Cultural Activities
10) **Empowering Innovation**: Establishing a Central Instrumentation Lab with State-of-the-Art Equipment and Facilities

6.5.2 Academic and Administrative Audit (AAA) and Followup Action Taken

YEAR: 2023-2024

SN	Charting the Path to Progress	Action Taken
1.	Addressing Faculty Shortages	▪ Continued recruitment process is taking place. ▪ Some regular faculty positions have been filled while the insufficiency of the staff position is covered up through KVK staff, Young Professionals and contractual teachers.
2.	Optimizing Operational Support	▪ Due to imposition of code of conduct (State Assembly and Parliamentary Elections) the process of recruitment is lying pending. ▪ The Contractual services provided for smooth functioning of the colleges.
3.	Streamlining Recruitment System	▪ An Online Recruitment Management System (RMS) has been implemented in VV for ensured transparency in recruitment process.
4.	Unlocking Career Pathways	▪ Though Placement has never been an issue for RVSKVVIANS, still DI and DSW office and

		Placement Cells are made active in this regard while alumni are supporting the cause.
5.	Setting Academic Standards	▪ To adhere to the Academic calendar a Charter has been prepared to ensure completion of all the academic activities within the stipulated time line.
6.	Empowering Innovation	▪ Special lecture classes have been organized by the faculty and guest speakers (NAHEP) to raise awareness amongst the students which is the part of syllabus also.
7.	Supporting Research Excellence	▪ The University gives away awards to the scientists for recognizing their achievements from time to time. ▪ Scientists with high rated papers have been sent abroad for further strengthening their research acumen.
8.	Equipping Faculty for Success	▪ Training imparted to the scientists for research projects have started yielding results. A number of research projects have been submitted by the scientists of the VV and some of

		which got sanctioned through various funding agencies also.
9.	Enhancing Extramural Offerings	▪ Attempts towards improving Facilities for Sports, gym, Yoga and Cultural Activities are underway.
10.	Empowering Innovation	▪ Incubation Center at VV Head Quarter has been started. The efforts to develop Central Instrumentation lab is in under way.

Technical Officer
DFA, R.V.S.K.V.V. Gwalior

OFFICE OF DEAN FACULTY OF AGRICULTURE

Rajmata Vijyaraje Sindhia Krishi Vishwavidhyalaya
Raja Pancham Singh Marg, Gwalior-474002

No./DFA/2022-23/ 905 **Dated-** 27/10/2022

To,

Dean,
College of Agriculture/Horticulture,
Gwalior/Indore/Sehore/Khandwa/Mandsaur

Sub: Academic and Administrative Audit Report 2022-23- reg.

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Please find enclosed herewith the Academic and Administrative Audit Report for the session 2022-23 for your information and necessary action as discussed in meeting.

T.O. to DFA

Endt.No./DFA/2022-23/ 906 **Dated-** 27/10/2022

Copy for Information-

1- Director Extension/Instructions/Research, RVSKVV, Gwalior.
2- Registrar/Comptroller, RVSKVV, Gwalior.
3- Executive Engineer, RVSKVV, Gwalior.
4- P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

T.O. to DFA

Academic and Administrative Audit Report

Session: 2022-2023

Strength of all Colleges:

1. Specialized updated Faculty: Experts in Their Respective Domains
2. Committed, ambitious, goal oriented disciplined Students
3. Well maintained Department labs and Field labs for practical
4. Modernized Classrooms and Seminar Spaces
5. Computer lab with facility of statistical analysis
6. Well maintained Study material in Library
7. Availability of CeRA Consortium
8. Tech-Enabled Campus with Proficient Faculty and Students
9. Research Projects with host of crops available for practical
10. Availability of crop cafeteria
11. Germplasm accessions for research
12. Instructional farm with implements
13. Availability of student bus for local exposure visits to ICAR Institutes, various Agri based commodity Mandi etc.
14. Supportive Academic Environment with Administrative Backing

Roadmap for Quality Improvement:

"Charting the Path to Progress: A Strategic Roadmap for Improvement"

YEAR: 2022-2023

1. **Addressing Faculty Shortages**: Ensuring Academic Excellence Through Staffing Solutions
2. **Optimizing Operational Support**: Addressing Staffing Shortages for Enhanced Efficiency"
3. **Expanding Digital Libraries**: Amplifying Access to E-Books and E-Journals
4. **Mastering English**: Enhancing Language Proficiency for Success
5. **Empowering Tomorrow's Leaders**: Harnessing Emerging Issues and Technologies Through Training Workshops
6. **Empowering Educators:** National and International Faculty Development and Capacity-Building Initiatives
7. **Forging Global Partnerships**: Signing MoUs for Education, Research, and Capacity Building with Esteemed National and International Institutes
8. **Navigating Global Opportunities**: Building Awareness for Education and Research Abroad
9. **Empowering Faculty**: Faculty development and capacity development programme at national and international level
10. **Cultivating Consciousness**: Raising Awareness for Bio Waste Management

6.5.2 Academic and Administrative Audit (AAA) and Followup Action Taken

YEAR: 2022-2023

SN	Charting the Path to Progress	Action Taken
1.	Addressing Faculty Shortages	▪ Some new appointments are made, some are under process rest of the positions are filled with the appointment of contractual teachers and also by engaging subject matter specialists from KVKs. ▪ Expert Guest Lectures conducted under IDP-NAHEP support the cause up to a great extent. ▪ Lectures by alumni and other technical staff of VV are conducted from time to time.
2.	Optimizing Operational Support	▪ Contractual services have been provided for smooth working in all colleges.
3.	Expanding Digital Libraries	▪ E-materials like, e-books (different publishers and ICAR CeRA portal), e-journals (Consortium for e-Resources in Agriculture- CeRA), reports, articles, and e-thesis (Krishikosh Repository), Shodhganga, statistical information (India

		Agristat), etc. are made available.
4.	Mastering English	▪ Special classes, invited lectures and establishment of language labs under IDP-NAHEP in all constituent Colleges are some of the steps taken to ensure English proficiency for success.
5.	Empowering Tomorrow's Leaders	▪ Technology centric courses addressing the need of ever evolving world has been conducted under NAHEP.
6.	Empowering Educators	▪ The initiatives for national and international trainings under NAHEP have been taken and selected scientists will embark on foreign trip to capacity building initiatives.
7.	Forging Global Partnerships	▪ MOUs with a number of institutions both national and international have been signed. ▪ Students have started going abroad for dual degree programme and batches of new students from all constituent Colleges will soon depart to explore new national and international avenues.

		▪ Faculty exchange programme is underway.
8.	Empowering Faculty	▪ Scientists are encouraged to undergo trainings both national and international which is a mandatory requirement for promotion of the scientists.
9.	Green initiatives and sustainability	▪ Solar energy is being utilized to replace the non-renewable source of power. ▪ Recycling plants have been established under NAHEP to boost up the reuse initiatives. ▪ Establishment of Eco-Oxy zone and promotion of activities *viz.,* plantation and natural beautification of campus have gained momentum.

Technical Officer
DFA, R.V.S.K.V.V. Gwalior

OFFICE OF DEAN FACULTY OF AGRICULTURE

Rajmata Vijyaraje Sindhia Krishi Vishwavidhyalaya

Raja Pancham Singh Marg, Gwalior-474002

No./DFA/PS/2021-22/ 369 **Dated-** 14/07/2021

To,

Dean,
College of Agriculture/Horticulture,
Gwalior/Indore/Sehore/Khandwa/Mandsaur

Sub:Academic and Administrative Audit Report 2021-22- reg.

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Please find enclosed herewith the Academic and Administrative Audit Report for the session 2021-22 for your information and necessary action as discussed in meeting.

Technical Officer to DFA

Endt.No./DFA/PS/2021-22/ 370 **Dated-** 14/07/2021

Copy for Information-

1- Director Instructions/Extension/Research, RVSKVV, Gwalior.
2- Registrar/Comptroller, RVSKVV, Gwalior.
3- P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Technical Officer to DFA

Academic and Administrative Audit Report

Session: 2021-2022

Strength of Colleges :

(1) Specialized updated Faculty: Experts in Their Respective Domains

(2) Committed, ambitious, goal oriented disciplined Students

(3) Well maintained Department labs and Field labs for practical

(4) Modernized Classrooms and Seminar Spaces

(5) Computer lab with facility of statistical analysis

(6) Well maintained Study material in Library

(7) Availability of CeRA Consortium

(8) Tech-Enabled Campus with Proficient Faculty and Students

(9) Research Projects with host of crops available for practical

(10) Availability of crop cafeteria

(11) Germplasm accessions for research

(12) Instructional farm with implements

(13) Availability of student bus for local exposure visits to ICAR Institutes, various Agri based commodity Mandi etc.

(14) Supportive Academic Environment with Administrative Backing

Roadmap for Quality Improvement:

"Charting the Path to Progress: A Strategic Roadmap for Improvement"

YEAR: 2021-2022

1. **Addressing Faculty Shortages**: Ensuring Academic Excellence Through Staffing Solutions
2. **Optimizing Operational Support**: Addressing Staffing Shortages for Enhanced Efficiency"
3. **Elevating Scientific Exploration**: Accessing Advanced Lab Equipment for Cutting-Edge Research"
4. **Revolutionizing Agriculture**: Advancing Farm Implements for Increased Efficiency
5. **Expanding Horizons**: Extra-Curricular Lectures Tackling Cross-Cutting Issues
6. **Strengthening Campus Security**: Expanding CCTV Surveillance for Hostels and Campus
7. **Nurturing Tomorrow's Innovators**: Enhancing Opportunities for Skill and Entrepreneurial Development Among Students
8. **Transparency in Assessment**: Implementing an RTI System for Answer Book Revaluation
9. **Supporting Students**: Psychological Resilience in the Post-COVID Transition
10. **Meeting Challenges**: Addressing the Lack of Specialized Faculty in the Department of Environmental Science
11. **Empowering Success**: Fulfilling the Need for Online Preparation for Competitive Examinations

6.5.2 Academic and Administrative Audit (AAA) and Followup Action Taken

YEAR: 2021-2022

SN	Charting the Path to Progress	Action Taken
1.	Addressing Faculty Shortages	▪ Some Staff positions are filled in on regular basis, others are under the process of recruitment, and rest of the positions is filled in through contractual teachers. ▪ Guest lectures by experts and alumni are also conducted. ▪ Support of Part Time Contractual Teachers still continued.
2.	Optimizing Operational Support	▪ In Colleges having KVK establishment, support from KVKs for addressing staffing shortage and enhanced efficiency is sought after. ▪ As an immediate alternate Contractual staff has been provided for smooth functioning of the Colleges.
3.	Elevating Scientific Exploration	▪ Establishment of state of art Biotechnology center and further strengthening various labs by purchase of advanced equipments to ensure the conduction of high quality research in the University.

4.	Revolutionizing Agriculture	▪ Farm implements have been arranged for the stated purpose and judicious utilization of the same has been taken care of.
5.	Expanding Horizons	▪ Multiple quality lectures conducted under IDP-NAHEP in all the Colleges for the intended purpose.
6	Strengthening Campus Security	▪ For twenty-four seven security High-definition CCTV surveillance have been ensured in all key points.
7	Nurturing Tomorrow's Innovators	▪ A very special care has been taken to the enhancement of entrepreneurship through Certificate Courses/Training Programmes under IDP-NAHEP. ▪ Establishment of incubation center in on the cards for the attainment of stated purpose.
8.	Transparency in Student Assessment	▪ To address evaluation related grievances of students guideline prepared and being implemented to show the Answer books of students on applying as prescribed under RTI act which has increased transparency

		multifold.
9.	Psychological Resilience in Post-COVID Transition	▪ During the catastrophic aftermath of Covid, the students got complete support from **Shake hands Club** working on mentor-mentee system that was made to work on the line of guardian-ward mode that yielded desirable fruit as students remained hopeful all along as teachers like guardians always pointed to 'silver lining among dark clouds' and no incident of students' adopting drastic measure has ever been reported in the University. ▪ Students' Whatsapp group for MCQs, Notes, ppt, study material sharing, virtual classes etc have been launched during Covid period that provided strong academic support to the students.
10	Addressing Lack of Specialized Faculty in the Department of Environmental Science	▪ The guest lectures organized under NAHEP and through other sources was the solution adopted to face the dearth of

		Environment Science faculty until other arrangement is not made. ▪ Implementation of closing of Department is underway.
11	Online Preparation for Competitive Examinations	▪ Online storehouse of knowledge for the preparation of the competitive examinations has been offered to students and faculties with access twenty-four seven even through their smart phones. ▪ The students while staying for village and industry attachment also during internship under READY Programme feel the need of maximum academic support which is duly addressed through this offer.

Technical Officer
DFA, R.V.S.K.V.V. Gwalior

Academic and Administrative Audit Report

Session: 2020-2021

2020-2021(CORONA PANDEMIC) No Audit Meeting and Review

Technical Officer
DFA, R.V.S.K.V.V. Gwalior

OFFICE OF DEAN FACULTY OF AGRICULTURE

Rajmata Vijyaraje Sindhia Krishi Vishwavidhyalaya
Raja Pancham Singh Marg, Gwalior-474002

No./DFA/2019-20/1451 Dated- 11/09/2019

To,

Dean,
College of Agriculture/Horticulture,
Gwalior/Indore/Sehore/Khandwa/Mandsaur

Sub:Academic and Administrative Audit Report 2019-20- reg.

^^^^^^

Please find enclosed herewith the Academic and Administrative Audit Report for the session 2019-20 for your information and necessary action as discussed in meeting.

Technical Officer to DFA

Endt.No./DFA/PS/2019-20/1452 Dated- 11/09/2019

Copy for Information-

1- Director Research/Extension/Instructions, RVSKVV, Gwalior.
2- Registrar, RVSKVV, Gwalior.
3- Comptroller, RVSKVV, Gwalior.
4- P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Technical Officer to DFA

Academic and Administrative Audit Report

Session: 2019-2020

Since June 2022, RVSKVV, Gwalior has established an Internal Quality assurance Cell (IQAC). Prior to its inception, quality assurance across all the mandatory university activities including academic and administrative audits was conducted through a meticulously organized mechanism engaging administrators and senior officials. Monthly Faculty Review Meetings led by College Deans pinpoint quality maintenance gaps and device improvement strategies. The quarterly Senior Officers Meet (SOM) chaired by the Vice Chancellor involves Deans and senior administrators. Here, issues and quality enhancement measures proposed by the Deans and Directors are reviewed, forming the basis for a structured roadmap that guides future actions.

The outcomes of the Senior Officers Meet (SOM) regarding the Academic and Administrative audits conducted over the past five years are detailed below:

Strength of the Colleges:

(1) Specialized updated Faculty: Experts in Their Respective Domains
(2) Committed, ambitious, goal oriented disciplined Students
(3) Well maintained Department labs and Field labs for practical
(4) Modernized Classrooms and Seminar Spaces
(5) Computer lab with facility of statistical analysis
(6) Well maintained Study material in Library
(7) Availability of CeRA Consortium
(8) Tech-Enabled Campus with Proficient Faculty and Students
(9) Research Projects with host of crops available for practical
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(12) Instructional farm with implements
(13) Availability of student bus for local exposure visits to ICAR Institutes, various Agri based commodity Mandi etc.
(14) Supportive Academic Environment with Administrative Backing

Roadmap for Quality Improvement:

"Charting the Path to Progress: A Strategic Roadmap for Improvement"

YEAR: 2019-2020

1) **Addressing Faculty Shortages**: Ensuring Academic Excellence Through Staffing Solutions
2) **Optimizing Operational Support**: Addressing Staffing Shortages for Enhanced Efficiency"
3) **Broadening Horizons**: State and National Level Institute Exposure Visits
4) **Revitalizing Workspaces**: Urgent Repairs and Renovations for Enhanced Infrastructure
5) **Securing Field Experiments**: Budgeting for Boundary Wall or Fencing
6) **Enhancing Accountability**: Implementing QR Coding for Transparency and Confidentiality in Examination Section
7) **Nurturing Green Ambassadors**: Instilling Responsibility and Stewardship for Environmental Preservation Among Students
8) **Cultivating Inclusivity**: Building Awareness for Gender Equity, Diversity, and Constitutional Values
9) **Comprehensive Campus Healthcare**: Providing Medical Facilities with Male and Female Doctors"
10) **Enriching Academic Experience**: Harnessing Adjunct Guest Faculty and Alumni Contributions for Advanced Learners"

6.5.2 Academic and Administrative Audit (AAA) and Followup Action Taken

YEAR: 2019-2020

SN	Charting the Path to Progress	Action Taken
1.	Addressing Faculty Shortages	▪ Process of appointment of regular faculty initiated. ▪ As an immediate alternate Part Time Contractual teachers appointed to fill the gap. ▪ KVKs' Subject Matter Specialists have also been engaged to fill the gap.
2.	Optimizing Operational Support	▪ Process of appointment of supporting staff initiated. ▪ As an immediate alternate Contractual staff has been provided for smooth functioning of the Colleges.
3.	Exposure Visits to various Institutes	▪ Exposure visits as Educational Tour have been arranged for UG outgoing students ▪ Component of exposure Visit is being taken care of while formulating the National Agricultural Higher Education Project under World Bank Funding in a competitive mode
4.	Repairs and Renovations of Infrastructure	▪ Development Grant of ICAR and other financial resources are utilized to update the infrastructure related necessities.
5.	Securing Field Experiments	▪ Instructions for Bio fencing issued under" go Green' policy of the University

		▪ Budgetary allocations are being made to ensure the safety where ever situation is becoming worse and requires urgent attention.
6.	Enhancing Accountability, Transparency and Confidentiality in Examination Section	▪ Implementation of QR code-based Fire Eye Scanner technology adopted on answer books
7.	Nurturing Green Ambassadors	▪ Green graduate Certificate programme has been started for guaranteed awareness amongst the students of RVSKVV for environment preservation.
8.	Cultivating Inclusivity	▪ Programmes on Women sensitization and legal literacy are conducted to address the issues.
9.	Comprehensive Campus Healthcare	▪ First- Aid facilities in Dispensary Units are further strengthened and Doctors Male Female appointed/arranged in all the Colleges.
10.	Enriching Academic Experience	▪ Robust Knowledge transfer is ensured through Expert Guest lectures and alumni for learners of all kind.

Technical Officer
DFA, R.V.S.K.V.V. Gwalior

(II)

Conferences, Seminars, Workshops on quality conducted

(No New Information Added)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

List of Conferences/Seminars/Workshops on Quality conducted for

Year-2023-24

S.No.	Topic	Date	Mode
1.	Ethics and Integrity in Education	03 December 2023	Offline
2.	Quality Assurance and Strategies for Student Engagement	24 September 2023	Offline
3.	Empowering Agriculture Input Dealers: Ensuring Quality and Knowledge for Safer, Smarter Choices for Farmers	01 October 2023	Offline
4.	Strategies for Leading a Balanced quality and Fulfilling Student Life	12 September 2023	Offline
5.	Upholding Human Values: Navigating Ethics in Today's Complex World	01 October 2023	Offline

Seminars on Quality conducted

Year-2023-24

1. Topic : Ethics and Integrity in Education

Highlights:

- Upholding academic integrity
- Ethical decision-making in educational settings
- Developing a culture of transparency and accountability

Guest Speaker: Shri Apurva Gaivak, Professor, GSITS, Indore





Ethics and Integrity in Education: Shri Apurva Gaivak, Indore

2. **Topic: Quality Assurance and Strategies for Student Engagement**

Highlights:

- Understanding accreditation requirements
- Creating a supportive learning environment
- Encouraging student feedback and involvement

Guest Speaker: Dr MK Sharma, Retired ADA and a Motivational speaker, Indore





Dr MK Sharma, Retired ADA and a Motivational speaker, Indore



3. Topic: Empowering Agriculture Input Dealers: Ensuring Quality and Knowledge for Safer, Smarter Choices for Farmers

Highlights:

- Product Knowledge and Quality Standards
- Identifying and Avoiding Spurious Products
- Effective Communication and Advisory Skills

Guest Speaker: Dr Rahul Patidar, Entomologist, Indore







Guest Speaker: Dr Rahul Patidar, Entomologist, Indore

4. **Topic: Strategies for Leading a Balanced quality and Fulfilling Student Life**

Highlights:

- Time Management and Prioritization
- Physical and Mental Well-Being
- Building Meaningful Relationships

Guest Speaker: Dr Sandeep Atre, Motivational Speaker, Director, CHEM, Indore





Strategies for Leading a Balanced quality and Fulfilling Student Life

5. Topic: Upholding Human Values: Navigating Ethics in Today's Complex World

Highlights:

- Understanding Core Human Values
- Ethical Decision-Making
- Promoting a Culture of Integrity

Guest Speaker: Shri Neelesh Jain, Motivational Speaker, Swati Jain Academy, Indore







Shri Neelesh Jain, Motivational Speaker, Swati Jain Academy, Indore



(III)

Collaborative quality initiatives

with

other institution(s)

Submission of New Information

(Sharing for the first time)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

DIRECTORATE OF RESEARCH SERVICES
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya,
2nd Floor, Administrative Block, Raja Pancham Singh Marg, Gwalior 474 002 M.P.
(An ISO 9001:2008 Certified Organization No. 67934/A/0001/UK/En)

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509 (Tele-Fax)
Email: drs@rvskvv.net

No.DRS/2023/178

Date: 21-04-2023

CERTIFICATE

RVSKVV Gwalior is having MoU with various national and international institutes for developing technological options for various site specific and location specific problems and needs. The details of the technologies developed in collaboration with different institutes are given below:

S. No.	Name of Collaborative Institute	Technologies/Varieties Developed
1.	Bhabha Atomic Research Centre, Mumbai	Crop Improvement: Released New wheat variety i.e. TRVW155
2.	International Centre of Research in Semiarid and tropics, Hyderabad	Crop Improvement of Chickpea &Pigeon pea in terms of short duration, biotic, abiotic tolerant and climate resilient varieties of these crops.
3.	FiBL, Switzerland	Organic Farming, development of varieties of cotton for organic farming.
4.	Raja Ramanan Centre for Advanced Technology, Indore	Development of Nano Gypsum.
5.	Indian Agricultural Research Institute, New Delhi	Technology Development and seed production of wheat, rice and Chickpea.
6.	ICAR, New Delhi	Dryland Farming, Water Management, Crop Improvement of sorghum, soyabean, safflower, wheat, Gram, Legumes, Pigeon Pea, Cotton, Mustered, Pearl Millet, Ground Nut, Onion & garlic, weed management, Grapes, Medicinal & aromatic plants etc.
7.	Borlaug Institute of South Asia, Jabalpur	Crop Improvement specifically wheat crop
8.	Extension Education Institute, ANAND- Gujarat	Enhancing Soft Skills and managerial proficiency for organizational success
9.	Extension Education Institute, ANAND- Gujarat	Behavioural Skills for extensionist and scientist
10.	Entrepreneurship Development Institute of India Ahmedabad	Skill Development Programme on Agro-based Entrepreneurship

This is in response to matrix No. 652

21/4/2023

Director Research Services

ANNUAL PROGRESS REPORT

BARC Funded Research Work

2023-24

Dr. Sushma Tiwari

Scientist

Department of Plant Molecular Biology and Biotechnology

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR

COLLEGE OF AGRICULTURE

GWALIOR (M.P.)

Physical and Financial progress of BARC funded Project

1. **Name of the Project:** Field and laboratory facilities for wheat
2. **Principal Investigator of the project:** Dr Sushma Tiwar
3. **Location of the project:**
   - RVSKVV, College of Agriculture, Indore
   - RVSKVV, R.A.K College of Agriculture, Sehore
   - RVSKVV, B.M College of Agriculture, Khandwa
   - RVSKVV, KVK, Alirajpur
   - RVSKVV, KVK, Sheopur
   - RVSKVV, ZARS, Morena
   - RVSKVV, SARS, Bhind
4. **Introduction and objectives:**

Wheat (*Triticum aestivum L.)* is the world's most staple food crop as well as most consumed cereal. It is known as "king of cereals" as its cultivation is easier, ecologically suitable and contain high amount of nutrients. In India, it is the staple diet in the northern and central regions. It is cultivated on 15.4 % of the arable land in the world in almost all countries, except the humid and high-temperature areas in the tropics and high-latitude environments. Accounting for a fifth of humanity's food, wheat is the second only to rice which provides 21% of the food calories and 20% of the protein for more than 4.5 billion people in 94 developing countries (Braun *et al*., 2010). Major countries growing wheat crop are China, India, United States of America (USA), Russia, Canada, and Mexico. Presently, the world acreage under wheat crop is 240 million hectares with a production of 734.5 million tonnes of grain, 1.2 million tonnes more than in the previous year, mostly on account of higher production in Australia, China, Morocco, Turkey, Ukraine and the United States (FAOSTAT, 2016).

India stands second both in area and production next to China in the world. Presently, India's share in global wheat production is 13.1 per cent. It is a major contributor in food security system of India, occupying nearly 29.55 million hectares with production 101.20 mt and productivity of 34.24 qh^{-1}. In Madhya Pradesh, it is being cultivated in 5.52 million hectares with the production of 17.35 million tones with 31.43 qh^{-1}productivity (Anonymous, 2019). Uttar

Pradesh, Punjab and Haryana are the important states from the point of both area and production. Productivity wise Punjab stands first. Due to introduction of semi-dwarf varieties India's wheat production has been rising continuously since late 1960's. Between 1970-1994, it has risen at the rate of more than 3 percent per annum. However, since 1995, it has showed down to more than 1 per cent per annum (Rajaram, 2011)

Objectives:

- Field management for wheat improvement
- Laboratory facilities for molecular breeding of wheat

5. Account statement:

Year	Allotment	Expenditure	Balance
2019-20	40,000/-	40000/-	Nil
2020-21	30,000/-	28000/-	2000/-
2021-22	30000/-	29744/-	256/-
2022-23	Nil	-	-
2023-24	86257	86121/-	136/-

6. **Title of experiments:** "Field and laboratory facilities for wheat"

A. Experimental Details

No. of entries	:	16 + 1
No. of rep.	:	01
No. of rows/plot	:	06
Row length	:	5 m
Row to row distance	:	20 cm
Plot size (Net)	:	4 m^2
Date of sowing	:	10/09/2023
Irrigation	:	Three

Table: List of wheat genotypes with their pedigree

S.NO.	Genotype	Pedigree
1.	TAW155	MUTUS/AKURI#1//MUTUS
2.	TAW170	MACS6222/PBW677Mutant//GW322
3	TAW171	MACS6222/ PBW677 Mutant //GW366
4.	TAW172	HI1605/PBW725 Mutant //HD2932
5.	TAW173	GW366/Borlaug100 mutant
6.	TAW174	HI1605/PBW725 Mutant //HD2932
7.	TAW175	HI1605/Borlaug Mutant // MACS6222
8.	TAW176	HI1605/Borlaug Mutant// MACS6222
9	TAW177	Borlaug Mutant// MACS6222
10.	TAW178	Borlaug Mutant// MACS6222
11.	TAW179	Borlaug Mutant// MACS6222
12.	TAW180	HD2932/GW322 Mutant // RAJ3777
13.	TAW181	TAW119/DBW187
14.	TAW182	TAW123/GW322
15.	TAW183	TAW119/ GW366
16.	TAW184	TAW119RAJ3777
17.	RVW 4106	CHIBIA/PRL11/CM65531

7. **Research Findings with graphical presentation: (Supported with yield attributes and Yield Data)**

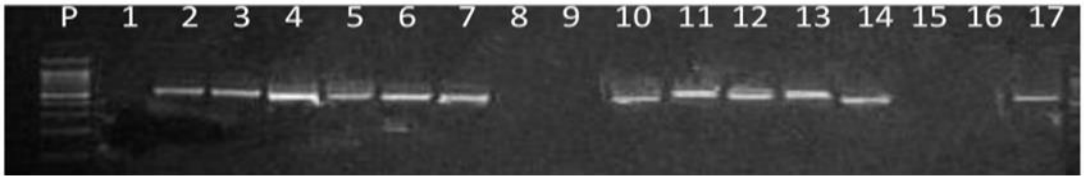
Plant height, Spike length, Spike weight, Tiller number, Gain number, Grain weight, Yield, Days to heading and Days to maturity were analyzed.

S.NO	Genotypes	Days to 50% heading (days)	Days to 50% flowering (days)	Grain filling period	Days of maturity	number of tiller	Plant height (cm)	Peduncle length (cm)	flag leaves area (sq.cm)
1	TAW 155	81.21	91.22	37.83	128.79	9.19	85.29	12.82	43.24
2	TAW 170	81.74	90.89	36.30	127.21	9.00	88.58	14.09	42.32
3	TAW 171	81.80	91.78	38.86	130.21	9.27	87.73	13.99	43.89
4	TAW 172	81.68	92.06	39.20	130.70	9.04	89.42	14.31	46.26
5	TAW 173	81.33	90.83	37.90	129.23	8.67	88.99	14.24	43.79
6	TAW 174	82.88	92.67	37.95	129.83	8.77	86.06	13.80	45.52
7	TAW 175	83.14	92.61	38.84	131.51	9.46	89.14	14.67	45.05
8	TAW 176	83.91	92.72	37.74	130.71	8.88	87.33	14.14	45.76
9	TAW 177	83.72	92.50	37.84	130.95	9.44	88.40	14.01	43.33
10	TAW 178	83.74	93.67	38.44	131.45	8.82	88.78	13.99	44.04
11	TAW 179	81.12	91.44	40.99	131.59	9.26	90.78	13.49	45.27
12	TAW 180	81.82	91.44	42.21	133.27	9.02	90.68	14.45	43.63
13	TAW 181	83.01	92.45	37.11	129.23	9.00	89.28	13.00	44.92
14	TAW 182	83.78	93.39	34.56	127.03	10.11	90.90	13.83	43.62
15	TAW 183	82.52	92.05	38.22	129.32	9.01	88.94	13.38	41.49
16	TAW 184	82.88	92.61	37.78	129.37	8.91	89.71	12.90	43.87
17	RVW 4106	82.52	91.78	40.01	130.60	9.06	86.63	13.79	44.17
	Mean	**82.51**	**92.12**	**38.34**	**130.05**	**9.11**	**88.62**	**13.81**	**44.12**
	C.V.	0.83	0.50	3.06	0.45	3.24	1.44	2.77	2.43
	S.E.	0.39	0.27	0.69	0.33	0.16	0.74	0.21	0.62
	C.D. 5%	1.11	0.75	1.95	0.95	0.44	2.09	0.59	1.74
	C.D. 1%	1.47	1.00	2.59	1.26	0.59	2.77	0.78	2.31

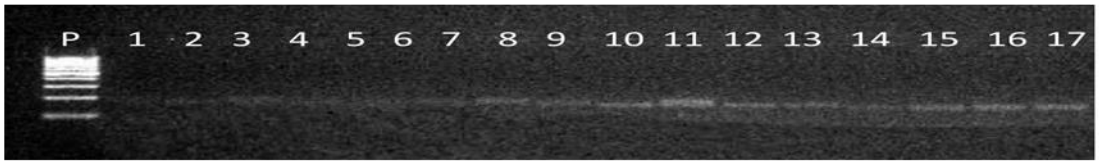
S.NO	Genotypes	spike length (cm)	spike weight (gram)	No. of grain/ spike	1000 seed weight (gram)	Harvest index (%)	Biological yield per plant (gram)	Grain yield per plant (gram)
1	TAW 155	10.96	3.33	64.61	48.28	45.82	196.31	86.03
2	TAW 170	11.43	2.75	65.37	47.76	44.01	171.28	78.45

3	TAW 171	11.14	3.32	70.04	49.40	47.03	175.38	86.35
4	TAW 172	10.62	3.45	65.22	49.69	45.61	176.19	82.73
5	TAW 173	11.02	3.27	67.48	46.83	47.96	217.56	86.78
6	TAW 174	11.26	3.09	69.10	47.89	44.62	196.41	89.55
7	TAW 175	11.18	3.35	67.98	45.92	38.06	212.83	83.80
8	TAW 176	11.20	3.27	67.87	45.13	40.25	190.36	79.82
9	TAW 177	11.54	3.24	68.93	45.48	39.42	188.99	77.40
10	TAW 178	11.03	3.37	66.47	46.04	45.37	173.75	80.31
11	TAW 179	10.95	3.56	68.17	46.78	43.66	184.52	83.09
12	TAW 180	10.82	3.29	66.34	47.10	41.57	177.43	75.06
13	TAW 181	11.12	3.49	65.83	49.85	45.84	175.34	83.89
14	TAW 182	10.75	3.36	66.37	49.76	41.94	202.17	86.29
15	TAW 183	10.62	2.86	62.62	50.51	42.94	185.11	81.51
16	TAW 184	11.33	2.77	66.71	48.32	42.06	178.45	76.38
34	RVW 4106	11.35	3.53	68.10	41.89	39.28	201.16	85.78
	Mean	**11.07**	**3.25**	**66.89**	**47.44**	**43.26**	**188.42**	**82.54**
	C.V.	2.86	4.77	2.46	3.09	2.75	2.66	2.12
	S.E.	0.18	0.09	0.92	0.79	0.69	2.88	1.01
	C.D. 5%	0.50	0.24	2.60	2.24	1.94	8.12	2.85
	C.D. 1%	0.67	0.32	3.46	2.97	2.57	10.79	3.79

Screening for Sr31 gene



*Sr*31 gene SCAR markers SCS 30.2



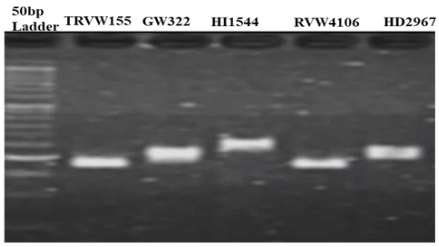
Lr26/Sr31 SSR markers lag 95

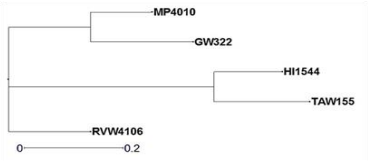
Marker	Major.Allele. Frquency	Allele No	Gene Diversity	PIC
SCS 30.2	**0.7059**	**2.0000**	**0.4152**	**0.3290**
SCS1302	**0.7647**	**2.0000**	**0.3599**	**0.2951**
SCS 26.1	**0.8235**	**2.0000**	**0.2907**	**0.2484**
Lag 95	**0.4706**	**3.0000**	**0.6315**	**0.5575**
Xgwm533	**0.5294**	**3.0000**	**0.5467**	**0.4486**
csSr2	**0.4412**	**3.0000**	**0.6142**	**0.5324**
Mean	**0.6225**	**2.5000**	**0.4764**	**0.4018**

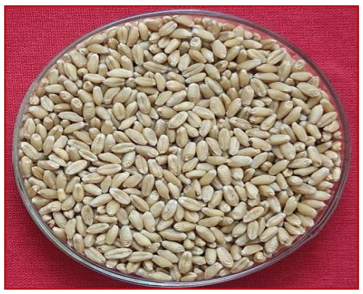
Highlights of the Experiment:

Evaluation of 16 wheat genotypes and 1 check verity was done at Gwalior, Sehore, Sheopur, Bhind, Morena, Alirajpur and Khandwa Centre of RVSKVV, Gwalior. Morphological observations for plant height, spike length, spike weight, tiller number, gain number, grain weight, yield, days to heading and days to maturity were taken. Total 16 wheat genotypes were evaluated at 7 different centers of RVSKVV, Gwalior. Released one variety TRVW155 at state level. One PhD student Mr Pradeep Kumar Yadav, has done his research work on same planting material.

Outcome with Photographs: Variety state release TRVW 155 (Trombay Raj Vijay Wheat 155) IC number generated from NBPGR IC650600







TRVW155



Plant and Spike of TRVW155



COA,Gwalior



COA,Indore



B.M.COA,Khandwa



R.A.K COA, Sehore



ZARS, Morena



KVK, Sheopur



SARS, Bhind



KVK, Alirajpur

Fig. Field view of Trombay wheat genotypes at different locations

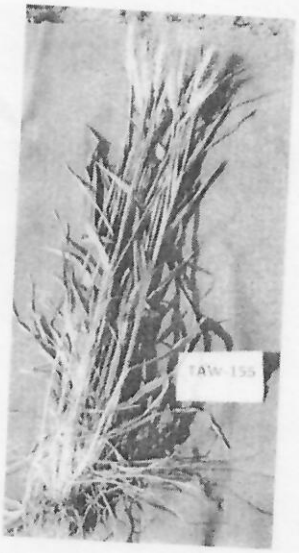
Additional information (if any)

Research plan 2024-25 details

Received set of high yielding and heat tolerant genotype Borlauge 100 (advance mutants), it was evaluated for heat during 2023-24 and will be repeated again in 2024-25.

Collaborative variety development programme:

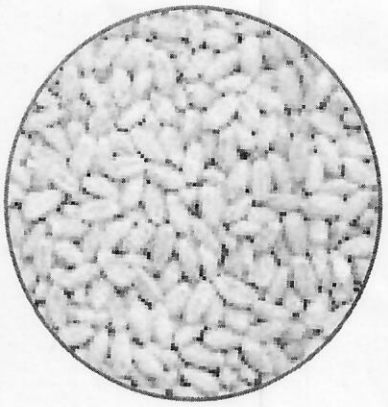
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya and **Bhabha Atomic Research Centre, Trombay,** Mumbai in collaboration developed a high yielding wheat variety TRVW 155 for Central Zone in 2023. This variety has been recommended for timely sown irrigated conditions of low and medium fertility soils of MP. TRVW155 is a high yielding wheat variety with average yield 55-59q per ha. Maturity 120 days; Plant height 94 cm.; 1000 grain weight 44g; Protein content 11.0% and iron content is (40.5ppm). TRVW155 is a medium tall variety with amber, semi- hard and bold grains with 'chapatti' making quality parameters. TRVW155 showed high level of resistance to wheat blast, stripe rust, leaf rust and stem rust under both natural field and artificial conditions. It showed average yield 55-59q per ha. Which is above 10% higher than prevalent varieties like MP4010 and Gw 322. The variety performed excellently on farmers field.



Single plant of TRVW 155



Ear head



Grain

Project Summary: Enhancing Pigeonpea Production and Productivity in India by Promoting High-Yielding Early Maturing Varieties and Hybrids

Funding Agency: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
Project Duration: 3 Years

Project Investigators: Dr. M. Yasin, Dr. Ashok Saxena, Dr. A. Nishant Bhanu

Objective

The project aims to enhance pigeonpea production and productivity in India by promoting high-yielding, early maturing varieties and hybrids. The focus is on identifying and demonstrating superior genotypes for the Madhya Pradesh region, covering early, mid-early, and medium-duration varieties.

Key Components

1. **Identification of Superior Varieties**:
    - Conduct multi-location trials to evaluate early, mid-early, and medium-duration pigeonpea genotypes.
    - Select and recommend superior varieties that are well-suited to the agro-climatic conditions of Madhya Pradesh.
2. **Front Line Demonstrations (FLDs)**:
    - Implement on-farm demonstrations of superior pigeonpea genotypes.
    - Showcase the advantages of improved varieties to farmers in real-world conditions, focusing on yield, pest resistance, and adaptation to local environments.
3. **Farmers' Training Programs**:
    - Organize training sessions for farmers on scientific methods of pigeonpea production.
    - Cover topics such as crop management, pest control, fertilizer application, and water-use efficiency to maximize productivity.

Expected Outcomes

- Identification and adoption of high-yielding pigeonpea varieties tailored to the Madhya Pradesh region.
- Increased productivity and profitability for farmers through the use of scientifically validated practices.
- Enhanced capacity of farmers to adopt modern technologies for pigeonpea cultivation, leading to sustainable agricultural development.

This project will serve as a significant step in advancing pigeonpea production, addressing regional food security, and contributing to the socio-economic well-being of farmers in Madhya Pradesh.

Report on Multilocation Trials Conducted in 2023-24

The 2023-24 growing season included the evaluation of advanced breeding lines across four multilocation trials (MLTs) under the **TPR 23** series. These trials were conducted to assess the yield and associated traits of medium, mid-early, and extra-early duration pulse lines using the **Alpha Lattice Design**, ensuring robust statistical evaluation.

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1. TPR 23 MLT Medium (PYT 07)

- **Objective**: Evaluation of medium-duration lines for yield and associated traits.
- **Experimental Design**: Alpha Lattice Design
- **Number of Entries**: 50
- **Results**: The top-performing entries were:
    1. **Plot No. 149**
    2. **Plot No. 235**

2. TPR 23 MLT Extra Early (PYT 08)

- **Objective**: Evaluation of extra-early lines for yield and associated traits.
- **Experimental Design**: Alpha Lattice Design
- **Number of Entries**: 40
- **Results**: The top-performing entries were:
    1. **Plot No. 110**
    2. **Plot No. 157**

3. TPR 23 MLT Mid Early (PYT 09)

- **Objective**: Evaluation of mid-early lines for yield and associated traits.
- **Experimental Design**: Alpha Lattice Design
- **Number of Entries**: 40
- **Results**: The best-performing plots were:
    1. **Plot No. 172**
    2. **Plot No. 192**

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4. TPR 23 MLT Mid Early (PYT 10)

- **Objective**: Evaluation of mid-early lines for yield and associated traits.
- **Experimental Design**: Alpha Lattice Design
- **Number of Entries**: 40
- **Results**: The top-performing entries were:
    1. **Plot No. 106**
    2. **Plot No. 174**

Conclusion

The multilocation trials successfully identified high-performing entries across different maturity groups. These promising lines will be considered for further validation and advancement in the breeding pipeline, contributing to the development of high-yielding, regionally adapted pulse varieties.

Progress and Achievements

- **Variety Identification**: Two promising pigeonpea varieties have been identified during the project. These varieties exhibit high yield potential and adaptability to the Madhya Pradesh region.
- **Nomination for National Trials**: The identified varieties have been nominated for testing under All India Coordinated Research Project (AICRP) trials further to validate their performance and suitability for widespread adoption.

Training/Awareness on Pigeonpea - Farmer's Training on Pigeonpea

Location: RAK College of Agriculture, Sehore, Madhya Pradesh

Participants: 50 Farmers from Sehore District

An interactive session was held where farmers could discuss their concerns and challenges with the scientists. Topics included low production, new varieties, and improved management practices. This interaction provided an opportunity for farmers to get personalized advice and solutions from the experts.



Farmers Training Program organised at R.A.K. College of Agriculture, Sehore.

Project Title: Building Lentil Growing Community Resilience by the Development of Climate Smart Lentil Varieties through Farmer's Participatory Interventions

FUNDING AGENCY: IIPR

Report for the year 2023-24

Component I: Advanced breeding lines/genetic gain evaluation trial

Under the project "Building Lentil Growing Community Resilience by the Development of Climate Smart Lentil Varieties through Farmer's Participatory Interventions," an advanced breeding lines/genetic gain evaluation trial was conducted, focusing on the assessment of 100 lentil genotypes. This trial aimed to identify and develop superior lentil varieties that are resilient to climate change and can enhance productivity. The evaluation included comprehensive field trials and genetic analyses to determine the performance of these genotypes.

Component II: Training/Awareness on Lentil - Farmer's Training on Lentil

Training Date: March 14, 2024 and March 19, 2024

Location: RAK College of Agriculture, Sehore, Madhya Pradesh

Participants: 100 Farmers from Sehore District

Introduction:

On March 14, 2024 and March 19, 2024, a one-day training program for farmers on lentil cultivation was conducted under the project “Building Lentil Growing Community Resilience by the Development of Climate Smart Lentil Varieties through Farmers Participatory Interventions.” The training aimed to equip farmers with the latest knowledge and practices to boost lentil production and productivity. The event saw the participation of around 50 farmers in each training from the Sehore District.

Session Highlights:

Inaugural Session:

The training session commenced with a warm welcome to all participants, followed by an overview of the day’s agenda and objectives.

Overview of Lentil and Pulses in Madhya Pradesh and Export Opportunities:

Speaker: Dr. M. Yasin

Dr. M. Yasin provided an insightful presentation on the overall scenario of lentil cultivation in Madhya Pradesh. He highlighted the state's current production statistics, major lentil-growing

regions, and the importance of lentils in the agricultural economy. Dr. Yasin also discussed the export opportunities for lentils, emphasizing the potential for farmers to increase their income through improved cultivation practices and high-yielding varieties.

Management Practices for Lentil Cultivation:

Speaker: Dr. Ashok Saxena

Dr. Ashok Saxena delivered a comprehensive lecture on the best management practices for lentil cultivation. He covered various aspects such as soil preparation, optimal sowing time, spacing, fertilization, irrigation, and weed management. Dr. Saxena's session aimed to enhance the farmers' understanding of how to achieve better yields and sustainable farming practices.

Quality Seed Production of Lentil:

Speaker: Dr. A. Nishant Bhanu

Dr. A. Nishant Bhanu briefed the participants on the importance of quality seed production. He explained the process of selecting, producing, and preserving high-quality seeds. Dr. Bhanu emphasized the role of quality seeds in achieving higher yields and better crop performance, and he provided practical tips on seed production techniques.

Disease and Pest Management Practices in Lentil:

Speaker: Dr. Ashok Choudhary

In his session, Dr. Ashok Choudhary focused on the major diseases and pests affecting lentil crops. He provided detailed information on the identification, prevention, and control of common lentil diseases and pests. Dr. Choudhary also introduced integrated pest management (IPM) strategies to help farmers minimize crop losses and reduce dependency on chemical pesticides.

Field Visit to Experimental and Demonstration Plots:

Facilitator: Dr. A. Nishant Bhanu

The training concluded with a field visit led by Dr. A. Nishant Bhanu. Farmers were taken to the experimental and demonstration fields where they could see firsthand the implementation of the discussed practices. In the field, Dr. Yasin explained the various experimental setups and demonstrated practical applications of the management practices, quality seed production, and disease and pest management techniques discussed earlier in the sessions.

Farmers-Scientist Interaction:

An interactive session was held where farmers could discuss their concerns and challenges with the scientists. Topics included low production, new varieties, and improved management practices. This interaction provided an opportunity for farmers to get personalized advice and solutions from the experts.

Key Outcomes:

1. **Increased Awareness:**
    - Enhanced understanding among farmers about the latest practices in lentil cultivation.
    - Awareness of export opportunities and market potential.
2. **Adoption of Best Practices:**
    - Farmers equipped with knowledge of quality seed production, disease, and pest management.
    - Encouragement to adopt climate-smart practices for better yield and sustainability.
3. **Collaborative Learning:**
    - Active interaction between farmers and scientists leading to practical solutions.
    - Identification of common issues and potential strategies for improvement.

Conclusion:

The one-day training session successfully imparted essential knowledge and skills to the participating farmers. The interactive format allowed for meaningful exchanges between farmers and experts, fostering a collaborative approach to improving lentil cultivation practices in the Sehore District. This initiative is expected to contribute significantly to building a resilient and productive lentil-growing community.

Acknowledgements:

We thank the Government of India Ministry of Agriculture and Farmers Welfare, Department of Agriculture & Farmers Welfare Crops and PHMF Division Krishi Bhawan for funding this initiative and IIPR as the lead centre. We also express our gratitude to the farmers for their enthusiastic participation.



Glimpses of Farmers Training

COMPILED PROGRESS REPORT OF FiBL PROJECT

YEAR

2019-2023

SUBMMITED BY

Dr. D.K.SHRIVASTAVA

Principal Investigator

FiBL Project

ALL INDIA COORDINATED RESEARCH PROJECT ON COTTON

RAJMATA VIJAYARAJE SCINDIA KRISHI VISWA VIDYALAYA, GWALIOR

B.M.COLLEGE OF AGRICULTURE, KHANDWA(M.P.)

The FiBL

The **Research Institute of Organic Agriculture (FiBL)** is a private foundation aiming at establishing practice-oriented agronomic and economic research in organic farming, including plant breeding. FiBL has about 150 staff and is one of the world's leading R&D and technology transfer centers dedicated to sustainable, organic and low-input agriculture. FiBL focuses on applied soil and crop science, socio-economic and animal science and the dissemination of scientific findings to farmers, policy makers and other stakeholders in the food supply chain. The close links between R&D and technology transfer is a particular strength of FiBL. FiBL is/was coordinator/partner in over 25 scientific projects of the European Research framework. FiBL's Plant Breeding focuses focus on plant soil/microbe interaction aiming for breeding for improved adaptation and symbiosis, on genotype x management interaction (cropping systems, fertilizer levels), participatory breeding approaches (cotton breeding), optimizing genotype and management simultaneously (breeding for mixed cropping systems) and networking. FiBL is collaborating closely with private and public breeders, farmers, label organisations and policy makers. Breeding activities are complemented by on farm cultivar trials and the development of marketing concepts involving different stakeholders. FiBL has long been committed to the international development of organic agriculture. Alongside practical research, high priority is given to transferring knowledge into agricultural practice through advisory work, training courses and expert reports as well as various modern methods of documentation. Since 2002, FiBL is conducting research on cotton in India and also in West Africa. FiBL has close collaboration with various scientific groups in India in the scope of the Indo-Swiss-Collaboration for Biotechnology since almost 15 years and is conducting long term research in collaboration with bioRe since 2007. The participatory cotton breeding work in collaboration with Prof Patil is running since 2011.

Physical and Financial progress of Project

1. Name Project : Seeding the Green Future - Participatory Cotton Breeding for Organic Farming & Securing Genetic Diversity of non-GM Cotton (FiBL)

2. Location of the project : B.M.College of Agriculture, Khandwa

3. Name of PI : Dr. D.K.Shrivastava
Scientist& Head AICRP on Cotton,
B,M,College of Agriculture, Khandwa

4. Date of start of the project : 2019-20

5.Date of Completion of the Project : 2022-23

6. Introduction and objectives :

1. To improve the availability of high-quality seed of adapted non-GM cultivars of cotton for the benefit of small holder farmers in India.
2. In a participatory approach involving farmers and the entire value chain, organic GM-free seeds and improved cotton cultivars are developed that show a high degree of adaptability to the local growing conditions and increase the genetic diversity.
3. To enhance the collaboration among the various stakeholders and to facilitate local capacity building together with farmers in the short term to establish the local seed supply for organic cotton and in the medium term to restore and to improve yields (especially the yield security) and the fibre quality under organic and low input farming and to promote seed sovereignty of smallholder farmers.

7. Account statement of the project: 2019-20 to 2022-23

2019-20

Budget Head	Allotment (CHF)	Allotment (Rs)	Expenditure (Rs)	Balance (Rs)
Participatory Cotton Breeding-FiBL(2019-20)				
Personnel cost including social charges & overhead	6000.0	320141.0	Nil	320141.0
Material cost	6750.0	360159.0	Nil	360159.0
Travel expenses	2250.0	120053.0	Nil	120053.0
Total	15000.0	800353.0	Nil	800353.0

2020-21

Budget Head	Allotment (CHF)	Allotment (Rs)	Opening Balance (Rs)	Expenditure (Rs)	Balance (Rs)
Participatory Cotton Breeding-FiBL(2020-21)					
Personnel cost including social charges & overhead	11905.0	846952.65	320141.0	320141.7	526811
Material cost	6750.0	480212.55	360159.0	360159.3	120053.3
Travel expenses	1300.0	92485.00	120053.0	120053.1	-27568.1
Total	19955.0	846952.65	800353.0	800353.3	619296.9

2021-22

Budget Head	Allotment (CHF)	Allotment (Rs)	Opening Balance (Rs)	Expenditure (Rs)	Balance (Rs)
Participatory Cotton Breeding-FiBL(2021-22)					
Personnel cost including social charges & overhead	22969.0				
Material cost	3991.0				
Travel expenses	2395.0				
Total	29355.0				

2022-23

Budget Head	Allotment (CHF)	Allotment (Rs)	Opening Balance (Rs)	Expenditure (Rs)	Balance (Rs)
Participatory Cotton Breeding-FiBL(2022-23)					
Personnel cost including social charges & overhead	12037.0	1063654.0	356770.0	1520424.0	(-)100000
Material cost	2092.0	184096.0	160407.0	371859.0	(-)27356
Travel expenses	1255.0	110440.0	126916.0	110000.0	127356

Total	15384.0	1358190.0	644093.0	2002283.0	0

8. Physical progress of the project:

2019-20 Research Findings :

Crossing Programme : 2019-20

10 crosses each of G.arboreum and G.hirsutum lines were made and grown in offseason in net house to get F2 seeds.

S.No	Cross	No of F1 seeds
G. arboreum		
1	KGA-3 X KGA-10	28
2	KGA-4 X KGA-11	26
3	KGA-5 X KGA-12	22
4	KGA-6 X KGA-12	29
5	JK-5 X KGA-10	21
6	JK-5 X KGA-11	29
7	JK-5 X KGA-12	27
8	JT X KGA-10	25
9	JT X KGA-11	19
10	JT X KGA-12	23
G hirsutum		
1	KGH-30 X KGH-4	33
2	KGH-30 X KGH-7	29
3	KGH-30 X KGH-9	22
4	KGH-30 X KGH-17	18
5	KGH-33 X KGH-46	23
6	KGH-33 X KGH-47	21
7	KGH-33 X KGH-48	19
8	JK-4 X KGH-10	27
9	JK-4 X KGH-27	25
10	JK-4 X KGH-30	20

Conduction of CET : 01

No of Entries	:	30
No of Replication	:	03
Spacing	:	
		1. 90cm X 60cm (R X P) for Hybrids 2. 90cm X 30cm (R X P) for varieties
Row/plot	:	04
Saparater Used	:	Ragi one row
Plot Area	:	3.6 X 6.0 sm

Best performing G.arboreum varieties/hybrids

Varity/Hybrid	SCY(kg/ha)	No of Boll/plant	GP %
Namaskar_Gold-81	725.3071	44.60	34.26
AV-C14	711.4183	42.6	34.88
GA-8004	685.6161	36.40	34.94
PA-255	675.9245	41.93	31.66
AV-G13	617.2827	37.40	35.27
AV-G11	496.9125	24.40	33.51

Best performing G. hirsutum varieties/hybrids

Varity/Hybrid	SCY(kg/ha)	No of Boll/plant	GP %
AKH09-5	740.74	29.20	36.89
Chetna-D11	695.83	26.60	35.10
GH-8001 E	627.31	23.27	33.74
GH-8032	614.20	21.80	32.96
AKH 9916	575.62	19.87	33.53
Suraj	572.53	19.53	29.58
Chetna-S1	549.38	18.80	34.55
BKMP_27	377.31	16.13	33.12
Chetna_J1	375.77	12.33	27.97

Major findings :

- In Arboreum cotton hybrid and varieties group seed cotton yield range between 496.91 to 725.31 kg/ha. The top three varieties are Namaskar_Gold-81, AV-C14 and PA-255.
- In Hirsutum varieties group seed cotton yield range between 375.77 to 740.73 kg/ha. The top three varieties are AKH09-5, GH-8001 E and GH-8032.
- In Hirsutum hybrid group seed cotton yield range between 543.20 to 930.55 kg/ha. The top performing hybrids are Bhakti-245, Raja-954 and Nirmal 996.
- No of bolls in arboretum cotton varieties ranged from 24.40 to 44.6 bolls/plant. The highest number of bolls are recorded in Namaskar_Gold-81 (44.6) followed by AV-C14(42.6) and PA-255(41.93).
- Number of bolls in Hirsutum varieties ranged from 12.33 to 26.4 bolls/plant. The highest number of bolls are recorded in GA-8004 (26.4) followed by AKH09-5 (29.2) and GH-8001 E (23.27).
- Number of bolls in Hirsutum hybrids ranged from 18.80 to 33.2 bolls/plant. The highest number of bolls are recorded in Bhakti-245 (33.2) followed by AKH09-5 (29.2) and Raja-954 (31.87).
- The highest Ginning Percent is observed in Nirmal 996(37.91) followed by AKH09-5(36.89),AV-G13(35.27) and Raja-954(35.07).
- The highest Lint Index is observed in Nirmal 996(3.96) followed by Namaskar_Gold-81(3.80) and AV-G13(3.65).

Involvement/participation and/or activities organized under SGF or support from SGF in 2019-2020

Browser: 01

Title : PROM : A ORGANIC NUTRIENT SUPPLEMENT

Poster : 01

Title : ORGANIC AND BIODYNAMIC RESEARCH ON COTTON

Participation in symposium/seminar/workshop :

- Dr S.K. Rao Vice Chancellor, RVSKVV, Gwalior and Dr D.K. Shrivastava, Scientist, AICRP on Cotton , Khandwa participated in the 2nd Symposium on Participatory Research to Foster Innovation in Agriculture with a focus on organic cotton" at Botanical Garden, Zurich, Switzerland from 28th to 29th August 2019, organized by Research Institute of Organic Agriculture (FiBL), Switzerland.
- Dr D.K. Shrivastava, Scientist, AICRP on Cotton , Khandwa participated in Seeding the Green Future (SGF) annual project progress review meeting organized on April 2 and 3, 2019 at Sayaji Hotel, Indore

Mid -Season Monitoring Field Visit Program for On-Station CET and On-Farm Trials for SGF (2019- 2020) :

Dr. Amritvir Riar,Dr.Monika Messmer, Dr Tanay Joshi and scientist of FiBL partner organiztions were visited the CET and Breeding Blocks during 23-24 Nov 2019

Participatory Plant Breeding approach and training to farmers for participatory variety selections

- Mr. Stefan Graf, research student from 'Bern University of Applied Sciences', Switzerland, visited CET at RVSKVV, B.M. College of Agriculture, Khandwa from 12-15 Nov 2019. He involved in training to cotton farmers and student of B.Sc (Ag)III year on participatory selection of varieties.
- Mr. Mohan Bhimate, SRF, SGF-PDKV, Akola, Mr. Anant Parihar, SRF, SGF-PDKV, Akola and Mr. Shankar Parihar visited CET and record entomological observations from 19-20 Dec, 2019

2020-21 : Research Findings :

Handling of Segregating F2 population: 2020-21

S.No	Cross	No of SPS (F3)	Specific Traits
G. arboreum			
1	KGA-3 X KGA-10	67	Fibre length < 29mm,Early Maturity, high strength
2	KGA-4 X KGA-11	46	Fibre length < 29mm,Early

			Maturity, high strength
3	KGA-5 X KGA-12	75	Fibre length < 29mm,Early Maturity, high strength
4	KGA-6 X KGA-12	34	Fibre length < 29mm,Early Maturity, high strength
5	JK-5 X KGA-10	42	Fibre length < 28mm,Early Maturity, high strength
6	JK-5 X KGA-11	56	Fibre length < 28mm,Early Maturity, high strength
7	JK-5 X KGA-12	52	Fibre length < 28mm,Early Maturity, high strength
8	JT X KGA-10	28	Fibre length < 28mm,Early Maturity, high strength
9	JT X KGA-11	17	Fibre length < 28mm,Early Maturity, high strength
10	JT X KGA-12	31	Fibre length < 28mm,Early Maturity, high strength
G hirsutum			
1	KGH-30 X KGH-4	54	Fibre length < 30mm,Early Maturity, high strength
2	KGH-30 X KGH-7	63	Fibre length < 30mm,Early Maturity, high strength
3	KGH-30 X KGH-9	66	Fibre length < 30mm,Early Maturity, high strength
4	KGH-30 X KGH-17	49	Fibre length < 30mm,Early Maturity, high strength
5	KGH-33 X KGH-46	69	Fibre length < 30mm,Early Maturity, high strength
6	KGH-33 X KGH-47	28	Fibre length < 30mm,Early Maturity, high strength
7	KGH-33 X KGH-48	39	Fibre length < 30mm,Early Maturity, high strength
8	JK-4 X KGH-10	44	Fibre length < 29mm,Early Maturity, high strength
9	JK-4 X KGH-27	31	Fibre length < 29mm,Early Maturity, high strength
10	JK-4 X KGH-30	48	Fibre length < 29mm,Early Maturity, high strength

Crossing Programme :

S.No	Cross	No of F1 seeds
G. arboreum (A X A)		
1	KGA-7 X KGA-10	11
2	KGA-8 X KGA-11	10
3	KGA-9 X KGA-12	22
4	LL6 X KGA-10	18

5	LL6 X KGA-11	21
6	LL6 X KGA-12	17
7	KGA-5 X LL6	19
8	KGA-4 X LL6	20
9	KGA-6 X LL6	21
G. hirsutum (H X H)		
1	KGH -30 X KGH-25	17
2	KGH -30 X KGH-34	12
3	KGH -30 X KGH-36	18
4	KGH -33 X KGH-33	19
5	KGH -30 X KGH-43	21
6	KGH -30 X KGH-52	15
7	JK-4 X KGH-19	18
8	JK-4 X KGH-46	23
9	JK-4 X KGH-47	20

Conduction of CET : 01

No of Entries : 30

No of Replication : 03

Spacing :

3. 90cm X 60cm (R X P) for Hybrids
4. 90cm X 30cm (R X P) for varieties

Row/plot : 04

Saparater Used : Ragi one row

Plot Area : 3.6 X 6.0 sm

Best performing G.arboreum varieties/hybrids

Varity/Hybrid	**SCY(q/ha)**
Swadeshi-5	16.91
NG-81	15.34
GA 8004	13.07
GAV8011	12.88
AVG 13	12.84
AVG 14	12.63
GAV8013	12.03
PA 255	11.99

Best performing G. hirsutum varieties/hybrids

Varity/Hybrid	SCY(kg/ha)
Varieties	
Chetana D11	11.84
GH 8001	11.76
Chetana-91	11.75
GH8032	11.64
GHV8023	11.38
GHV 8036	11.16
Hybrids	
Pertech30+	15.08
Vasudha 1384	13.75
Partech 30	12.94
Vasudha 1319 G	12.56
Bhakti 245	11.57
Raja 954	11.47

Major Findings :

- During 2020-21 in CET Desi (G. arboretum) varieties/hybrids performed better than hirsutum varieties/hybrids. In top ten varieties six are desi (G. arboretum) varieties. The highest seed cotton yield was also recorded by Desi cotton hybrid Swadeshi-5 (1691.0 kg/ha)

- In Arboreum cotton hybrid and varieties group seed cotton yield range between 1199.1 to 1691.0 kg/ha. The top performing hybrid/varieties are Swadeshi-5, Namaskar-Gold-81, PA-255, GAV8011 and AVG14.

- In Hirsutum varieties group seed cotton yield range between 1031.3 to 1213.0 kg/ha. The top performing varieties are AKH 095, Suraj and Chetana D11.

- In Hirsutum hybrid group seed cotton yield range between 1082.2 to 1508.1 kg/ha. The top performing hybrids are Pertech30+, Vasudha 1384, Pertech 30 and Vasudha 1319 G.

- No of bolls in arboretum cotton varieties ranged from 16.2 to 28.7 bolls/plant. The highest number of bolls are recorded in Swadeshi-5 (28.7) followed by Namaskar-Gold-81(26.9), PA-255(28.1).

- Number of bolls in Hirsutum varieties ranged from 8.9 to 16.3 bolls/plant. The highest number of bolls are recorded in Suraj (16.3) followed by AKH 095(14.9) and Chetana D11(13.4).

- Number of bolls in Hirsutum hybrids ranged from 9.1 to 19.9 bolls/plant. The highest number of bolls are recorded in Pertech30+(19.9) followed by Vasudha 1384(18.1) and Pertech 30(16.7).

- The highest Ginning Percent is observed in AKH 095 and Bhakti 245(34.0%) followed Vasudha 1319 G (33.9%) and Chetana-91(33.8%).
- The highest Lint Index of 4.1 is observed in Suraj, Bhakti245 and Vasudha 1319 and Vasudha 1319.

Involvement/participation and/or activities organized under SGF or support from SGF in 2020-2021/Broucher/Name

Poster : 02 i) Vermicompost

ii) Techniques of low cost mass multiplication of Biofertilisers.

Training :

Training on participatory selection breeding programme was organized on 08/10/2020. Seventeen farmers were participated in this training programme.

Visits of dignitaries :

- Visit of CET by Hon'ble Vice Choncellor, Dean faculty and Director Research Services, RVSKVV, Gwalior.
- Internal monitoring and evaluation of SGF activities by Hon'ble Vice Choncellor, Dean faculty and Director Research Services, RVSKVV, Gwalior.
- Visits of pathologist, entomologist and agronomist in CET trial for screening of diseases and insect pest.

Support from SGF :

Multilocation trial on screening of non Bt cotton varieties/hybrids at six locations namely Khandwa, Khargone, Badwani, Indore, Dhar and Jhabua.

Evaluation of SGF activities

External evaluation of SGF activity by external evaluator.

2021-22 : Research Findings :

Handling of Segregating population : 2021-22

SN	Cross	No of SPS (F4)	Specific Traits
G. arboreum			
1	KGA-3 X KGA-10	43	Fibre length < 29mm,Early Maturity, high strength
2	KGA-4 X KGA-11	33	Fibre length < 29mm,Early Maturity, high strength
3	KGA-5 X KGA-12	58	Fibre length < 29mm,Early Maturity, high strength
4	KGA-6 X KGA-12	21	Fibre length < 29mm,Early Maturity, high strength

5	JK-5 X KGA-10	29	Fibre length < 28mm,Early Maturity, high strength
6	JK-5 X KGA-11	45	Fibre length < 28mm,Early Maturity, high strength
7	JK-5 X KGA-12	39	Fibre length < 28mm,Early Maturity, high strength
8	JT X KGA-10	19	Fibre length < 28mm,Early Maturity, high strength
9	JT X KGA-11	12	Fibre length < 28mm,Early Maturity, high strength
10	JT X KGA-12	19	Fibre length < 28mm,Early Maturity, high strength
G hirsutum			
1	KGH-30 X KGH-4	40	Fibre length < 30mm,Early Maturity, high strength
2	KGH-30 X KGH-7	46	Fibre length < 30mm,Early Maturity, high strength
3	KGH-30 X KGH-9	51	Fibre length < 30mm,Early Maturity, high strength
4	KGH-30 X KGH-17	38	Fibre length < 30mm,Early Maturity, high strength
5	KGH-33 X KGH-46	48	Fibre length < 30mm,Early Maturity, high strength
6	KGH-33 X KGH-47	20	Fibre length < 30mm,Early Maturity, high strength
7	KGH-33 X KGH-48	24	Fibre length < 30mm,Early Maturity, high strength
8	JK-4 X KGH-10	33	Fibre length < 29mm,Early Maturity, high strength
9	JK-4 X KGH-27	21	Fibre length < 29mm,Early Maturity, high strength
10	JK-4 X KGH-30	27	Fibre length < 29mm,Early Maturity, high strength

S.No	Cross	SPS (F3)	Specific Traits
G. arboreum (A X A)			
1	KGA-7 X KGA-10	87	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
2	KGA-8 X KGA-11	72	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
3	KGA-9 X KGA-12	117	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
4	LL6 X KGA-10	94	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
5	LL6 X KGA-11	56	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
6	LL6 X KGA-12	47	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
7	KGA-5 X LL6	44	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
8	KGA-4 X LL6	53	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
9	KGA-6 X LL6	39	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
G. hirsutum (H X H)			
1	KGH -30 X KGH-25	77	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
2	KGH -30 X KGH-34	65	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
3	KGH -30 X KGH-36	71	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
4	KGH -33 X KGH-33	59	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm

5	KGH -30 X KGH-43	81	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
6	KGH -30 X KGH-52	66	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
7	JK-4 X KGH-19	51	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
8	JK-4 X KGH-46	58	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
9	JK-4 X KGH-47	105	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm

Crossing Programme:

S.No	Cross	No of F1 seeds
G. arboreum		
1	KGA-20 X GP146	11
2	KGA-26 X GP151	16
3	KGA-39 X GP 88	14
4	KGA-42 X GP 66	18
5	KGA-55 X GP 61	17
G hirsutum		
1	KGH-10 X KGH-30	19
2	KGH-11 X KGH-30	15
3	KGH-12 X KGH-30	20
4	KGH-13 X KGH-33	21
5	KGH-14 X KGH-33	17

Conduction of CET : 01

No of Entries : 30

No of Replication : 03

Spacing :

1. 90cm X 60cm (R X P) for Hybrids
2. 90cm X 30cm (R X P) for varieties

Row/plot : 04

Saparater Used : Kodo one row

Plot Area : 3.6 X 6.0 sm

Best performing G.arboreum varieties/hybrids

Variety	SCY(Kg/ha)	Boll/plant
GAV-8012	890.7	18.0
GAV-8011	865.8	17.5
GA- 8004	835.3	23.4
GH-8001 E	833.4	20.0
GAV-8013	802.6	16.7
AV-C14	750.3	20.0
PA-255	745.4	19.0

Best performing G. hirsutum varieties/hybrids

Varieties/ Hybrids	SCY(Kg/ha)	Boll/plant
Varieties		
GH-8032	1101.229	23.05
GHV- 8036	975.5211	20.3
BKMP_27	923.4101	16.7
Chetana_ D11	905.7713	17
Chetana _J1	899.6833	14.6
Hybrids		
Vasudha-1318 Gold	1162.261	28.2
Partech -30	1099.451	16.6
AKH09-5	1075.308	17.8
Malika	1030.53	15.4
Vasudha-1319 Gold	1005.341	15
NSS	983.7202	19.7
Ojas	977.5998	16.1

Major Findings :

- In Arboreum cotton hybrid and varieties group on the basis of morphological observations, it is observed that Namaskar-Gold-81, GAV8013 and AV-G13 are perform better with regards to Seed cotton yield.
- In Hirsutum varieties group AKH 09-5, Chetana_D11, Chetana_J1 and GHV 8036 are better in view of plant growth, boll bearing and boll size.
- In Hirsutum hybrid group on the basis of plant growth and number of bolls/plant the best performing hybrids are be Pertech30 and Vasudha 1318 Gold.

Involvement/participation and/or activities organized under SGF or support from SGF in 2021-2022/Broucher/Name

Poster : 02 i) Jeevamurit and Beejamurit

ii) Agro-technology of organic cotton production

Training :

Training on participatory selection breeding programme was organized on 04/10/2021. Nineteen farmers were participated in this training programme.

Visits of dignitaries :

- Dr. Charu Jain, Louder's Foundation and Dr Subhadra, OFCA visited on 08/10/2021
- Visits of pathologist, entomologist and agronomist in CET trial for screening of diseases and insect pest.

Support from SGF :

Multilocation trial on screening of non Bt cotton varieties/hybrids at six locations namely Khandwa, Khargone, Badwani, Indore, Dhar and Jhabua.

FiBL-Seeding the Green Future' (F-SGF) Master Thesis Scholarship Programme

Academic year : 2021-2022

Selection of Students for Scholarship:

The online application from the students of M.Sc.(Ag) previous year of the discipline of Plant Breeding and genetics, Agronomy and Soil Science were called through Dean, college of Agriculture, Gwalior, Sehore and Indore. The 16 students were applied for the SGF Scholarship.

As per the proposal of FiBL two scholarship has to be sanction for Plant breeding and Genetics/ Agronomy/ Soil science discipline, hence based on educational qualification, awards, training, publication, participation in seminar/symposia and motivation letter, submitted by the students along with application form, the nine students were shortlisted for online interview.

Interview Committee :

1. Dr A.K. Singh Chairman
2. Dr Tanay Joshi External Expert
3. Dr S. K. Parsai Member
4. Dr. Sushma Tiwari Member

5. Dr. D.K. Paliwal Member
6. Dr. D. K. Shrivastava Member Secretary

Date of Interview : 06/04/2021

Recommendation of Interview Committee:

Based on score card Interview Committee recommended Mr. Pradeep Beniwal for scholarship in Plant breeding and genetics discipline and Mr. Tejpal Sharma for Agronomy discipline.

Details of Scholarship :

Name of Student	**Department/ discipline**	**Class**	**Period of Scholarship**	**Amount of Scholarship**	**Date of Start**	**Place where thesis work is to be completed**
Mr. Pradeep Beniwal	Plant Breeding & Genetics, College of Agriculture, Gwalior	M.Sc (Ag) previous Year	12 Months	Rs 8000/ month	June-July 2021	Field Experiments: B. M. College of Agriculture, Khandwa Lab work : College of Agriculture, Gwalior
Mr. Tejpal Sharma	Agronomy, College of Agriculture, Gwalior	M.Sc(Ag) previous Year	12 Months	Rs 8000/month	June-July 2021	Field Experiments: B. M. College of Agriculture, Khandwa Lab work: College of Agriculture, Gwalior

Advisory Committee :

Student Name	**Title of the thesis**	**Department**	**Advisory committee**

Mr. Pradeep Beniwal	Study on Distinctness, Uniformity and Stability in advance organic lines of G.hirsutum and G.arboreum in Nimar region of Madhya Pradesh	Plant Breeding & Genetics, College of Agriculture, Gwalior	Dr. D.K.Shrivastava Dr. Sushma Tiwari Dr.Amritbir Riar Dr.Tanay Joshi Dr. Y.M.Inderpurkar Dr.V.B.Singh
Mr. Tejpal Sharma	Response of non-GM cotton advance lines to varying levels of nitrogen under rainfed organic cultivation in Madhya Pradesh	Agronomy, College of Agriculture, Gwalior	Dr. Ekta Joshi Dr. D.K.Shrivastava Dr.Amritbir Riar Dr.Tanay Joshi Dr. Shashi Singh Yadav Dr. V.B.Singh

Experimental work of Students :

Mr. Pardeep Beniwal

En experiment on 12 advance lines of *Gossypium hirsutum* L. and *Gossypium arboreum* L. has conducted during kharif 2021 at in Randomized Block Design at farm, AICRP on cotton, B.M.College of Agriculture, Khandwa with three replications.

Aspects of the study

- Morphological characterization of organic advance lines of *Gossypium hirsutum* L. and *Gossypium arboreum* L. for DUS testing.
- Molecular characterization of organic advance lines of *Gossypium hirsutum* L. and *Gossypium arboreum* L. for DUS testing

Mr. Tejpal Sharma

En experiment on two advance lines each of *Gossypium hirsutum* L. and *Gossypium arboreum* L. and two levels of nitrogen (40 and 60 Kg/ha) has been conducted during kharif 2021 in Randomized Block Design at farm, AICRP on cotton, B.M.College of Agriculture, Khandwa with three replications.

Aspects of the study

- Assessment of the effect of different levels of nitrogen through organic sources on yield and fibre quality indices under rainfed cotton.
- Estimation of the effect of varying levels of nitrogen on soil fertility.

Present Status of work

Mr. Pardeep Beniwal and Mr. Tejpal Sharma has been completed their experiments in January 2022, submitted their these in April 2022 and awarded M.Sc(Ag) degree in May 2022

2022-23 : Research Findings :

Handling of Segregating population : 2022-23

SN	Cross	No of SPS (F5)	Specific Traits
G. arboreum			
1	KGA-3 X KGA-10	19	Fibre length < 29mm,Early Maturity, high strength
2	KGA-4 X KGA-11	18	Fibre length < 29mm,Early Maturity, high strength
3	KGA-5 X KGA-12	23	Fibre length < 29mm,Early Maturity, high strength
4	KGA-6 X KGA-12	17	Fibre length < 29mm,Early Maturity, high strength
5	JK-5 X KGA-10	19	Fibre length < 28mm,Early Maturity, high strength
6	JK-5 X KGA-11	28	Fibre length < 28mm,Early Maturity, high strength
7	JK-5 X KGA-12	39	Fibre length < 28mm,Early Maturity, high strength
8	JT X KGA-10	19	Fibre length < 28mm,Early Maturity, high strength
9	JT X KGA-11	12	Fibre length < 28mm,Early Maturity, high strength
10	JT X KGA-12	19	Fibre length < 28mm,Early Maturity, high strength
G hirsutum			
1	KGH-30 X KGH-4	23	Fibre length < 30mm,Early Maturity, high strength
2	KGH-30 X KGH-7	21	Fibre length < 30mm,Early Maturity, high strength
3	KGH-30 X KGH-9	29	Fibre length < 30mm,Early Maturity, high strength
4	KGH-30 X KGH-17	19	Fibre length < 30mm,Early Maturity, high strength
5	KGH-33 X KGH-46	23	Fibre length < 30mm,Early Maturity, high strength
6	KGH-33 X KGH-47	12	Fibre length < 30mm,Early Maturity, high strength
7	KGH-33 X KGH-48	14	Fibre length < 30mm,Early Maturity, high strength
8	JK-4 X KGH-10	18	Fibre length < 29mm,Early Maturity, high strength
9	JK-4 X KGH-27	11	Fibre length < 29mm,Early Maturity, high strength
10	JK-4 X KGH-30	15	Fibre length < 29mm,Early Maturity, high strength

S.No	Cross	SPS (F4)	Specific Traits
G. arboreum (A X A)			
1	KGA-7 X KGA-10	52	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
2	KGA-8 X KGA-11	49	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
3	KGA-9 X KGA-12	68	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
4	LL6 X KGA-10	66	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
5	LL6 X KGA-11	38	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
6	LL6 X KGA-12	27	Short stature, Long and bold bolls, high No of

			Bolls, fibre length < 29mm
7	KGA-5 X LL6	27	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
8	KGA-4 X LL6	39	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
9	KGA-6 X LL6	25	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
G. hirsutum (H X H)			
1	KGH -30 X KGH-25	44	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
2	KGH -30 X KGH-34	41	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
3	KGH -30 X KGH-36	51	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
4	KGH -33 X KGH-33	33	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
5	KGH -30 X KGH-43	67	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
6	KGH -30 X KGH-52	38	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
7	JK-4 X KGH-19	31	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
8	JK-4 X KGH-46	36	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm
9	JK-4 X KGH-47	69	Short stature, Long and bold bolls, high No of Bolls, fibre length < 29mm

S.No	Cross	SPS (F3)	Specific traits
G. arboreum			
1	KGA-20 X GP146	36	Early maturity, Fiber density on seed, softness of fibre, Fibre length (<29 mm) compact plant type suitable for HDP
2	KGA-26 X GP151	49	-do-
3	KGA-39 X GP 88	56	-do-
4	KGA-42 X GP 66	49	-do-
5	KGA-55 X GP 61	53	-do-
G hirsutum			
1	KGH-10 X KGH-30	54	Early maturity, Fiber density on seed, softness of fibre, Fibre length (<30 mm) compact plant type suitable for HDP
2	KGH-11 X KGH-30	48	-do-
3	KGH-12 X KGH-30	50	-do-
4	KGH-13 X KGH-33	42	-do-
5	KGH-14 X KGH-33	39	-do-

Crossing Programme :

S.No	Cross	No of F1 seeds
G. arboreum		
1	KGA-10 X LL-9	22
2	KGA-11 X LL-9	18
3	KHA-12 X LL-9	19
4	KGA-10 X LL-11	20
5	KGA-11 X LL-11	21
6	KGA-12 X LL-11	19
G hirsutum		
1	KGH-9 X KH-2	24
2	KGH-9 X Vikram	18
3	KGH-9 X Sarbottam	20
4	KGH-9 X JK-35	14

Conduction of CET : 01

No of Entries : 30

No of Replication : 02

Spacing :

1. 90cm X 60cm (R X P) for Hybrids
2. 90cm X 30cm (R X P) for variety

Row/plot : 04

Separate Used : Ragi one row

Plot Area : 3.6 X 6.0 sm

Best performing G.arboreum varieties/hybrids

Variety	SCY(Kg/ha)	Boll/plant	GOT(%)
NG	975.7	15.8	35.8
GA8004	778.9	22.7	33.2
GAV-8013	627.3	14.3	31.4
GAV-8011	615.7	14.9	34
AV-G11	589.1	15.6	34
AV-G13	585.6	25.1	34

Best performing G. hirsutum varieties/hybrids

Varieties/ Hybrids	SCY(Kg/ha)	Boll/plant	GOT(%)
Varieties			
Chetana-D11	881.9	17	36.2
GHV-8036	731.5	13.6	31.5
BKMP27	695.6	14	35.4
Chetana-J1	680.6	15.3	34.8
GH-8032	662.0	13	32.3
Hybrids			
Ganesh	1081.0	17.9	35.7
Vasudha-1318 G	880.8	18.2	34
Vasudha-1319 G	870.4	17.4	33.7
Raja 954	838.0	16.1	34.8
Partech-30	828.7	15.1	34.9

Major Findings :

- 30 entries were tested in CET during 2022-23
- In G.arboreum hybrid only Namaskar Gold-81 is tested, it yield highest Seed Cotton yield (975.7 kg/ha)among G.arboreum lines. Among G.arboreum advance varieties GA8004 ranked top with 778.9 kg/ha seed cotton yield followed by GAV-8013(627.3 Kg/ha)and GAV-8011(615.7 Kg/ha)
- Among G.hirsutum hybrids Ganesh was highest yielding hybrid with 1081.0 Kg/ha seed cotton yield followed by Vasudha-1318 G (880.8 Kg/ha) and Vasudha-1319 G(870.4 Kg/ha).
- Variety Chetana D-11 yielded highest seed cotton of 881.9 Kg/ha followed by GHV-8036 (731.5 Kg/ha), BKMP27(695.6 Kg/ha) and Chetana-J1(680.6 Kg/ha)

Involvement/participation and/or activities organized under SGF or support from SGF in 2022-2023/Broucher/Name

Folders : 02 i) Non GM Desi organic cotton variety : RVJK-SGF-1

ii) Non GM American organic cotton variety : RVJK-SGF-2

Training :

Training on participatory selection breeding programme was organized on 11/10/2022. Eighteen farmers were participated in this training programme.

Visits of dignitaries :

- Dr. Barat Bangari, OFCA visited on 12/09/2022
- Dr. S.D.Upadhyay, Dean, Medicaps University, Indore
- Dr. Snehal doshi MD, Partech seeds pvt ltd Ahmedabad India
- Visits of pathologist, entomologist and agronomist in CET trial for screening of diseases and insect pest.

Support from SGF :

Multilocation trial on screening of non Bt cotton varieties/hybrids at six locations namely Khandwa, Khargone, Badwani, Indore, Dhar and Jhabua.

Identification of advance lines for release :

University Variety Release Committee, RVSKVV, Gwalior has been identified following advance lines of cotton for release in Madhya Pradesh for organic cultivation. These lines were under testing in CET, Baby Trials and Pilot Trials over seven locations in Madhya Pradesh, Maharastra, Odisha and Karnatka. These lines were also tested for their performance in front line demonstration on farmers field at six locations i.e. Khandwa, Khargone, Badwani, Dhar and Indore in Madhya Pradesh.

S.No.	Advance Lines	Species	Type	Status
1	GA-8004	G.arboreum	Non GM	Organic
2	Chetana-D11	G.hirsutum	Non GM	Organic

Recommendation of State Seed Sub Committee :

State Seed Sub Committee, Bhopal, Madhya Pradesh has been recommended following lines of cotton as Non GM organic cotton varieties for cultivation under organic conditions by his letter No

S.No.	Advance Lines	Name of Variety	Type	Status
1	GA-8004	RVJK-SGF-1	Non GM	Organic
2	Chetana-D11	RVJK-SGF-21SGF9Sowing	Non GM	Organic

1. RAJ VIJAY JAIVIK KAPAS-SGF-1

Special features

1. Adopted for organic cultivation
2. High responsive to organic inputs
3. High Seed Cotton Yield (8.87q/ha)in Organic Cultivation
4. Compact Plant type
5. All most synchronous maturity (80% boll bursting in first picking)
6. Yellow flowers with yellow pollens
7. Bolls Green, pitted, elliptical and pointed
8. Average ginning out turn (32-34%)
9. White fibre colour
10. Medium long fibre (28-30mm, 2.5% span length)
11. High fibre strength (27-30 g/tex)
12. Medium Fineness (4-4.5Micronaire value)
13. Fibre Uniformity (75-82%)
14. Suitable for 16s to 34s count spinning to make a good quality fabric
15. Suitable for all cotton growing area om Madhya Pradesh







2. RAJ VIJAY JAIVIK KAPAS-SGF-2

Special features

1. Adopted for organic cultivation
2. High responsive to organic inputs
3. High Seed Cotton Yield (8.3 q/ha)in Organic Cultivation
4. Compact plant type
5. All most synchronous maturity (80% boll bursting in first picking)
6. Cream flowers with cream pollens
7. Bolls Green, smooth, elliptic and pointed
8. Average ginning out turn (32-34%)
9. White fibre colour
10. Medium long fibre (29-30mm, 2.5% span length)
11. High fibre strength (29-30 g/tex)
12. Medium Fineness (4-4.5Micronaire value)
13. Fibre Uniformity (81-83%)
14. Suitable for 20s-50s count spinning to make a good quality fabric
15. Suitable for all cotton growing area of Madhya Pradesh







Name, designation, discipline, year since ICAR-AICRP on Cotton, contact details, pass-port size image (good quality), significant research achievements, publications in cotton, etc.

A Brief Report

on

Synthesis of Nano Gypsum for the Effective Reclamation of Salt Affected Soils in Combination with the Different Amendments

Rajmata Vijaya Raje Scindia Agriculture University

Gwalior

2023

Introduction

'Salt-affected soils' is an umbrella term to designate the soils having either excess soluble salts and/or exchangeable sodium. Based on the values of soil saturation paste extract electrical conductivity, pH, and exchangeable sodium percentage, soils are classified into normal, saline, sodic, and saline-sodic. About 20% of the global croplands have become less productive or, in extreme cases, uncultivable wastelands due to waterlogging and salinization. The presence of salty water in the root zone virtually transforms the affected lands into wetland deserts. Soils in many rainfed areas are also reeling under the combined impacts of erosion, salinization.

A recent estimate suggests that over 1100 Million hectares (M ha) of the global land area is affected by salinity and related problems to varying extents. In India, 146.8 M ha land suffers from one or another kind of degradation: The currently estimated area under SAS (6.74 M ha; comprising of 3.79 M ha sodic and 2.95 M ha saline area) is projected to increase to 16.2 M ha by 2050. An area of more than 2.5 lakh ha affected by salinity and alkalinity is estimated to be existing in the Chambal Command area of Madhya Pradesh. These soils extent in 23 districts spreading over two soil regions i.e. black soil region and the alluvial soil region in the Chambal Command area (Raghuwanshi, 2011).

Although salt-induced crop losses are common throughout the country, Among these, alkali soils are found to be highly problematic for crop production because of the very poor physical and chemical environment, particularly in irrigated areas. Sodicity problem in irrigated agriculture is becoming more and more serious because of poor quality water, lack of adequate knowledge about soils, and poor management practices.
In saline soils, excess soluble salts consisting mainly of chlorides and sulfates of Na^{+}, Ca^{2+}, and Mg^{2+}, raise soil ECe (≥ 4 dS m-1) resulting in reduced water availability (i.e., physiological drought) and specific ion toxicities responsible for growth and yield reduction in crop plants. High ESP (>15) deteriorates the structure, impedes the water and air flows, reduces water intake capacity, and hampers the root penetration in sodic soils.

Irrigation is hailed as an intervention to enable agricultural production in areas where rainfall is inadequate, but the scarcity of freshwater means some farmers are forced to irrigate plants using poor quality water. This is particularly so where saline water is irrigated and then exacerbates the problem on agricultural fields that suffer the effects of salinization. Currently, about 33% of the global irrigated lands are affected by salinization6. Salinity affects plant growth by influencing plant physiological processes including photosynthesis and transpiration. Salt stress decreased soil water potential (osmotic stress), causing ion toxicity and consequently plant death. Decreased osmotic stress reduces water uptake by plants, which usually through closing leaf stomata and decreasing transpiration, and this negatively affects plant growth by decreasing plant photosynthesis. Therefore, a direct correlation of plant growth with soluble salt concentration and duration of stress has been identified, recent work has elaborated the potentiality of biochar to enhance soil fertility and improve crop productivity. Many studies conducted in different parts of the world have reported improved soil water holding capacity, nutrient availability to plants, and plant productivity as a result of using biochar amendment. Schmidt reported that a fourfold increase in pumpkin production after soil was amended with biochar when mixed with and without cow urine. Kamman gave a molecular interpretation about the positive effect of biochar on crop production, where he found that the development of acid and basic functional groups and organo-mineral complexes on the biochar-matrix surfaces which responsible for nutrient retention. Joseph also reported that organic coating on biochar explained its ability on nutrient retention. However, a few pieces of researches had been done to evaluate/ investigate the potential of biochar amendment (BA) in reducing the soil soluble salt under saline water (SW) irrigation as well as enhancing fruit quality. For example, Usman used Conocarpus biochar under SW irrigation to investigate the changes in soil nutrient availability and tomato growth. Additionally, Lashari concluded that BA increased the plant growth, biomass, and yield and also increased photosynthesis, nutrient uptake, although under salt stress. The feedstock of biochar is the main factor determining the effects of BA on plant growth.

The salinity problem has become more intricate in the past few decades as evidenced by the co-existence of complex problems such as soil erosion, excess salts, nutrient toxicities, and waterlogging in many situations. ICAR-CSSRI has estimated huge salt-induced losses in annual food grain, oilseed, and cash crop production. While salinity diminishes ≈5.66 Million tonnes of produce valued at Rs. 8,000 Crores (Sharma et al., 2016a), sodicity causes an annual loss of ≈11 Million tonnes (Rs. 15,000 Crores; Sharma et al., 2016b). Although such monetary estimates provide a reasonable approximation of the harmful impacts of salinity, basically concerning farmers' sustenance and drain on the national exchequer, it is important to understand the spillover effects that debilitate the capacity of SAS to provide a range of vital ecosystem services.

Different approaches are used in the amelioration of this soil in terms of the impacts they have on the physical and chemical properties of the soil as well as about the effect on plant nutrient availability, crop productivity, and economic and environmental sustainability (Qadir et al., 2006). Extensive research has been conducted on the use of chemical amendments in sodic soil to provide Ca2+ to replace Na+ on the exchange sites (Brinck and Frost, 2009; Qadir et al., 2002). Several amendments have been shown to protect various plant species against sodicity stress by reducing exchangeable sodium ion concentration in salt-affected soils.

The impact of salt stress and approaches to diminish the negative effects has been a subject of several studies. Techniques involved in these studies range from management options to identifying plant characteristics that help mitigate the effects of salinity. For example, Jouyban investigated the use of different techniques i.e. scraping, flushing, and leaching to remove excess salt from the root zone of plants. Others have targeted the utilization of various irrigation techniques in decreasing salinity. Improvement of salt tolerance/resistance is another technique used to address the constraint of soil salinity. Researchers have employed methods to improve plant salt tolerance, including inoculating seeds with halotolerant plant-growth-promoting rhizobacteria, using plant growth regulators, and developing salt-resistant cultivars. However, these approaches can be unprofitable, limited by the high costs and labour-consuming requirements that are involved to counter the salinization problems. More

recently, applications of organic conditioners have become a more sustainable and popular approach for enhancing crop productivity in salt-affected soils.

Among them, Traditionally, gypsum is recommended for the reclamation of sodic soils the gypsum is one of the potential soil amendments used to reclaim sodic soils and to improve plant growth and development (Muhammad and Khattak,2011), but the ability to reclaim the soil depends on the quality (fineness and solubility) and quantity of gypsum used. Though gypsum is effective, it takes much time to reclaim sodic soils due to its low solubility (0.2%) and also its repeated application is obligatory to keep sodium content below the favourable level. However, the insoluble portion of gypsum will be settled at the sub-soil layer resulting in the formation of calcareous sodic soil (Shchurina and Kurbatov, 1976). Once calcareous sodicity is developed, the gypsum application becomes pointless and hence it is the right time to look for alternate amendments. The amelioration of these soils is not only expensive but also time-consuming and laborious (Gupta et al., 1995).

The high salt concentration negatively affects soil microbial activity as well as soil chemical and physical properties, thus causing a decline in soil productivity. A Decline in vegetation growth due to salt toxicity and detrimental osmotic potential results in lower carbon (C) inputs into these soils and further deterioration of their physical and chemical properties (Wong et al., 2009). Therefore, over a long period of soil salinization, C storage decreases at a significant rate (Wong et al., 2010). Application of organic matter (such as green manures, compost, and food processing wastes) can both ameliorate and increase the C stocks and fertility of saline soils. Biochar is a C-rich organic material produced during slow exothermic thermal decomposition of biomass at temperatures ≤700 °C under zero or low oxygen conditions (Lehman and Joseph 2009; Kwapinski et al., 2010). In recent years with increasing concern about climate change due to elevated anthropogenic CO2 emissions, research interest on biochar production and its application to soils has gained importance (Woolf et al., 2010).

Biochar influences different properties of soils under various mechanisms of fragmentation, oxidation, decay, and carboxylation (Kookana et al., 2011). For instance, biochar addition may decrease N availability by increasing N immobilization due to its

effects on soil microbial activity, pH, and CEC (Van Zwieten et al., 2010b; Reverchon et al., 2014, 2015).

Improvement of the soil physical properties such as bulk density, porosity, saturated hydraulic conductivity, and aggregate stability due to biochar application have been reported (Herath et al., 2013; Laird et al., 2010) Recent studies reports that biochar is rich in nutrients like Ca^{2+} and Mg^{2+} reported (Tsai et al., 2012) and hence its application as amendments may enhance their availability in soil (Laird et al., 2010; Rajkovich et al., 2012). Therefore, the remediation of sodic soil by adding Ca^{2+} and Mg^{2+} through the addition of biochar, improves aggregate stability, hydraulic conductivity, and potentially enhances Na+ leaching (Chaganti et al., 2015) from the soil. Biochar is a carbon-rich solid produced by heating biomass with little or no oxygen (Tan et al., 2015, 2016) and exhibits a porous carbonaceous structure, many functional groups, and an aromatic surface. The production process of biochar mainly consists of slow pyrolysis, hydrothermal carbonization, flash carbonization, and gasification (Tan et al., 2015). Biochar produced from biomass pyrolysis can modify the physicochemical properties of the soil (DeLuca et al., 2006), decrease gaseous N emission (Yanai et al., 2007), alter soil nutrient availability (Chan et al., 2008a), reduce nutrient leaching (Zheng et al., 2013a), and increase crop yields (Major et al., 2010). In addition, biochar produced from pig manure can degrade up to 90.6% of carbaryl (Zhang P et al., 2013). Moreover, soil microbial properties, such as microbial abundance and activity, and mycorrhizal associations were improved after the application of biochar (Warnock et al., 2007; Steiner et al., 2008a). Ren et al., (2016) indicated that biochar amendment of pesticide-polluted soil could enhance its bioremediation.

The biotic approach 'plant-microbe interaction' to overcome salt stress has recently received considerable attention from many workers throughout the world. Plant-microbe interaction is a beneficial association between plants and microorganisms and also a more efficient method used for the reclamation of salt-affected soils. Bacteria are the most commonly used microbes in this technique. Rhizosphere bacteria improve the uptake of nutrients by plants and/or produce plant growth-promoting compounds and regenerate the quality of the soil. These plant growth-promoting bacteria can directly or indirectly affect plant growth. Indirect plant growth promotion includes the prevention of

the deleterious effects of phytopathogenic organisms by inducing cell wall structural modifications and biochemical and physiological changes leading to the synthesis of proteins and chemicals involved in plant defence mechanisms.

The halophilic microorganisms or salt-loving microorganisms live in environments with high salt concentrations that would kill most other microbes. Halotolerant and halophilic microorganisms can grow in hypersaline environments,

Bacteria are the most commonly used microbes in this technique. The applications of halophilic bacteria include recovery of salt-affected soil by directly supporting the growth of vegetation, thus indirectly increasing crop yields in salt stress (Arora et al., 2014b). With the possibility of application of halophilic bacteria in saline soil recovery and the importance of microbial diversity in soil, the study of halophilic bacterial diversity in saline soil is important to realistically access their future application in the rehabilitation of saline-degraded lands. Plant-microbe interactions are beneficial associations between plants and microorganisms and also a more efficient method for reclamation of saline soils.

The different stress factors have a significant influence on the performance of microorganisms. The selection and deployment of microorganisms in stressed ecosystems, therefore requires concerted research and technology development. Extensive research has been carried out on the occurrence and functional diversity of agriculturally important microbes in stressed environments as reviewed by several authors (Grahm 1992; Zahran 1999; Venkateswarlu et al., 2008). The occurrence of Rhizobium, Bradyrhizobium, Azotobacter, Azospirillum, Pseudomonas, and Bacillus have been reported from desert ecosystems, acid soils, saline, and alkaline areas, and highly eroded hill slopes of India (Tilak et al., 2005, Selvakumar et al., 2009, Upadhyay et al., 2009).

Bacteria are more commonly in this technique than A sustainable approach for improving productivity is to adopt beneficial microorganisms to enhance the supply of soil nutrients to plants in stressful environments

Microorganisms could play a significant role in stress management, once their unique properties of tolerance to extremities, their ubiquity, genetic diversity are understood and methods for their successful deployment in agriculture production are developed. These

organisms also provide excellent models for understanding stress tolerance mechanisms that can be subsequently engineered into crop plants.

At present nanotechnology is extensively used in different sectors including agriculture to promote the concept of precision agriculture. Nano compounds having one or more dimensions in the order of 100 nm or less show extraordinary physical properties and may find application in plant protection and nutrition management because of their size, high surface to volume ratio, and unique optical properties (Auffan et al., 2009, Ghormade et al., 2011). Nanoparticles with unique properties can be easily synthesized from different biological sources and applied in agriculture. Gypsum is a soluble source of calcium and sulfur which improves plant growth. Amendments of gypsum can also improve the physical properties of some soils. It promotes soil aggregation which prevents dispersion of soil particles, reduces surface crust formation, promotes seedling emergence, and increases water infiltration rates and movement through the soil profile (Dontsova et al., 2005).

Nanotechnology may also be a promising approach for these purposes Nanomaterials for soil reclamation and environmental remediation reclamation of these soils involves removing soil contaminants and enhancing soil quality and fertility.

With an idea to explore the possibilities of nanotechnology in soil reclamation and to improve the efficiency and economies of the gypsum requirement, an attempt was made to design nano-gypsum for soil reclamation.

The advantages of nanomaterials over the traditional amendments for soil reclamation include the higher reactivity due to smaller particle size and higher specific surface area and the easier delivery of the small-sized particles into the porous media (soils). High reactivity leads to high efficiency and a high rate of soil reclamation, while easy delivery is advantageous for in situ application. These nanomaterials have large potentials for reclaiming salt-affected soils

The remediation of degraded areas is not only the main target but also the is an urgent need. Therefore, nano remediation may be considered as a promising strategy for management and reacclimating the degraded land. Furthermore, It is well documented that, nanotechnology can play a great role in salt-affected and marginal lands (Patra et

al., 2016). Several approaches may be used in managing these lands including chemical reclamation (a very expensive source) or nanomaterials.

These soil nano-reclaimants can effectively create improved soil materials and systems as well as manage these lands using nano properties (Floris et al., 2017). Therefore, it could be used many nanomaterials (nano reclaimants) in the reclamation of salt-affected soils including nano gypsum, nano calcium (Nano-Ca^{2+}), and nano-magnesium (nano-Mg^{2+}) compounds, etc. These nano reclaimants are more efficient and readily manufacturable as well as enhanced hydraulic characteristics and soil stability (Mukhopadhyay and Kaur 2016; Patra et al., 2016).

These nano-reclaimants have several advantages in reclamation the salt-affected soils such as: 1. Improving soil drainage through removing Na+ from the soil solution and improving soil structure in subsurface and subsoils using nano-Ca^{2+}, nano ferrites as well as biofriendly nano polymers.

2. Replacing Na+ by Ca^{2+} by removing Na+ from soil and replacing with nano-Ca^{2+}, nano-Mg^{2+}, and nano-K^{+} [3]. Reducing salt concentration in soil solution through enhancement Na removal, soil stability, and hydraulic characteristics using polymeric carriers in nano-reclaimants via clay binding processes.

Among the many advancements in science, nanotechnology is being visualized as a rapidly evolving field that has the potential to revolutionize agriculture and food science, even though nanotechnology served as a prime tool in the field of material science, defence, and medicine, we began to scratch the surface in the field of agriculture.

For a country like India, applications of nanotechnology could be in the areas of, nanofood systems, nanobiotechnology, and nano remediation, although nanotechnology is likely to overwhelm all spheres of agricultural activities: Research endeavours so far have mostly been concentrated in two broad fields, i.e., the post-harvest and next-generation pesticide formulations, research arenas like remediation and sustainability, are yet to receive the desired attention. Its application in agriculture needs to be weighed carefully against any environmental footprint.

Given such background, it is obvious that a large number of experimental studies are being undertaken in this field. However, there seems to be a genuine lack of well-organized study overuse of nanoparticles in the reclamation of problematic soils.

Gypsum is being used for the reclamation of saline and alkaline soils effectively but its economic aspects are still under question. Therefore, it has been felt to evaluate the effect of nano gypsum in the reclamation of saline-alkaline soils and its effect on soil properties and economics. This all will help in the bioremediation of saline soil and improve the crop yields and in turn help in uplifting the socio-economic status of the farming community. However, there are great opportunities and challenges for the future of bioremediation techniques for effective reclamation of salt-affected soils.

Keeping in view the above facts, an intensive and well-planned study of reclamation of salt-affected soils soil is required. Therefore, the proposed study **"Synthesis of Nano Gypsum for the effective reclamation of Salt Affected Soils in combination with the different amendment."** has been proposed to investigate objectives listed below:

Objectives:

- To synthesis nano gypsum using Computational modelling.
- To formulate and characterize nano gypsum.
- To assess the effectiveness of nano gypsum for reclamation of salt-affected soils.
- To evaluate the effect of collective application of nano gypsum, biochar, vermicompost, and biomes on the soil properties.
- To assess the germination percentage, initial root and shoot growth of different crops using reclaimed soil.

RESULTS

This section deals with the results obtained in the investigation carried out in the laboratory. In the duration of this course of investigations, Simulation, characterization and synthesis of nano-gypsum was performed along with Soil column study under laboratory condition and a pot experiment, to evaluate the effect of synthesized nano gypsum and its various combinations on salt affected soil Here the results are presented in detail.

The results were appropriately tabulated, organized, statically analysed, interpreted and discussed under the following main and sub-heads.

4.1 Computational Study of Nano-Gypsum Cluster:

In order to study the stable structural stability of nano-gypsum cluster, the most stable structure of individual gypsum molecule has to be determined. Therefore, initial DFT calculations are performed to optimize the gypsum molecule and evaluating minimum binding energy of the gypsum molecule. The most stable structure of gypsum ($CaSO_4.2H_2O$) shown in Figure 1. Optimization for structure stability of gypsum molecule) is performed using DFT calculation and obtained structure with minimum binding energy possess monoclinic crystal structure with calcium (Ca^{2+}) and SO_4^{2-} are in-line with each other and H_2O molecules forms a prominent cleavage between them with an outward hydrogen atom (Figure 2). Evaluated value of binding energy is 621.3 kcal/mol and 623.3 kcal/mol respectively. Obtained value bond length for calcium (Ca) and Oxygen atom from water molecules (O_W) i.e. Ca-O_W is 2.61Å and O_W-O_H is 1.9Å.

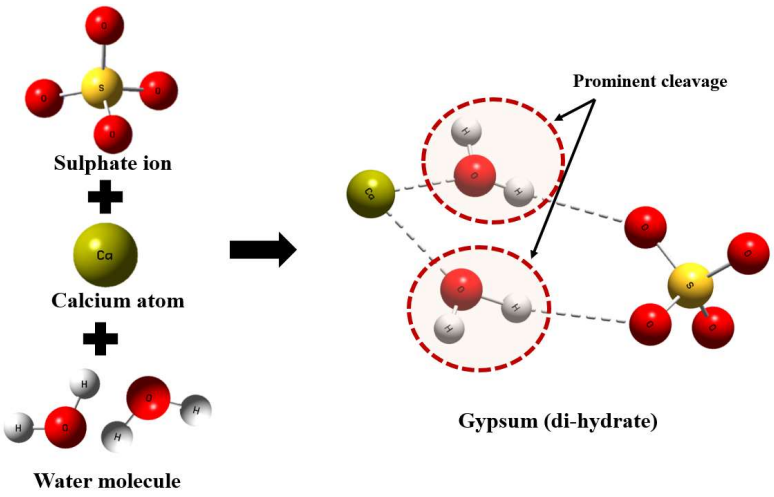


Figure 4.1: Formation of gypsum and its obtained structure at minimum binding energy.

After performing local minimization of single unit gypsum molecules, global minimum binding energy is calculated for cluster of gypsum molecules Eb_n (n represents number of gypsum molecule, n = 1,2, 3..., n). Gypsum molecules are randomly inserted in box and aggregations of these inserted molecules started as a formation of neutral cluster. These aggregations of gypsum molecules occur to offer higher binding energy of cluster than the binding energy of individual molecules. Figure 2. presents the different configuration of gypsum cluster for n=2 with their respective obtained possible configuration. It is observed that cluster structure with higher binding energy takes a layer structure with hydrogen atoms located between them. The obtained minimum value of binding energy for parallel layer (site A) and sideway arrangement (site B) is -1244.5 kcal/mol and -1244.6 kcal/mol, where site C possess the least stability with binding energy -1013.2 kcal/mol. It is observed that stable molecule of gypsum has Ca ion surrounded by four oxygen atoms i.e., three from Sulphate ion and one from water molecules. Water molecules stabilizes itself at prominent cleavage of crystal between two parallel sheets of gypsum offering weakest bond of the cluster.

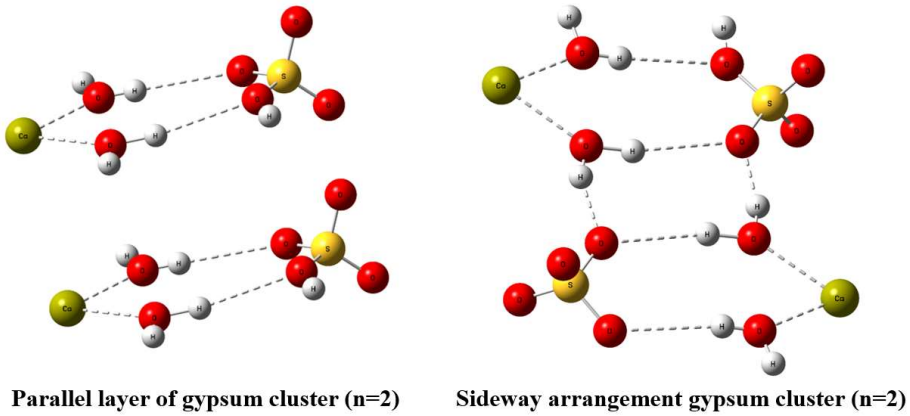
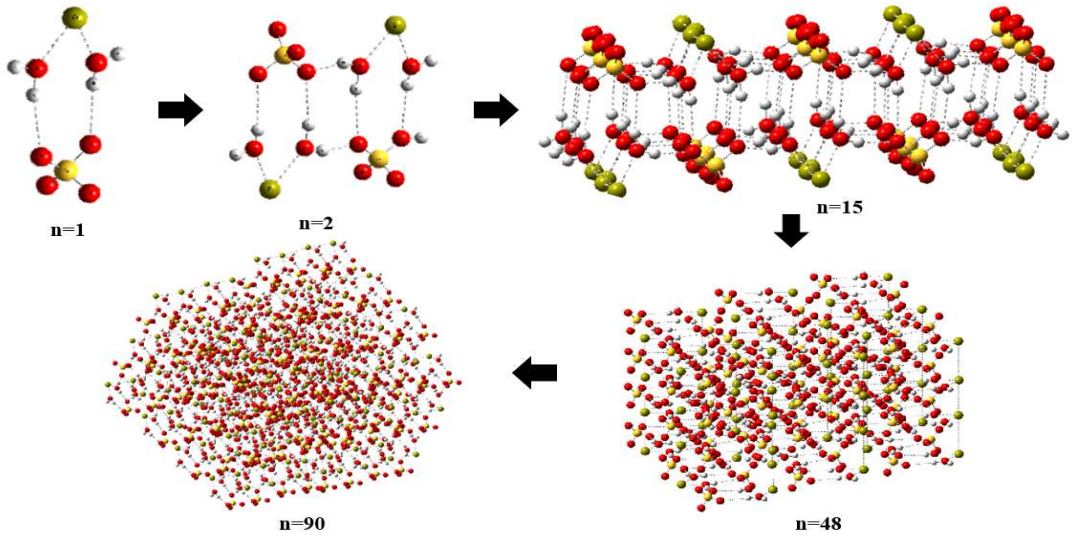
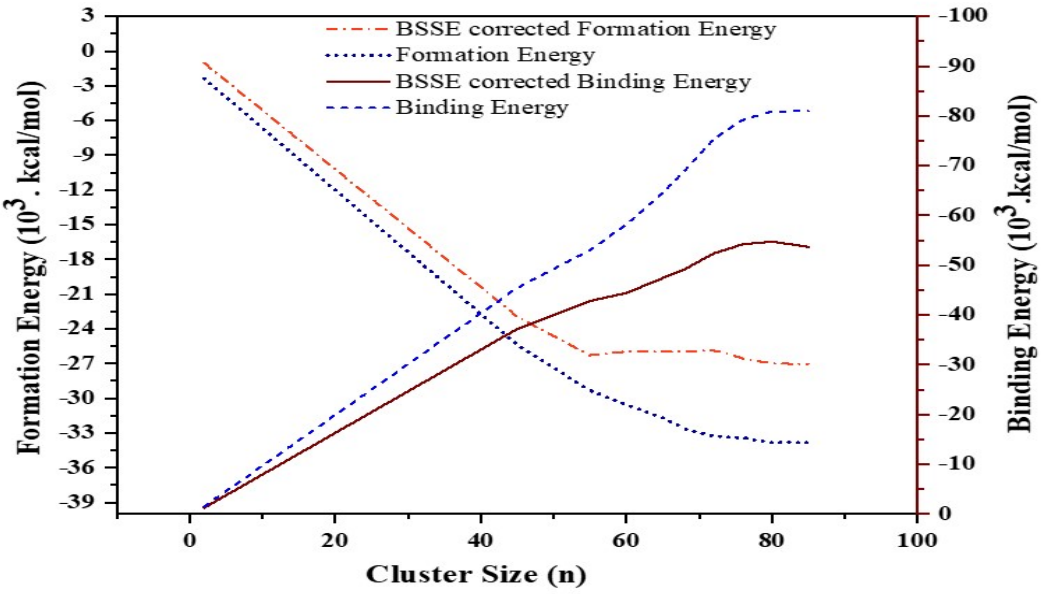


Figure 4. 2: Obtained stable configuration of cluster of gypsum at n=2

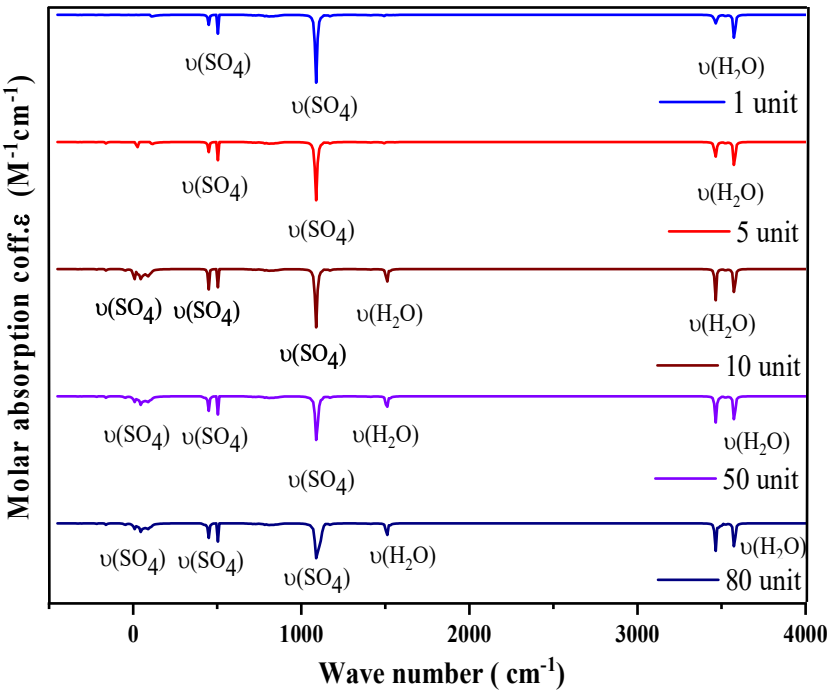
Binding energy per atom and formation energy has been evaluated for increased number of molecules i.e., n=3, 4…. n to established the size of the stable gypsum cluster. Figure 3(a) shows the arrangement of unit molecules of gypsum arranged as per preferred arrangement offering higher stability as mentioned earlier. Figure 3(b) presents the variation in formation energy and binding energy with size of gypsum cluster. It is observed that initially binding energy per atom and formation energy decreases with increases in size of cluster i.e. ~78-83 units; afterwards variation in energy becomes negligible. This reduced formation energy and binding energy with increase in size of nano-gypsum cluster establishes the stability of cluster. In addition with Binding energy, BSSE calculation is performed using counterpoise B3LYP/6-311G(d,p) basis set. It is observed that BSSE corrected binding energy and formation energy is 17% to 32.7% lower uncorrected values of these energy as shown in Figure 3(b). Higher value of correction is observed at large cluster size and, this can attributed to increased interaction of gypsum molecules with neighbouring molecules with increase in cluster size.


n=1
n=2
n=15
n=48
n=90

(a)


BSSE corrected Formation Energy
Formation Energy
BSSE corrected Binding Energy
Binding Energy
Formation Energy (10^3. kcal/mol)
Binding Energy (10^3.kcal/mol)
Cluster Size (n)
3
0
-3
-6
-9
-12
-15
-18
-21
-24
-27
-30
-33
-36
-39
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
0
20
40
60
80
100

(b)



(c)

Figure 4.3: Variation in (a) Unit size of nano-gypsum (b) Formation energy and binding energy (c) Vibrational spectrum with the size of gypsum cluster

In order to analysis the interaction of gypsum molecules with each other, infrared vibrational analysis is performed using B3LYP hybrid functional and the 6-311G(d,p) basis set. Figure 4.3(b) shows the calculated vibrational spectra of nano-gypsum cluster at different unit size. Major peak of symmetric stretching of tetrahedral SO_4 is observed at 1089 cm^{-1} with varying intensity at all level of nano-cluster of gypsum. A doublet peaks at 489 cm^{-1} and 501 cm^{-1} is observed due to symmetric bending of tetrahedral SO_4. In addition, a very weak peak of tetrahedral SO_4 at 110 cm-1, which can be attributed increased size of cluster leading to external modes of vibrations. Further, symmetric and asymmetric starching vibrations of O-H bonds leads to IR peaks at 3404 cm^{-1} and 3506 cm^{-1}. O-H bond peaks at lower unit of nano-gypsum is very weak, but increased interaction with increased units of nano-gypsum leads to strong peak of O-H bond as presented in Figure 3(b). It is observed that number of dominant peak finds a very close

match with experimentally reported IR gypsum peaks establishing the stability of simulated cluster of nano-gypsum.

From Figure 4.3, it is observed that after achieve a minimum aggregation of ~78 to 83 units of gypsum molecules cluster becomes stable. Obtained value of stable cluster size is around 23-41 nm.

Presented DFT calculations revels a gypsum of cluster size 23-41 nm is structural stable indicating unstable nature of nature of gypsum cluster below the mentioned cluster size.

4.2 Synthesis and Characterization of Nano-Gypsum:

After calculating the minimum size of achievable and stable nano-gypsum cluster, nano-gypsum particle is prepared using top to bottom approach by deploying planarity ball milling machine. This ball milled gypsum particle prepared at different hours of milling was subjected to XRD, particle size analyser and XRF for particle characterization purpose i.e., phase identification, particle size distribution and chemical compositions.

Figure 4. 4 presents the XRD peak pattern of milled gypsum at 30 hours and 50 hours. It was observed that obtained peaks of prepared nano-gypsum find close match with peaks of calcium sulphate di-hydrate. It indicated that during milling prepared nano-gypsum retained gypsum phases without forming any secondary phase. Major peaks were obtained at (131), (240), (112) and (460) as shown in Figure 4.4.

Debye – Scherer equation was used to evaluate nano-particle size (t). Which is given as: $t = 0.9\lambda / (B \cos\Theta)$

Where, t is particle size, λ is wavelength of X-rays, B is line broadening or full Width Half maximum (FWHM) and Θ is the Bragg angle in radian. For the present study Molybdenum K-ALPHA source is used which have a wavelength of 0.7108 A. Particle size was evaluated as

For $CaSO_4.H_2O$ (GY-PBM-30 Hrs.)

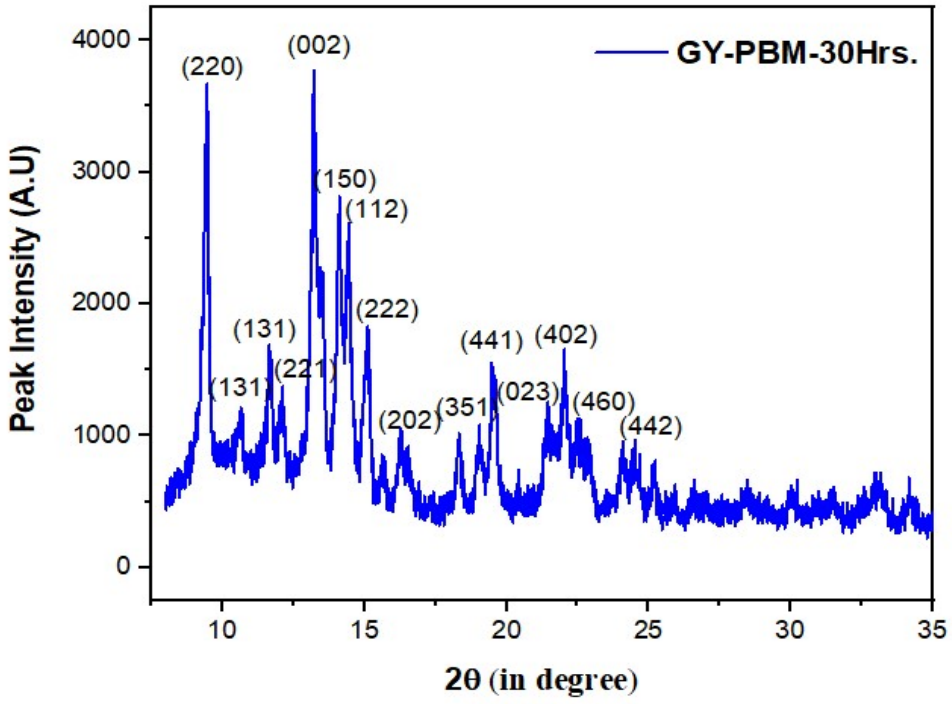
$t = (0.63972*10^{-10})/ (0.24° * \cos 6.55°))$

$t = 137.23$ nm

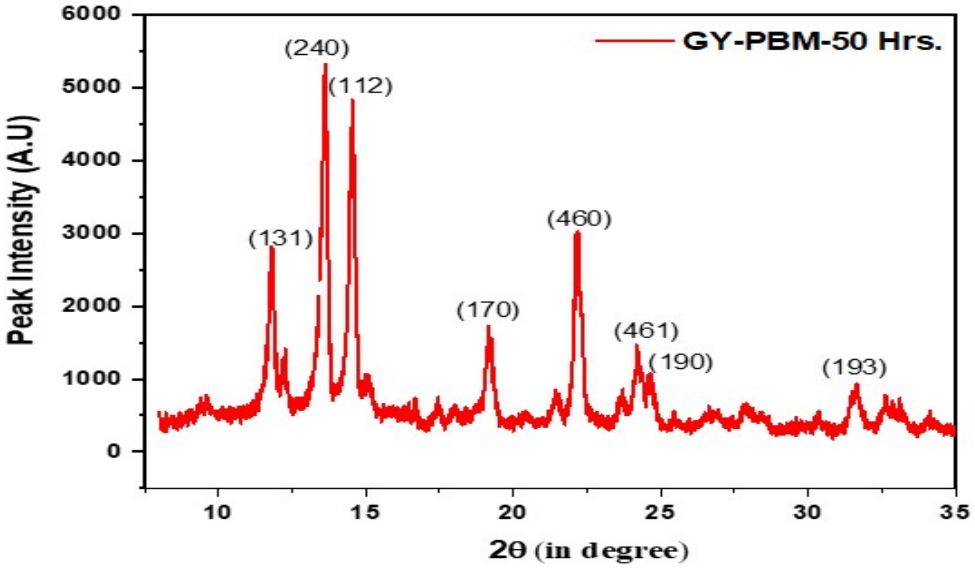
For $CaSO_4.H_2O$ (GY-PBM-50 Hrs.)

$t = (0.63972*10^{-10})/ (0.32° * \cos (5.53°))$

t = 128.23 nm



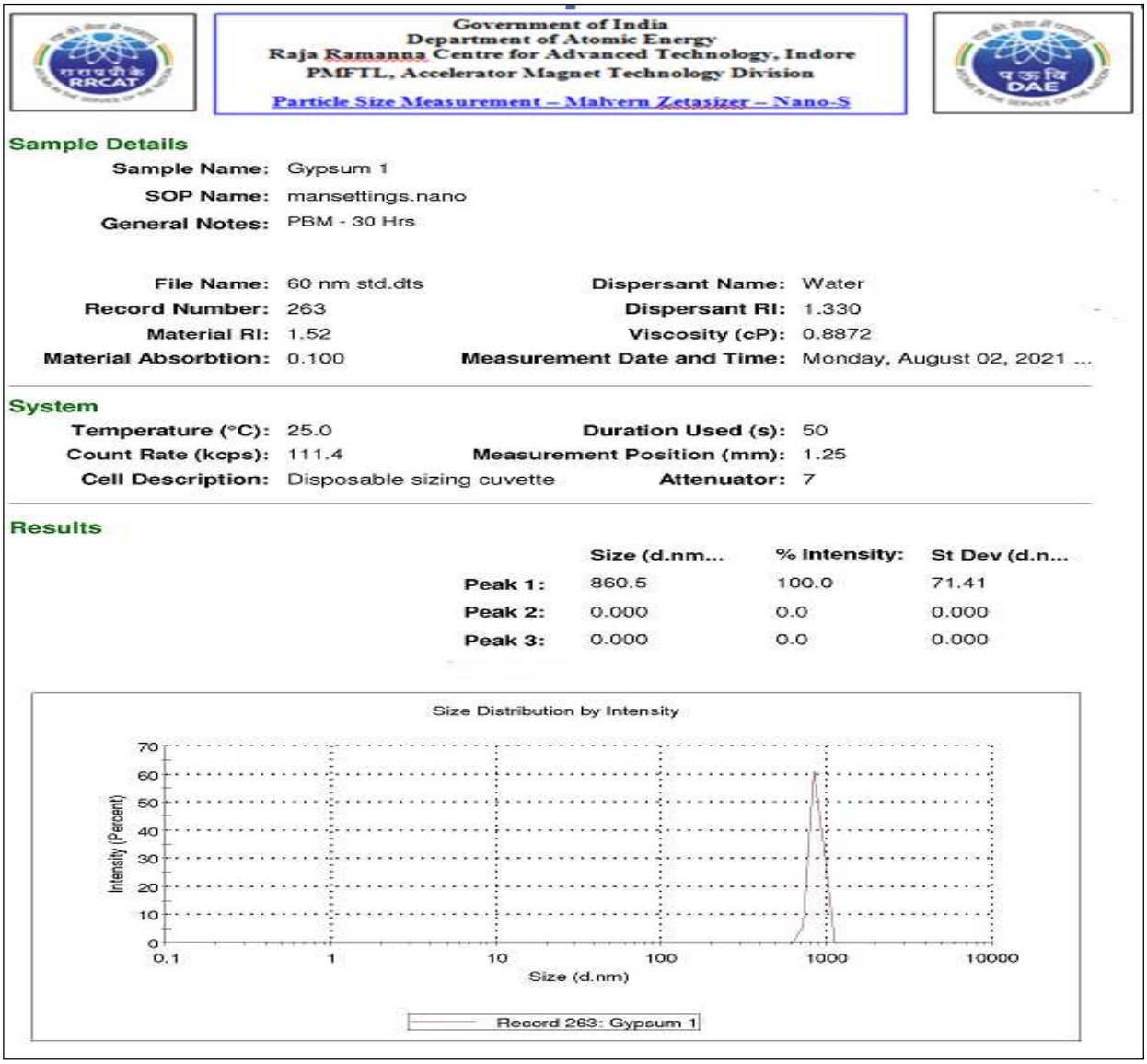
(a)



(b)

Figure 4.4: XRD pattern of balled milled gypsum at (a) 30 hours (b) 50 hours duration.

These milled gypsum particles were subjected to zeta size analyser for particle size distribution study. Figure 4.5 shows the particle distribution of nano-gypsum synthesis at different hours of ball milling. A close agreement between the values of particle size of gypsum by Zeta-sizer and XRD has been observed at 50 hours of milling.



Government of India
Department of Atomic Energy
Raja Ramanna Centre for Advanced Technology, Indore
PMFTL, Accelerator Magnet Technology Division
Particle Size Measurement – Malvern Zetasizer – Nano-S

Sample Details

Sample Name:	Gypsum 1		
SOP Name:	mansettings.nano		
General Notes:	PBM - 30 Hrs		
File Name:	60 nm std.dts	**Dispersant Name:**	Water
Record Number:	263	**Dispersant RI:**	1.330
Material RI:	1.52	**Viscosity (cP):**	0.8872
Material Absorbtion:	0.100	**Measurement Date and Time:**	Monday, August 02, 2021 ...

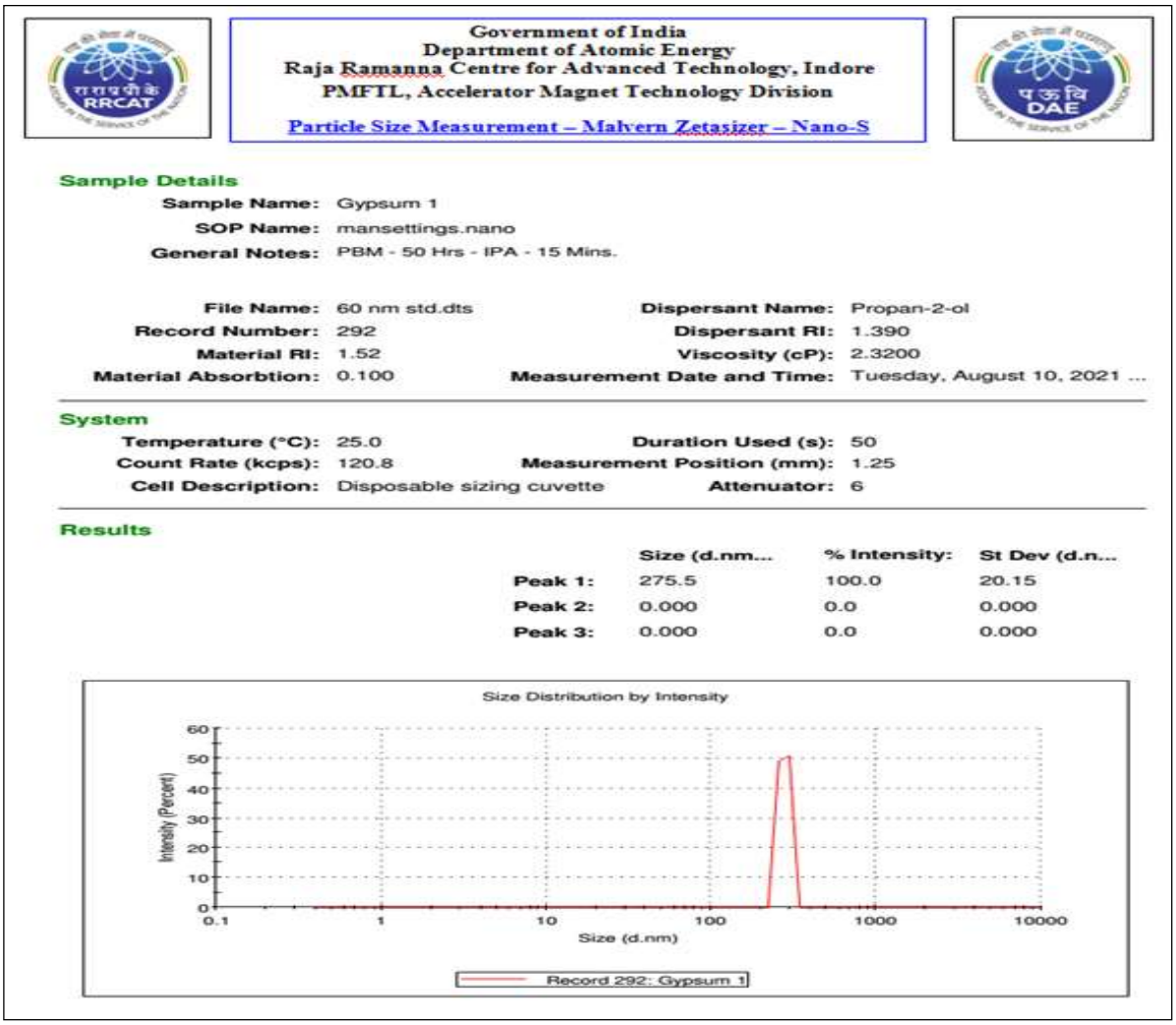
System

Temperature (°C):	25.0	**Duration Used (s):**	50
Count Rate (kcps):	111.4	**Measurement Position (mm):**	1.25
Cell Description:	Disposable sizing cuvette	**Attenuator:**	7

Results

	Size (d.nm...	% Intensity:	St Dev (d.n...
Peak 1:	860.5	100.0	71.41
Peak 2:	0.000	0.0	0.000
Peak 3:	0.000	0.0	0.000

(a)



(b)

Figure 4.5: The particle size of gypsum measured at (a) 30 hours (b) 50 hours of milling

In additions, with the use of X-ray fluorescence technique, analysis of material composition of the gypsum powder after has been done and it was found that there is highest content of calcium in the material followed by Sulphur (Figure.4.6) which does not have any phase changes with the time and PBM milling process.

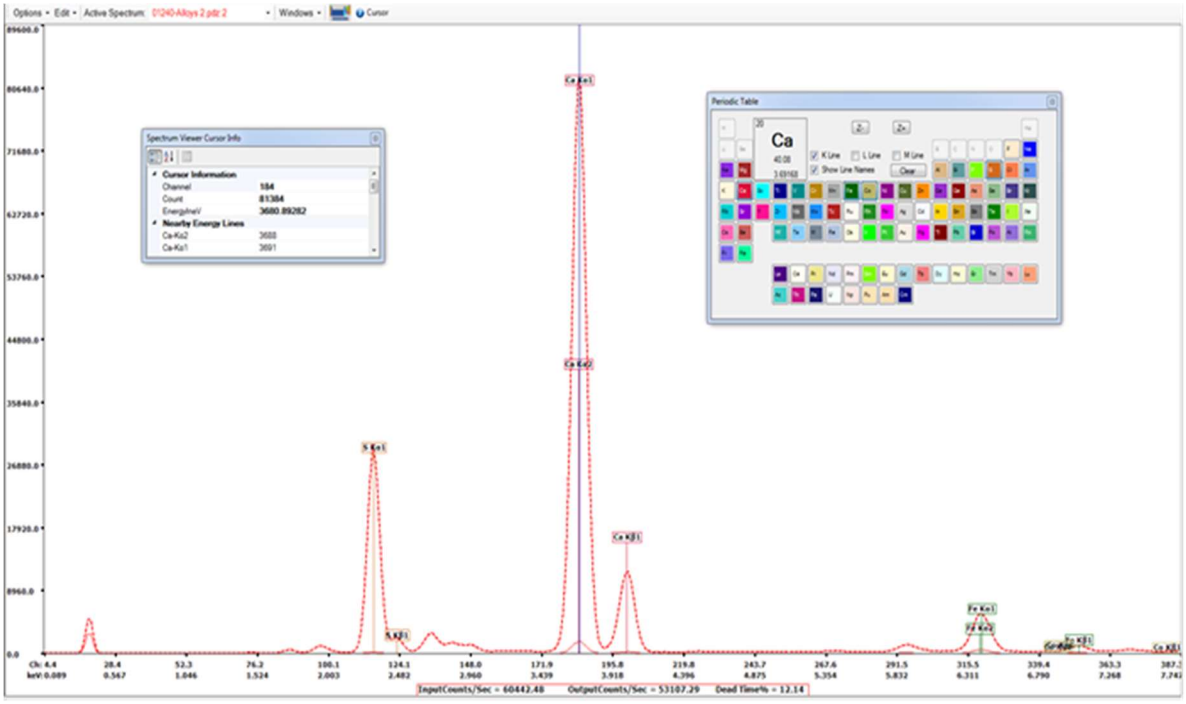


Figure 4.6: XRF - Analysis of Material Composition of the Gypsum Powder

Table.1. Effect of various treatments, pore volume and their combination on the leachate pH at 15 DAI											
Pore Volume / Treatment	**PV0.5**	**PV1**	**PV1.5**	**PV2**	**PV2.5**	**PV3**	**PV3.5**	**PV4**	**PV4.5**	**PV5**	**Mea**
T1	7.12	7.13	7.14	7.19	7.25	7.29	7.42	7.62	7.62	7.89	**7.3**
T2	7.10	7.11	7.12	7.17	7.23	7.27	7.40	7.60	7.60	7.87	**7.3**
T3	7.07	7.08	7.09	7.14	7.20	7.24	7.37	7.57	7.57	7.84	**7.3**
T4	7.17	7.18	7.19	7.24	7.30	7.34	7.47	7.67	7.67	7.94	**7.4**
T5	7.26	7.27	7.28	7.33	7.39	7.43	7.56	7.76	7.76	8.03	**7.5**
T6	7.38	7.39	7.40	7.45	7.51	7.55	7.68	7.88	7.88	8.15	**7.6**
T7	7.13	7.14	7.15	7.20	7.26	7.30	7.43	7.63	7.63	7.90	**7.3**
T8	7.10	7.11	7.12	7.17	7.23	7.27	7.40	7.60	7.60	7.87	**7.3**
T9	7.15	7.16	7.17	7.22	7.28	7.32	7.45	7.65	7.65	7.92	**7.3**
T10	7.46	7.49	7.51	7.53	7.64	7.81	7.94	8.04	8.29	8.46	**7.8**
T11	7.47	7.50	7.52	7.54	7.65	7.82	7.95	8.05	8.30	8.48	**7.8**
T12	7.50	7.53	7.55	7.57	7.68	7.85	7.98	8.08	8.33	8.51	**7.8**
T13	7.66	7.70	7.72	7.74	7.85	8.02	8.15	8.25	8.50	8.68	**8.0**
T14	7.65	7.69	7.71	7.73	7.84	8.01	8.14	8.24	8.49	8.67	**8.0**
T15	7.67	7.71	7.73	7.75	7.86	8.03	8.16	8.26	8.51	8.69	**8.0**
T16	7.83	7.87	7.90	7.96	8.07	8.20	8.38	8.65	8.76	8.98	**8.2**
T17	7.83	7.87	7.90	7.96	8.07	8.20	8.38	8.65	8.76	8.98	**8.2**
T18	7.85	7.89	7.92	7.98	8.09	8.22	8.40	8.67	8.78	9.00	**8.2**
T19	7.45	7.48	7.50	7.52	7.63	7.80	7.93	8.03	8.28	8.45	**7.8**
T20	7.42	7.45	7.47	7.49	7.60	7.77	7.90	8.00	8.25	8.43	**7.7**
T21	7.45	7.48	7.50	7.52	7.63	7.80	7.93	8.03	8.28	8.46	**7.8**
T22	7.61	7.65	7.67	7.69	7.80	7.97	8.10	8.20	8.45	8.63	**7.9**
T23	7.62	7.66	7.68	7.70	7.81	7.98	8.11	8.21	8.46	8.64	**7.9**
T24	7.63	7.67	7.69	7.71	7.82	7.99	8.12	8.22	8.47	8.65	**7.9**
T25	7.79	7.83	7.86	7.92	8.03	8.16	8.34	8.61	8.72	8.94	**8.2**
T26	7.81	7.85	7.88	7.94	8.05	8.18	8.36	8.63	8.74	8.96	**8.2**
T27	7.82	7.86	7.89	7.95	8.06	8.19	8.37	8.64	8.75	8.97	**8.2**
T28	7.41	7.42	7.43	7.48	7.54	7.58	7.63	7.71	7.91	8.18	**7.6**
Mean B	**7.48**	**7.50**	**7.52**	**7.56**	**7.65**	**7.77**	**7.91**	**8.07**	**8.21**	**8.43**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.006**		**0.004**		**0.02**						

3. The effectiveness of nano-gypsum for reclamation of salt affected soils and collective application of nano-gypsum, biochar, vermicompost and biomes on the soil properties.

Effect of various treatments, pore volume and their combination on the leachate pH at 15,30 and 45 DAI:

Soil salinity, which poses one of the greatest threats to sustainable crop production worldwide, can be ameliorated through various approaches, such

as leaching, and amendment application. The effects of leaching and amendments viz. nano gypsum, biochar biomes and their combinations on saline soil reclamation have been studied separately. Therefore, a column experiment was designed with soils that were subjected to leaching with 0.5 and 5 pore volume (PV) of water to observe the effects of leaching on saline soil and leachate characteristics under different treatment combinations.

A: Results of column study for at 15 days after incubation revealed that the pH of leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the difference in pH of the leachate was found ar par in PV.

At 15 DAI results revealed that, the mean lowest concentration of pH was observed in treatment T3 and the highest in case of T18(Table.1 and Fig.7. Amendment treatments combination showed variable response and affected mean leachate pH differently. The maximum pH leachate was found in the treatment T18 (8.28). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest pH of leachate was found in the treatment T1 (7.31). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the leachate pH was. The conventional method was found statistically inferior to the treatments T10 (7.81), T12 (7.86), T13 (8.01), T14 (7.99), T15 (8.02), T16 (8.26), T17 (8.26), T18 (8.28), T19 (7.80), T20 (7.78) T21 (7.81), T19 (7.98) T23 (7.97), T24 (7.98), T25 (8.03), T26 (8.22), T27 (8.24), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leachate pH is presented in Table.1. and Fig.7. It is evident from the data that the leachate pH was affected significantly by different treatment combinations, amendment and pore volume. The most effective treatment combination was T18 which has having pH 9.00 when the soil column is subjected to leaching with PV5. Followed by T27(8.97), these treatments were found statistically

superior to rest of the treatments. In the above case as we increase the pore volume the concentration of pH increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination at PV5 was T3 (7.84). This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the pH of leachate increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 with PV 5, which has 10% high leachate as compared to treatment T28 which comprised of addition of conventional gypsum as per gypsum requirement of the soil with PV 5

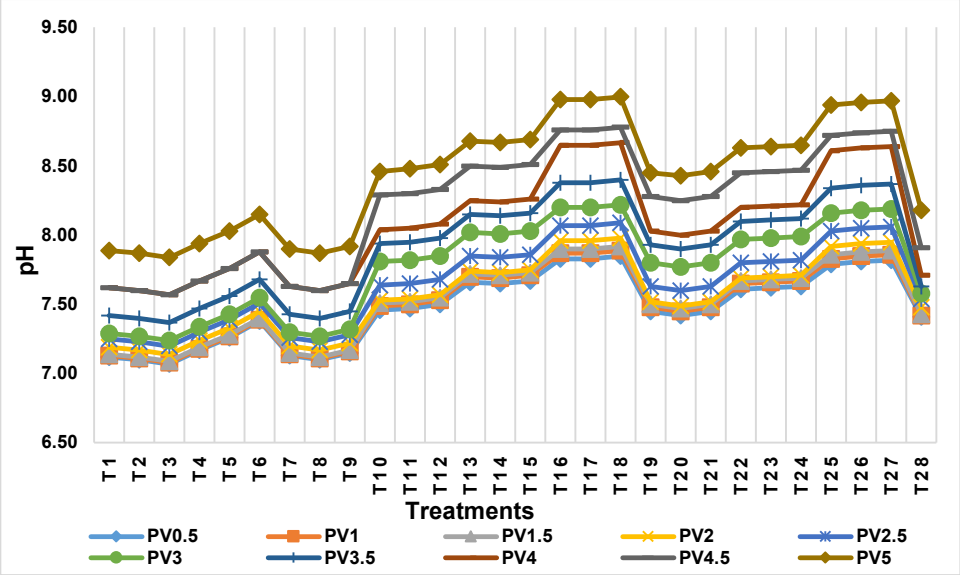


Fig.7: Interactive effect of various treatments on leachate pH at 15 DAI

Table.2. Effect of various treatments, pore volume and their combination on the leachate pH at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	7.19	7.20	7.21	7.26	7.32	7.36	7.41	7.49	7.69	7.96	**7.41**
T2	7.17	7.18	7.19	7.24	7.30	7.34	7.39	7.47	7.67	7.94	**7.39**
T3	7.14	7.15	7.16	7.21	7.27	7.31	7.36	7.44	7.64	7.91	**7.36**
T4	7.24	7.25	7.26	7.31	7.37	7.41	7.46	7.54	7.74	8.01	**7.46**
T5	7.33	7.34	7.35	7.40	7.46	7.50	7.55	7.63	7.83	8.10	**7.55**
T6	7.45	7.46	7.47	7.52	7.58	7.62	7.67	7.75	7.95	8.22	**7.67**
T7	7.20	7.21	7.22	7.27	7.33	7.37	7.42	7.50	7.70	7.97	**7.42**
T8	7.17	7.18	7.19	7.24	7.30	7.34	7.39	7.47	7.67	7.94	**7.39**
T9	7.22	7.23	7.24	7.29	7.35	7.39	7.44	7.52	7.72	7.99	**7.44**
T10	7.53	7.64	7.78	7.99	8.20	8.42	8.54	8.65	8.69	8.72	**8.22**
T11	7.54	7.65	7.79	8.00	8.21	8.43	8.55	8.66	8.70	8.74	**8.23**
T12	7.57	7.68	7.82	8.03	8.24	8.46	8.58	8.69	8.73	8.77	**8.26**
T13	7.84	8.05	8.26	8.48	8.60	8.71	8.75	9.00	9.04	9.03	**8.58**
T14	7.83	8.04	8.25	8.47	8.59	8.70	8.74	8.99	9.03	9.02	**8.57**
T15	7.85	8.06	8.27	8.49	8.61	8.72	8.76	9.01	9.05	9.04	**8.59**
T16	7.88	8.05	8.26	8.48	8.60	8.79	9.01	9.07	9.09	9.05	**8.63**
T17	7.87	8.04	8.25	8.47	8.59	8.78	9.00	9.06	9.08	9.04	**8.62**
T18	7.89	8.06	8.27	8.49	8.61	8.80	9.02	9.08	9.10	9.06	**8.64**
T19	7.52	7.63	7.77	7.98	8.19	8.41	8.53	8.64	8.68	8.71	**8.21**
T20	7.49	7.60	7.74	7.95	8.16	8.38	8.50	8.61	8.65	8.69	**8.18**
T21	7.52	7.63	7.77	7.98	8.19	8.41	8.53	8.64	8.68	8.72	**8.21**
T22	7.79	8.00	8.21	8.43	8.55	8.66	8.70	8.95	8.99	8.98	**8.53**
T23	7.80	8.01	8.22	8.44	8.56	8.67	8.71	8.96	9.00	8.99	**8.54**
T24	7.81	8.02	8.23	8.45	8.57	8.68	8.72	8.97	9.01	9.00	**8.55**
T25	7.84	8.01	8.22	8.44	8.56	8.75	8.97	9.03	9.05	9.01	**8.59**
T26	7.86	8.03	8.24	8.46	8.58	8.77	8.99	9.05	9.07	9.03	**8.61**
T27	7.85	8.02	8.23	8.45	8.57	8.76	8.98	9.04	9.06	9.02	**8.60**
T28	7.48	7.49	7.50	7.55	7.61	7.65	7.70	7.78	7.98	8.25	**7.70**
Mean B	**7.57**	**7.68**	**7.80**	**7.96**	**8.08**	**8.20**	**8.30**	**8.42**	**8.51**	**8.61**	

B: Effect of various treatments, pore volume and their combination on the leachate pH at 30 DAI:

Soil salinity, which poses one of the greatest threats to sustainable crop production worldwide, can be ameliorated through various approaches, such as leaching, and amendment application. The effects of leaching and amendments viz. nano gypsum, biochar biomes and their combinations on saline soil reclamation have been studied separately. Therefore, a column experiment was designed with soils that were subjected to leaching with 0.5 and 5 pore volume (PV) of water to observe the effects of leaching on saline soil and leachate characteristics under different treatment combinations. Results at 30 days after incubation revealed that the of leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume.

Amendment treatment combination showed variable response and affected mean leachate pH significantly presented in Table .2. and Fig.8. The maximum pH leachate was found in the treatment T18 (8.64). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments and the lowest pH of leachate was found in the treatment T3 (7.86) at PV5. This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the leachate pH was. The conventional method was found statistically inferior to the treatments T10 (8.22), T11 (8.23), T12 (8.53), T13 (8.58), T15 (8.18), T16 (8.63), T17 (8.62), T18 (8.64), T19 (8.21) T20 (8.59), ,T21 (8.21), T22 (8.54), T23 (8.55), T24 (8.57) ,T25 (8.59), T27 (8.60), T26 (8.61),and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leachate pH is presented in Table.2.and Fig.8. It is evident from the data that the leachate pH was affected significantly by different treatment combinations, amendment and pore volume. The most effective treatment combination was T18(9.06) which has having pH when the soil column is subjected to leaching with PV5. Followed by T27(8.60),

these treatments were found statistically superior to rest of the treatments. In the above case as we increase the pore volume the concentration of pH increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for pH leaching was T3(7.91) at PV 5. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the pH of leachate increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 with 5 pore volume, which has 5.34% high leachate as compared to treatment T28 which comprised of addition of conventional gypsum as per gypsum requirement of the soil with PV5.

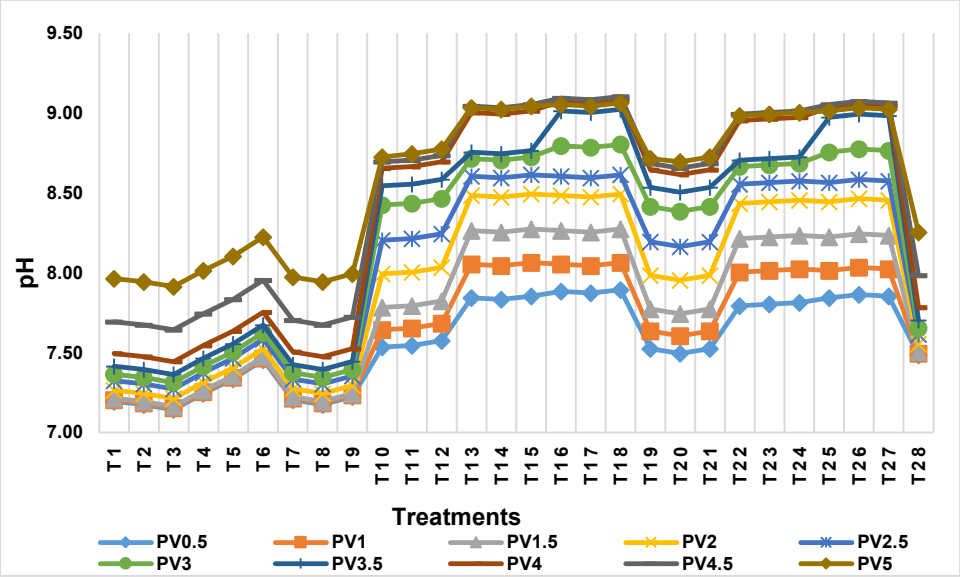


Fig.8: Interactive effect of various treatments on leachate pH at 30 DAI

Table.3. Effect of various treatments, pore volume and their combination on the leachate pH at 45 DAI											
Pore Volume / Treatment	**PV0.5**	**PV1**	**PV1.5**	**PV2**	**PV2.5**	**PV3**	**PV3.5**	**PV4**	**PV4.5**	**PV5**	**Mean**
T1	7.28	7.29	7.30	7.35	7.41	7.45	7.50	7.58	7.78	8.05	**7.50**
T2	7.26	7.27	7.28	7.33	7.39	7.43	7.48	7.56	7.76	8.03	**7.48**
T3	7.23	7.24	7.25	7.30	7.36	7.40	7.45	7.53	7.73	8.00	**7.45**
T4	7.33	7.34	7.35	7.40	7.46	7.50	7.55	7.63	7.83	8.10	**7.55**
T5	7.42	7.43	7.44	7.49	7.55	7.59	7.64	7.72	7.92	8.19	**7.64**
T6	7.54	7.55	7.56	7.61	7.67	7.71	7.76	7.84	8.04	8.31	**7.76**
T7	7.29	7.30	7.31	7.36	7.42	7.46	7.51	7.59	7.79	8.06	**7.51**
T8	7.26	7.27	7.28	7.33	7.39	7.43	7.48	7.56	7.76	8.03	**7.48**
T9	7.31	7.32	7.33	7.38	7.44	7.48	7.53	7.61	7.81	8.08	**7.53**
T10	7.62	7.73	7.87	8.08	8.29	8.51	8.63	8.74	8.78	8.81	**8.31**
T11	7.63	7.74	7.88	8.09	8.30	8.52	8.64	8.75	8.79	8.83	**8.32**
T12	7.66	7.77	7.91	8.12	8.33	8.55	8.67	8.78	8.82	8.86	**8.35**
T13	7.93	8.14	8.35	8.57	8.69	8.80	8.84	9.09	9.13	9.12	**8.67**
T14	7.92	8.13	8.34	8.56	8.68	8.79	8.83	9.08	9.12	9.11	**8.66**
T15	7.94	8.15	8.36	8.58	8.70	8.81	8.85	9.10	9.14	9.13	**8.68**
T16	7.97	8.14	8.35	8.57	8.69	8.88	9.10	9.16	9.18	9.14	**8.72**
T17	7.96	8.13	8.34	8.56	8.68	8.87	9.09	9.15	9.17	9.13	**8.71**
T18	7.98	8.15	8.36	8.58	8.70	8.89	9.11	9.17	9.19	9.15	**8.73**
T19	7.61	7.72	7.86	8.07	8.28	8.50	8.62	8.73	8.77	8.80	**8.30**
T20	7.58	7.69	7.83	8.04	8.25	8.47	8.59	8.70	8.74	8.78	**8.27**
T21	7.61	7.72	7.86	8.07	8.28	8.50	8.62	8.73	8.77	8.81	**8.30**
T22	7.88	8.09	8.30	8.52	8.64	8.75	8.79	9.04	9.08	9.07	**8.62**
T23	7.89	8.10	8.31	8.53	8.65	8.76	8.80	9.05	9.09	9.08	**8.63**
T24	7.90	8.11	8.32	8.54	8.66	8.77	8.81	9.06	9.10	9.09	**8.64**
T25	7.93	8.10	8.31	8.53	8.65	8.84	9.06	9.12	9.14	9.10	**8.68**
T26	7.95	8.12	8.33	8.55	8.67	8.86	9.08	9.14	9.16	9.12	**8.70**
T27	7.94	8.11	8.32	8.54	8.66	8.85	9.07	9.13	9.15	9.11	**8.69**
T28	7.57	7.58	7.59	7.64	7.70	7.74	7.79	7.87	8.07	8.34	**7.79**
Mean B	**7.66**	**7.77**	**7.89**	**8.05**	**8.17**	**8.29**	**8.39**	**8.51**	**8.60**	**8.70**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.005**		**0.003**		**0.015**						
CD5%	**0.013**		**0.008**		**0.04**						

C: Effect of various treatments, pore volume and their combination on the leachate pH at 45 DAI:

Results at 45 days after incubation revealed that the of leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume.

Amendment treatment combination showed variable response and affected mean leachate pH significantly (Table.3. Fig.9.) The maximum pH leachate was found in the treatment T18 (8.73). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest pH of leachate was found in the treatment T3 (8.45). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the leachate pH was. The conventional method was found statistically inferior to the treatments T10 (8.31), T11 (8.32), T12(8.35), T13 (8.67),T14 (8.66), T15 (8.68),T16 (8.72),T17 (8.71), T18 (8.73), T19 (8.30) ,T20 (8.27), T21 (8.30),T22 (8.62), T23 (8.63), T24 (8.64), T25 (8.68), T26 (8.70), T27 (8.69), and statistically superior to rest of the treatments.

It is evident from the data presented in table.3 and Fig.9., that the leachate pH was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most effective treatment combination was T18 (9.15)which has having pH when the soil column is subjected to leaching with PV5 followed by T27(9.11), these treatments were found statistically superior to rest of the treatments. In the above case as we increase the pore volume the concentration of pH increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for pH leaching was T3(8) at PV5. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the the pH of leachate increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment

was T18 with 5 pore volume, which has 9.7% high leachate as compared to treatment T28 which comprised of addition of normal gypsum as per gypsum requirement of the soil with 5 pore volume,

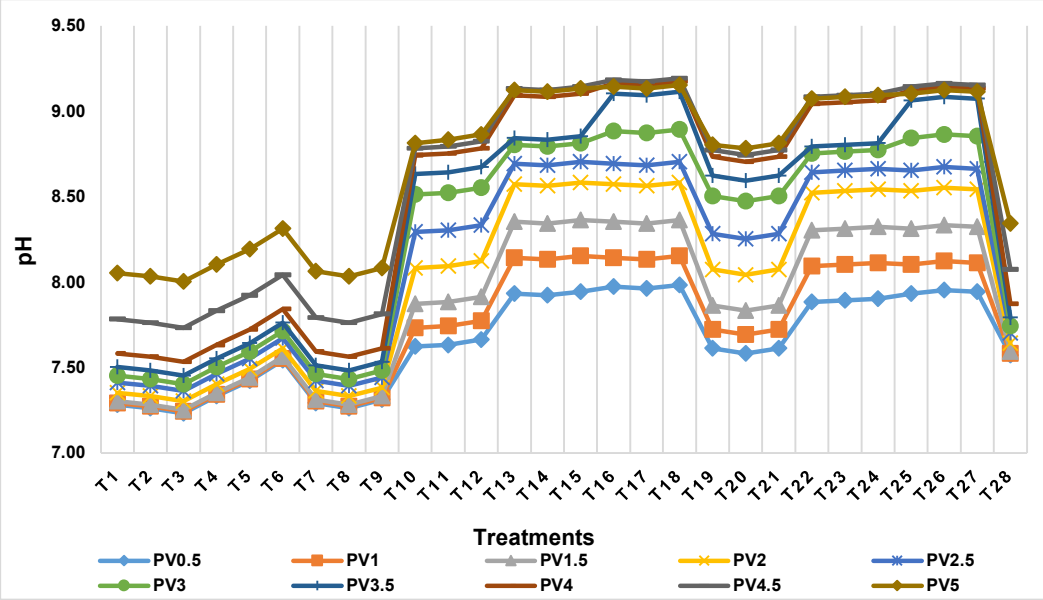


Fig.9: Interactive effect of various treatments on leachate pH at 45

Table. 4. Effect of various treatments and pore volume and their combination on the soil pH at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	9.28	9.22	9.12	8.97	8.89	8.84	8.77	8.72	8.63	8.55	**8.90**
T2	9.31	9.27	9.19	9.04	9.17	9.00	8.84	8.80	8.69	8.60	**8.99**
T3	9.32	9.30	9.28	9.24	9.20	9.08	8.92	8.85	8.74	8.79	**9.07**
T4	9.31	9.03	8.99	8.75	8.39	8.30	8.03	7.94	7.88	7.76	**8.44**
T5	9.25	8.88	8.80	8.68	8.35	8.25	8.00	7.89	7.81	7.72	**8.36**
T6	9.16	8.77	8.74	8.69	8.38	8.20	7.98	7.90	7.73	7.68	**8.32**
T7	9.32	9.21	9.08	8.96	8.91	8.78	8.69	8.69	8.62	8.54	**8.88**
T8	9.30	9.22	9.04	8.99	8.88	8.79	8.68	8.66	8.61	8.53	**8.87**
T9	9.29	9.18	8.96	9.02	8.81	8.71	8.67	8.64	8.59	8.52	**8.84**
T10	9.28	9.24	8.98	8.68	8.39	8.37	8.28	8.01	7.92	7.73	**8.49**
T11	9.26	9.20	8.99	8.95	8.68	8.44	8.25	8.00	7.86	7.83	**8.54**
T12	9.24	9.18	8.93	8.62	8.38	8.33	8.23	7.95	7.81	7.77	**8.44**
T13	8.62	8.40	8.29	8.02	7.98	7.89	7.82	7.78	7.72	7.66	**8.02**
T14	8.57	8.41	8.30	8.03	7.98	7.90	7.83	7.79	7.73	7.67	**8.02**
T15	8.40	8.32	8.17	7.87	7.89	7.81	7.77	7.70	7.64	7.61	**7.92**
T16	8.43	8.35	8.29	7.90	7.88	7.77	7.71	7.67	7.64	7.56	**7.92**
T17	8.42	8.33	8.27	7.88	7.86	7.75	7.69	7.65	7.62	7.54	**7.90**
T18	8.36	8.24	7.86	7.67	7.69	7.56	7.49	7.46	7.43	7.39	**7.73**
T19	9.30	9.27	8.98	8.93	8.70	8.46	8.39	8.13	7.96	7.83	**8.59**
T20	9.28	9.17	9.02	8.97	8.69	8.48	8.30	8.03	7.90	7.84	**8.57**
T21	9.28	9.21	8.97	8.66	8.41	8.40	8.28	8.00	7.84	7.80	**8.48**
T22	8.82	8.42	8.31	8.04	8.02	7.91	7.84	7.80	7.74	7.68	**8.06**
T23	8.60	8.43	8.32	8.05	8.00	7.92	7.85	7.81	7.75	7.69	**8.04**
T24	8.60	8.37	8.18	8.12	7.93	7.89	7.83	7.72	7.65	7.62	**7.99**
T25	8.47	8.36	8.31	7.94	7.91	7.81	7.75	7.70	7.68	7.59	**7.95**
T26	8.45	8.36	8.31	7.91	7.90	7.77	7.71	7.68	7.66	7.56	**7.93**
T27	8.38	8.26	7.91	7.69	7.71	7.58	7.51	7.48	7.45	7.41	**7.74**
T28	9.18	8.81	8.78	8.62	8.31	8.17	7.94	7.87	7.70	7.61	**8.30**
Mean B	**8.94**	**8.80**	**8.65**	**8.46**	**8.33**	**8.22**	**8.11**	**8.01**	**7.93**	**7.86**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.011		0.007		0.035						
CD5%	0.031		0.018		0.097						

Effect of various treatments and pore volume and their combination on the soil pH at 15 DAI:

The pH of soil as influenced by various treatments under study which are measured at 15, 30 and 45 Days after Incubation (DAI) . Post leaching soil analysis at 15, days after Incubation (DAI) and data are presented in Table.4. and Fig.10. revealed that soil pH was significantly lower as compared to initial soil pH. Among various treatments the mean lowest soil pH (7.72) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% + Biomes) having pH 7.74. The measured pH of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from pH reduction point of view are T18 followed by T27, T15, T16, T17, T24, T25, T26, in all these treatments the measured soil pH was found less than 8. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil pH by reducing it from 9.32 to < 8.0.

The soil pH decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil pH continuously at 15, 30, and 45 DAI. At 15 DAI the lowest mean soil pH (7.86) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 4.06, 5.61,7.16,9.26,10.64,11.83,13.03,14.08,14.97,15.70 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume the data are presented in Table 4. and Fig. 10. at 15, 30, and 45 DAI. From the Fig.8.and Table.4. it is evident that the most effective treatment for the reclamation of soil pH was T18PV5 (pH 7.39) which was closely followed by the treatment T27 PV5 (pH 7.41) these two treatments were statistically at par with each other. The neutral pH i.e., < 7.5 was recorded in the 5 pore volume treatments T28 PV5 (7.38),

T27 PV5 (7.40), similarly at lower pore volumes the pH below 7.5 recorded from 3.5 pore volume i.e., T18 PV3.5 (7.49),T27 PV3.5 (7.50), T18PV4 (7.46), T27 PV4 (7.48), T18 PV4.5 (7.43) T27 PV4.5 (7.45).

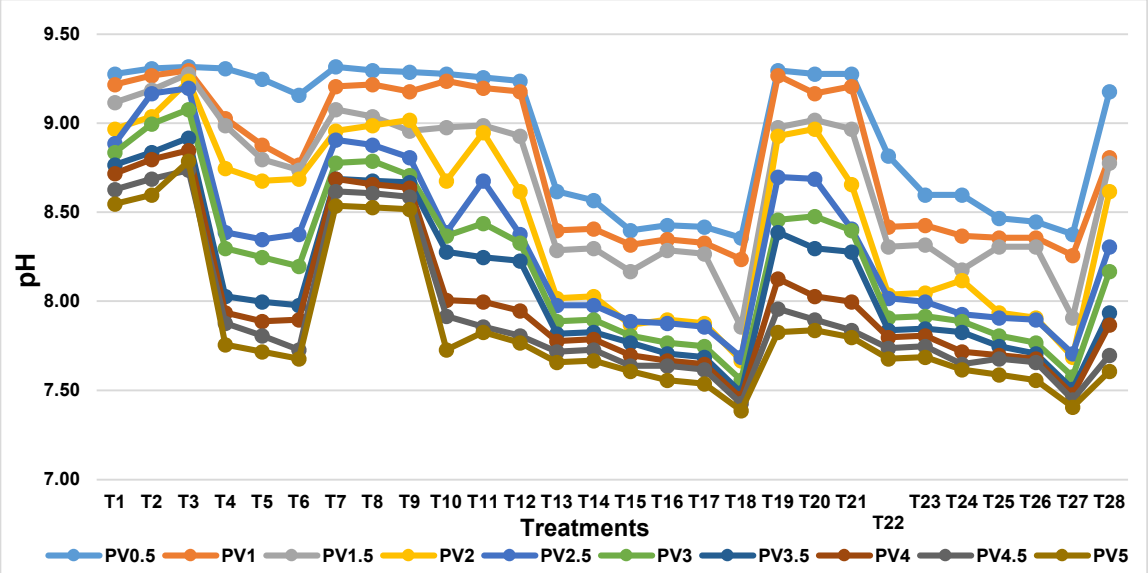


Fig.10: Interactive effect of various treatments on soil pH at 15 DA

Table. 5. Effect of various treatments and pore volume and their combination on the soil pH at 30 DAI.

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	9.25	9.20	9.10	8.95	8.87	8.80	8.75	8.70	8.61	8.53	**8.87**
T2	9.30	9.30	9.17	8.97	9.05	8.93	8.82	8.75	8.65	8.54	**8.95**
T3	9.30	9.25	9.26	9.20	9.03	8.94	8.91	8.85	8.80	8.71	**9.02**
T4	9.29	9.08	8.88	8.73	8.37	8.28	8.01	7.92	7.74	7.71	**8.40**
T5	9.23	8.87	8.74	8.64	8.33	8.23	7.98	7.87	7.79	7.70	**8.34**
T6	9.14	8.75	8.71	8.63	8.26	8.18	7.95	7.79	7.70	7.61	**8.27**
T7	9.30	9.19	9.06	8.94	8.87	8.74	8.78	8.66	8.60	8.52	**8.86**
T8	9.28	9.20	9.01	8.98	8.84	8.75	8.72	8.63	8.59	8.51	**8.85**
T9	9.27	9.16	8.94	9.16	8.79	8.69	8.65	8.62	8.57	8.50	**8.83**
T10	9.24	8.96	8.90	8.68	8.37	8.24	7.97	7.89	7.80	7.71	**8.37**
T11	9.27	8.95	8.86	8.66	8.35	8.26	7.98	7.88	7.81	7.69	**8.37**
T12	9.22	9.14	8.91	8.60	8.31	8.21	7.93	7.79	7.75	7.64	**8.35**
T13	8.60	8.38	8.27	8.00	7.87	7.80	7.76	7.70	7.64	7.61	**7.96**
T14	8.52	8.39	8.28	8.01	7.88	7.81	7.77	7.71	7.65	7.62	**7.96**
T15	8.37	8.30	8.15	7.85	7.79	7.75	7.68	7.62	7.59	7.56	**7.86**
T16	8.36	8.33	8.27	7.88	7.75	7.69	7.65	7.62	7.54	7.47	**7.85**
T17	8.38	8.31	8.25	7.86	7.73	7.67	7.63	7.60	7.52	7.45	**7.84**
T18	8.33	8.22	7.84	7.65	7.54	7.47	7.44	7.41	7.37	7.33	**7.66**
T19	9.25	8.98	8.96	8.66	8.37	8.26	7.99	7.90	7.81	7.72	**8.39**
T20	9.26	8.97	8.92	8.67	8.36	8.28	8.01	7.88	7.82	7.70	**8.38**
T21	9.22	9.17	8.93	8.61	8.32	8.23	7.94	7.80	7.76	7.66	**8.36**
T22	8.77	8.40	8.29	8.02	7.89	7.82	7.78	7.72	7.66	7.63	**8.00**
T23	8.54	8.41	8.30	8.03	7.90	7.83	7.79	7.73	7.67	7.64	**7.98**
T24	8.45	8.32	8.16	7.87	7.81	7.77	7.70	7.63	7.60	7.58	**7.89**
T25	8.43	8.34	8.28	7.89	7.76	7.70	7.66	7.63	7.55	7.48	**7.87**
T26	8.41	8.32	8.26	7.87	7.74	7.68	7.64	7.61	7.53	7.46	**7.85**
T27	8.34	8.28	7.88	7.67	7.56	7.49	7.46	7.43	7.39	7.35	**7.68**
T28	9.16	8.79	8.68	8.55	8.29	8.18	7.95	7.81	7.61	7.53	**8.25**
Mean B	**8.91**	**8.75**	**8.61**	**8.40**	**8.21**	**8.13**	**8.01**	**7.93**	**7.86**	**7.79**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.009		0.005		0.029						
CD5%	0.026		0.015		0.081						

Effect of various treatments and pore volume and their combination on the soil pH at 30 DAI:

Post leaching soil analysis data of 30 DAI are presented in Table.5. and Fig.11., revealed that soil pH was significantly lower as compared to initial soil pH. Among various treatments the mean lowest soil pH (7.66) was recorded in case of T18 (Biochar + NG45% +biomes) which was found at par with the treatment T27 (Vermicompost + NG45% +Biomes) having pH 7.68. The measured pH of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from pH reduction point of view. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil pH by reducing it from 9.32 to < 8.0.

The soil pH decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil pH continuously at 15, 30, and 45 DAI. At 15 DAI the lowest mean soil pH (7.79) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 4.43 6.17 7.59 9.89 11.90 12.79 14.09 14.90 15.69 16.44 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

From the Table.5. and Fig.11. it is evident that the most effective treatment for the reclamation of soil pH was T18PV5 (pH 7.33) which was closely followed by the treatment T27 PV5 (pH 7.35) these two treatments were statistically at par with each other. The neutral pH i.e., < 7.5 was recorded in the 5 pore volume treatments T28 PV5 (7.33), T27 PV5 (7.35), T15 PV5 (7.47), T16 PV5 (7.45) ,T25 PV5 (7.48) T26 PV5 (7.46) similarly at lower pore volumes the pH below 7.5 recorded from 3 pore volume i.e., T18 PV3 (7.47),T27 PV3 (7.49), T18 PV3.5 (7.44),T27 PV3.5 (7.46),T18PV4 (7.41), T27 PV4 (7.43), T18 PV4.5 (7.37) T27 PV4.5 (7.39).

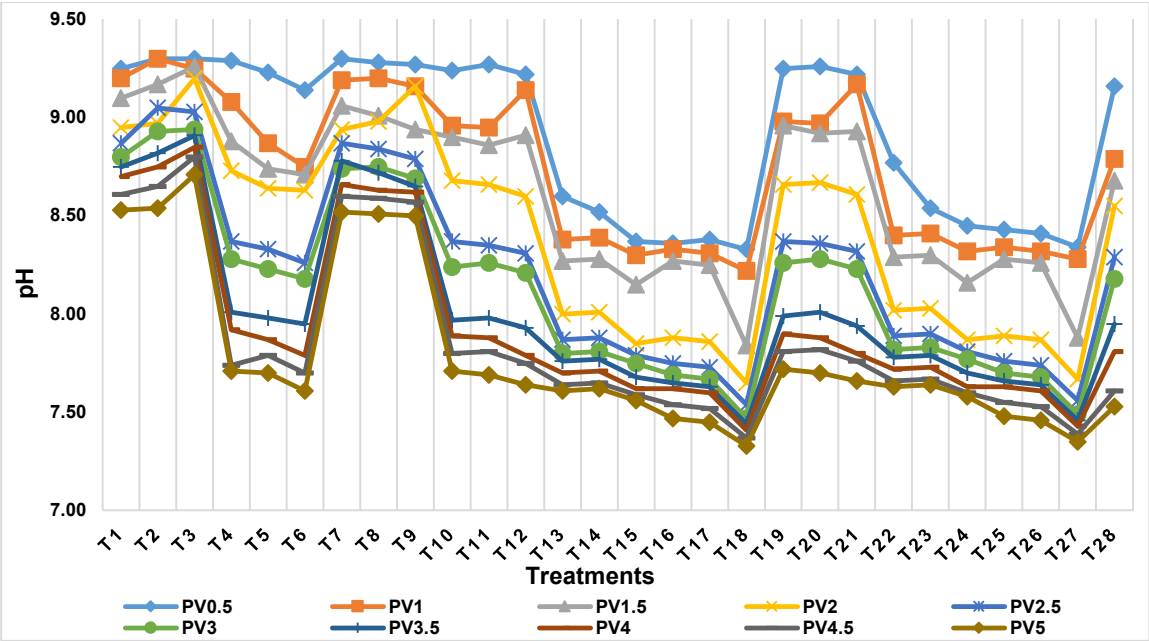


Fig.11: Interactive effect of various treatments on soil pH at 30 DAI

Table. 6. Effect of various treatments and pore volume and their combination on the soil pH at 45 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	9.20	9.15	8.99	8.90	8.81	8.74	8.70	8.65	8.56	8.48	**8.82**
T2	9.27	9.23	9.08	9.00	8.92	8.85	8.74	8.70	8.60	8.50	**8.89**
T3	9.24	9.21	9.21	9.15	8.98	8.90	8.87	8.81	8.75	8.67	**8.98**
T4	9.24	8.98	8.83	8.62	8.32	8.23	7.96	7.87	7.69	7.69	**8.35**
T5	9.18	8.83	8.69	8.59	8.28	8.18	7.93	7.82	7.70	7.65	**8.29**
T6	9.11	8.70	8.67	8.56	8.24	8.13	7.92	7.76	7.65	7.57	**8.23**
T7	9.25	9.14	9.01	8.89	8.81	8.70	8.74	8.62	8.55	8.47	**8.82**
T8	9.23	9.15	8.99	8.95	8.80	8.70	8.69	8.60	8.54	8.46	**8.81**
T9	9.22	9.11	8.00	8.89	8.74	8.64	8.60	8.59	8.52	8.45	**8.68**
T10	9.19	8.77	8.71	8.63	8.32	8.19	7.92	7.84	7.75	7.66	**8.30**
T11	9.22	8.90	8.85	8.61	8.30	8.21	7.93	7.83	7.76	7.64	**8.33**
T12	9.15	9.01	8.86	8.55	8.26	8.16	7.88	7.74	7.70	7.59	**8.29**
T13	8.56	8.33	8.22	7.95	7.82	7.75	7.71	7.65	7.59	7.56	**7.92**
T14	8.43	8.34	8.23	7.96	7.83	7.76	7.72	7.66	7.60	7.57	**7.91**
T15	8.34	8.22	8.10	7.80	7.74	7.70	7.63	7.57	7.54	7.51	**7.82**
T16	8.33	8.28	8.22	7.83	7.70	7.64	7.60	7.57	7.49	7.42	**7.81**
T17	8.32	8.26	8.20	7.81	7.68	7.62	7.58	7.55	7.47	7.40	**7.79**
T18	8.29	7.98	7.70	7.60	7.49	7.42	7.39	7.36	7.32	7.28	**7.59**
T19	9.10	8.81	8.93	8.61	8.32	8.21	7.94	7.85	7.76	7.67	**8.32**
T20	9.21	8.92	8.83	8.62	8.31	8.23	7.96	7.83	7.77	7.65	**8.34**
T21	9.17	9.09	8.88	8.56	8.28	8.18	7.89	7.75	7.71	7.61	**8.32**
T22	8.66	8.35	8.24	7.97	7.84	7.77	7.73	7.67	7.61	7.58	**7.95**
T23	8.47	8.36	8.25	7.98	7.85	7.78	7.74	7.68	7.62	7.59	**7.94**
T24	8.37	8.27	8.11	7.82	7.76	7.72	7.65	7.58	7.55	7.53	**7.84**
T25	8.38	8.29	8.23	7.84	7.71	7.65	7.61	7.58	7.50	7.43	**7.83**
T26	8.35	8.27	8.21	7.82	7.69	7.63	7.59	7.56	7.48	7.41	**7.80**
T27	8.31	7.83	7.74	7.65	7.54	7.47	7.44	7.41	7.37	7.30	**7.61**
T28	9.09	8.68	8.63	8.52	8.21	8.10	7.87	7.74	7.54	7.48	**8.19**
Mean B	**8.86**	**8.66**	**8.53**	**8.35**	**8.17**	**8.08**	**7.97**	**7.89**	**7.81**	**7.75**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.016		0.009		0.049						
CD5%	0.043		0.026		0.136						

Effect of various treatments and pore volume and their combination on the soil pH at 45 DAI:

Post leaching soil analysis of 45 DAI revealed that soil pH was significantly lower as compared to initial soil pH represented in Table. 6.and Fig.12.Among various treatments the mean lowest soil pH (7.72) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% +Biomes) having pH 7.74. The measured pH of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from pH reduction point of view are T18 followed by T27, T15, T16, T17, T24, T25, T26, in all these treatments the measured soil pH was found less than 7.5. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil pH by reducing it from 9.32 to < 8.0.

The soil pH decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil pH continuously at 15, 30, and 45 DAI. At 15 DAI the lowest mean soil pH (7.86) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 4.98 7.05 8.53 10.42 12.38 13.26 14.54 15.34 16.16 16.88 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

From the Table.6. and Fig. 12. it is evident that the most effective treatment for the reclamation of soil pH was T18PV5 (pH 7.28) which was closely followed by the treatment T27 PV5 (pH 7.30) these two treatments were statistically at par with each other. The neutral pH i.e., < 7.5 was recorded in the 5 pore volume treatments T18 PV5 (7.28), T27 PV5 (7.30), T17 PV5 (7.40), T25 PV5 (7.41), T16 PV5 (7.42), T24 PV5 (7.43) similarly at lower pore volumes the pH below 7.5 recorded from 2.5 pore volume i.e., T18 PV2.5 (7.49),T27 PV2.5 (7.50), T18 PV3 (7.42),T27 PV3

(7.47), T18 PV3.5 (7.39),T27 PV3.5 (7.44),T18PV4 (7.36), T27 PV4 (7.41), T18 PV4.5 (7.34) T27 PV4.5 (7.37).

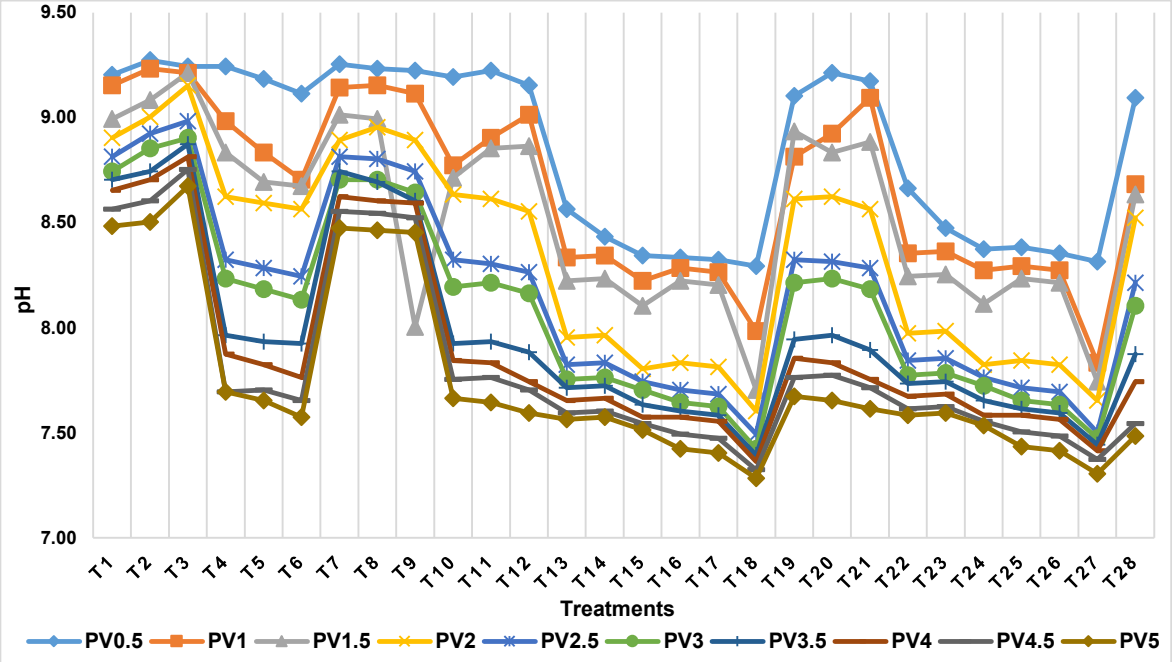


Fig.12: Interactive effect of various treatments on soil pH at 45 DAI

Table.7 Effect of various treatments, pore volume and their combination on the EC of leachates at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	2.00	2.64	2.46	2.31	2.25	2.06	1.90	1.41	1.36	1.30	**1.97**
T2	2.20	2.55	2.29	2.21	2.11	1.97	1.81	1.32	1.27	1.21	**1.89**
T3	2.17	2.55	2.24	1.80	1.24	1.11	1.19	1.30	1.17	1.21	**1.60**
T4	2.49	3.38	3.22	3.19	3.03	2.96	2.71	2.38	1.90	1.46	**2.67**
T5	2.53	3.57	3.31	3.28	3.22	3.15	2.90	2.57	2.09	1.65	**2.83**
T6	3.11	3.69	3.43	3.40	3.34	3.27	3.02	2.69	2.21	1.77	**2.99**
T7	2.15	2.69	2.55	2.47	2.37	2.11	1.95	1.46	1.41	1.35	**2.05**
T8	2.12	2.66	2.53	2.45	2.35	2.08	1.92	1.43	1.38	1.32	**2.02**
T9	2.17	2.71	2.58	2.50	2.40	2.13	1.97	1.48	1.43	1.37	**2.07**
T10	3.80	4.58	4.37	3.98	3.53	3.11	2.83	2.72	2.70	2.71	**3.43**
T11	3.78	4.49	4.23	3.82	3.39	3.03	2.79	2.70	2.69	2.67	**3.36**
T12	3.86	4.55	4.27	3.88	3.44	3.08	2.85	2.75	2.73	2.71	**3.41**
T13	3.76	4.50	4.14	3.93	3.73	3.31	2.99	2.81	2.76	2.77	**3.47**
T14	3.75	4.49	4.13	3.92	3.72	3.30	2.98	2.80	2.75	2.76	**3.46**
T15	3.77	4.51	4.15	3.94	3.74	3.32	3.00	2.82	2.77	2.78	**3.48**
T16	3.81	4.67	4.21	4.02	3.57	3.46	3.25	3.14	2.79	2.81	**3.57**
T17	3.80	4.66	4.20	4.01	3.56	3.45	3.24	3.13	2.78	2.80	**3.56**
T18	3.82	4.68	4.22	4.03	3.58	3.47	3.26	3.15	2.80	2.82	**3.58**
T19	3.72	4.50	4.29	3.90	3.45	3.03	2.75	2.64	2.62	2.63	**3.35**
T20	3.73	4.44	4.18	3.77	3.34	2.98	2.74	2.65	2.64	2.62	**3.31**
T21	3.79	4.48	4.20	3.81	3.37	3.01	2.78	2.68	2.66	2.64	**3.34**
T22	3.71	4.45	4.09	3.88	3.68	3.26	2.94	2.76	2.71	2.72	**3.42**
T23	3.72	4.46	4.10	3.89	3.69	3.27	2.95	2.77	2.72	2.73	**3.43**
T24	3.73	4.47	4.11	3.90	3.70	3.28	2.96	2.78	2.73	2.74	**3.44**
T25	3.77	4.63	4.17	3.98	3.53	3.42	3.21	3.10	2.75	2.77	**3.53**
T26	3.79	4.65	4.19	4.00	3.55	3.44	3.23	3.12	2.77	2.79	**3.55**
T27	3.78	4.64	4.18	3.99	3.54	3.43	3.22	3.11	2.76	2.78	**3.54**
T28	3.13	3.72	3.46	3.43	3.37	3.30	3.05	2.72	2.24	1.80	**3.02**
Mean B	**3.28**	**4.00**	**3.70**	**3.49**	**3.21**	**2.96**	**2.73**	**2.51**	**2.34**	**2.28**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.016		0.01		0.052						
CD5%	0.046		0.027		0.144						

Effect of various treatments, pore volume and their combination on the EC of leachates:

Soil salinity, which poses one of the greatest threats to sustainable crop production worldwide, can be ameliorated through various approaches, such as leaching, and amendment application. The effects of leaching and amendment application viz. nano gypsum, biochar biomes and their combinations on saline soil reclamation have been studied separately. A column experiment was designed with Salt affected soils which were subjected to leaching with various pore volume (PV) ranging from 0.5 to 5 PV with increase of 0.5 PV of water to observe the effects of leaching on soil and leachate characteristics under different treatment combinations at 15,30 and 45 DAI.

A: Results revealed that 15 DAI, the mean lowest EC was observed in treatment T3 and the highest in case of T18 Table.7.and Fig.13. Amendment treatments combination showed variable response and affected mean EC of leachate differently. The maximum mean EC concentration in the leachate was found in the treatment T18 (3.58 dSm^{-1}). This treatment was found most effective in the reclamation of saline soils, as it is found statistically superior to the rest of the treatments except T16, T17, T26 and T27, the lowest mean EC was found in the treatment T3 (1.60 dSm^{-1}) this treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment(T28), EC of leachate was 3.02 dSm^{-1}. The conventional method was found statistically inferior to the treatments T20 (3.31 dSm^{-1}), T21 (3.34 dSm^{-1}) , T19 (3.35 dSm^{-1}) T11 (3.36 dSm^{-1}),T12 (3.41 dSm^{-1}), , T22 (3.42 dSm^{-1}), T23 (3.43 dSm^{-1}), T10 (3.43 dSm^{-1}), T24 (3.44 dSm^{-1}) , T13 (3.47dSm^{-1}) T15 (3.48 dSm^{-1}), T25 (3.53 dSm^{-1}), , T26 (3.55 dSm^{-1}), T27(3.54 dSm^{-1}), T17(3.56 dSm^{-1}), T16 (3.57 dSm^{-1})T18 (3.58 dSm^{-1}), and statistically superior to rest of the treatments.

Further results revealed that the leaching of soils at different pore volume gave variable response in terms of salt concentration in the leachate. The maximum salt concentration was observed in PV 1 which was found statistically superior to the rest of the treatments. The break through curves for means leached EC for various

treatments during the leaching process are presented in Fig. No. initially the EC increased for all the treatments reaching at peak after approximately, 1PV.EC values than decreased gradually with further leaching. The Significantly higher EC at 1 PV compared to other treatments signifies that the application of amendments has been formed effective increasing the salt concentration in the leached. The most effective treatment for increasing thereby EC of leached as T18 at 1PV this was closely followed by T16, T17, T26 and T27 at 1 PV as the difference among there treatment combination were not significant. The least effective treatment combination were T2 PV5 and T3 PV5.these treatments were significantly inferior to rest of the treatments except T1PV5.

Overall result suggest that the application of 45% of GR through nano gypsum along with biomes and biochar(@20tha^{-1}) followed by leaching with 1 pore volume was found most effective reclaiming saline soils in terms of EC.

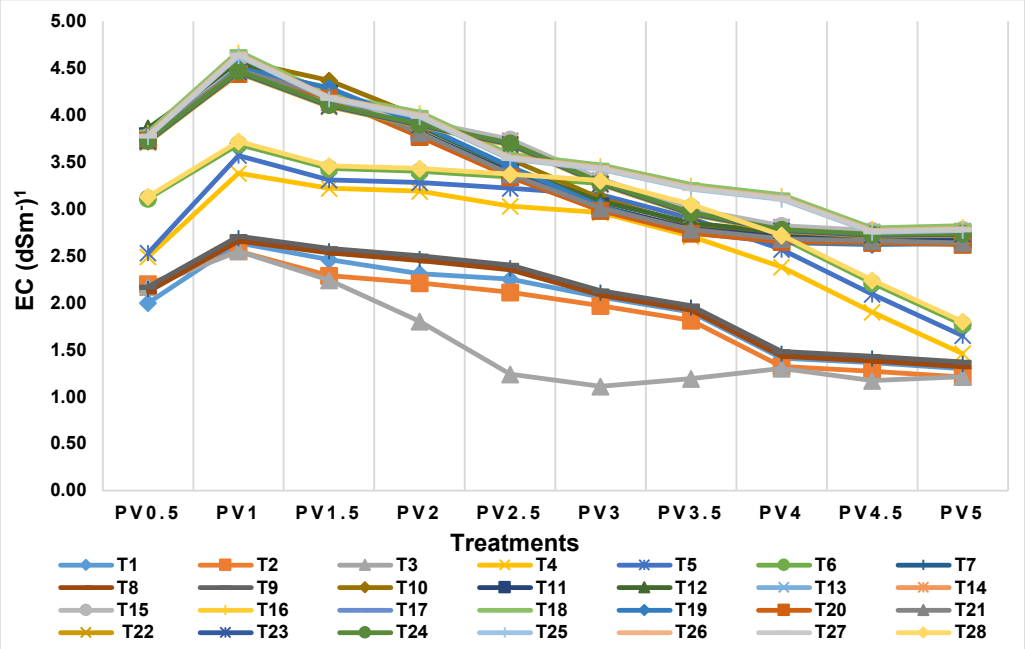


Fig.13: Interactive effect of various treatments on EC of leachate at 15 DAI

Table. 8 Effect of various treatments, pore volume and their combination on the EC of leachates at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	2.63	3.43	2.43	1.96	1.89	1.88	1.87	1.63	1.43	1.34	**2.05**
T2	2.43	3.36	2.66	1.89	1.82	1.81	1.80	1.56	1.36	1.31	**2.00**
T3	2.36	3.56	2.41	1.82	1.73	1.62	1.46	1.38	1.32	1.30	**1.89**
T4	3.33	4.04	3.42	2.80	2.22	1.80	1.58	1.54	1.57	1.50	**2.38**
T5	3.44	4.23	3.61	2.99	2.41	1.99	1.77	1.73	1.76	1.69	**2.56**
T6	3.42	4.35	3.63	3.11	2.53	2.11	1.89	1.85	1.88	1.81	**2.66**
T7	2.94	3.45	2.45	1.98	1.91	1.90	1.89	1.65	1.45	1.40	**2.10**
T8	2.92	3.42	2.42	1.95	1.88	1.87	1.86	1.62	1.42	1.37	**2.07**
T9	2.94	3.47	2.47	2.00	1.93	1.92	1.91	1.67	1.47	1.42	**2.12**
T10	4.85	5.53	4.90	4.73	3.73	3.33	3.08	2.98	2.96	2.89	**3.90**
T11	4.86	5.54	4.91	4.74	3.74	3.34	3.09	2.99	2.97	2.90	**3.91**
T12	4.89	5.57	4.94	4.77	3.77	3.37	3.12	3.02	3.00	2.93	**3.94**
T13	4.93	5.70	4.96	4.74	4.06	3.84	3.47	3.17	3.00	3.02	**4.09**
T14	4.92	5.69	4.95	4.73	4.05	3.83	3.46	3.16	2.99	3.01	**4.08**
T15	4.94	5.71	4.97	4.75	4.07	3.85	3.48	3.18	3.01	3.03	**4.10**
T16	4.99	5.76	5.02	4.80	4.12	3.90	3.53	3.23	3.06	3.08	**4.15**
T17	4.98	5.75	5.01	4.79	4.11	3.89	3.52	3.22	3.05	3.07	**4.14**
T18	5.00	5.77	5.03	4.81	4.13	3.91	3.54	3.24	3.07	3.09	**4.16**
T19	4.84	5.52	4.89	4.62	3.72	3.32	3.07	2.97	2.95	2.88	**3.88**
T20	4.81	5.49	4.86	4.59	3.69	3.29	3.04	2.94	2.92	2.85	**3.85**
T21	4.84	5.52	4.89	4.62	3.72	3.32	3.07	2.97	2.95	2.88	**3.88**
T22	4.88	5.65	4.91	4.69	4.01	3.79	3.42	3.12	2.95	2.97	**4.04**
T23	4.89	5.66	4.92	4.70	4.02	3.80	3.43	3.13	2.96	2.98	**4.05**
T24	4.90	5.67	4.93	4.71	4.03	3.81	3.44	3.14	2.97	2.99	**4.06**
T25	4.95	5.72	4.98	4.76	4.08	3.86	3.49	3.19	3.02	3.04	**4.11**
T26	4.97	5.74	5.00	4.78	4.10	3.88	3.51	3.21	3.04	3.06	**4.13**
T27	4.96	5.73	4.99	4.77	4.09	3.87	3.50	3.20	3.03	3.05	**4.12**
T28	3.44	4.38	3.76	3.14	2.56	2.14	1.92	1.88	1.91	1.84	**2.69**
Mean B	**4.22**	**4.98**	**4.22**	**3.88**	**3.29**	**3.04**	**2.79**	**2.59**	**2.48**	**2.45**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.024		0.014		0.076						
CD5%	0.067		0.04		0.212						

B: Effect of various treatments, pore volume and their combination on the EC of leachates at 30 DAI:

With increase in days of incubation there was increase in mean EC values of leachate for every treatment results of 30 DAI represented in Table.8 and Fig.14. revealed that , the mean lowest EC was observed in treatment T3 and the highest in case of T18 Amendment treatment combinations showed variable response and affected mean EC of leachate differently. The maximum mean EC concentration in the leached was found in the treatment T18 (4.16 dS/m^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments except treatments T15, T16, T17, T25, T26 and T27 and the lowest mean EC was found in the treatment T3 (1.89 dSm^{-1}) this treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, mean EC of leachate was T28 (2.69 dSm^{-1}). The conventional method was found statistically inferior to the treatment T10 to T27 as follows T10 (3.90 dSm^{-1}), T11 (3.91 dSm^{-1}), T12 (3.491dSm^{-1}), T13 (4.08dSm^{-1}),T15 (4.10 dSm^{-1}), T16 (4.15 dSm^{-1}), T17(4.14 dSm^{-1}), T18 (4.16 dSm^{-1}), T19 (3.88 dSm^{-1}), T20 (3.85 dSm^{-1}), T21 (3.88 dSm^{-1}), T22 (4.04 dSm^{-1}), T23 (4.05 dSm^{-1}), T24 (4.06 dSm^{-1}) , T25 (4.11 dSm^{-1}), T27(4.12 dSm^{-1}), T26 (4.13 dSm^{-1}) and statistically superior treatments T1 to T9.

Amendment treatments T1 to T18 gave higher EC at 1 PV which emphasized that the amendments application has been formed effective in reclaiming soils as the EC concentration increased in the leachate.

Among treatment combination the most effective treatment was T18PV1 which was found statistically at par with the treatment combination T12PV1, T13PV1, T14PV1, T15PV1 T16PV1, T17PV1, T22PV1, T23PV1, T24PV1, T25PV1, T26PV1, T27PV1. Rest of the treatment combination were statistically inferior to T18PV1.

Thus at 30 DAI also the most effective treatment for reducing soil EC and increasing leached EC was at t18 at PV1.

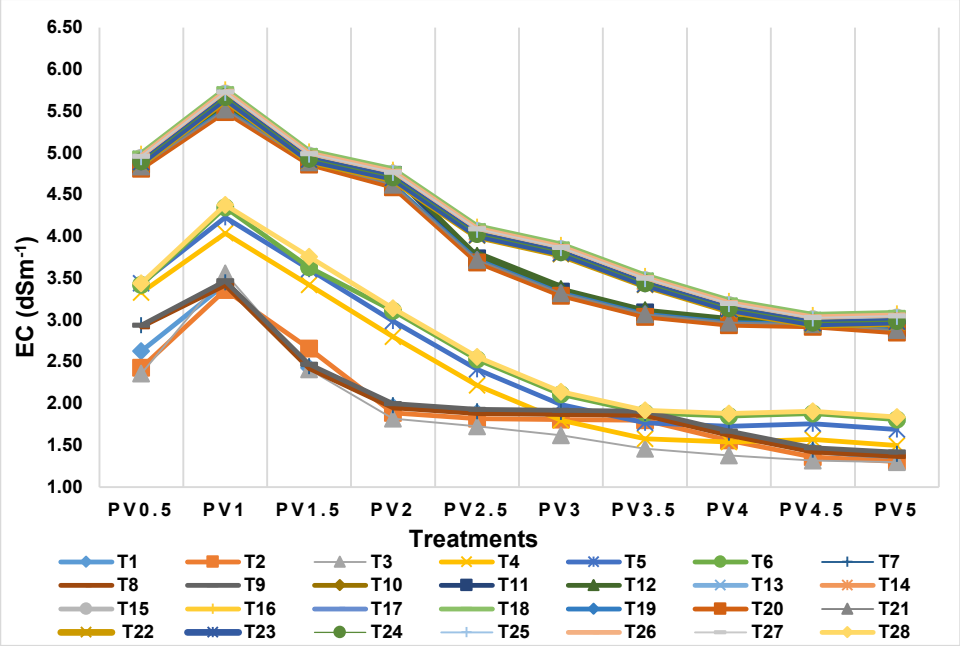


Fig.14: Interactive effect of various treatments on EC of leachate at 30 DAI

Table.9. Effect of various treatments, pore volume and their combination on the EC of leachates at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	3.49	4.31	3.77	2.74	1.98	1.84	1.74	1.64	1.66	1.45	2.46
T2	3.37	4.28	3.61	2.71	1.95	1.81	1.71	1.61	1.63	1.42	2.41
T3	3.16	4.02	3.42	3.33	3.01	2.23	1.67	1.39	1.35	1.38	2.50
T4	3.61	4.20	3.76	3.15	2.56	2.10	1.85	1.77	1.79	1.74	2.65
T5	3.67	4.33	3.86	3.28	2.69	2.23	1.98	1.90	1.92	1.87	2.77
T6	3.85	4.45	4.01	3.40	2.81	2.35	2.10	2.02	2.04	1.99	2.90
T7	3.69	4.36	3.82	2.79	2.03	1.89	1.79	1.69	1.71	1.50	2.53
T8	3.73	4.33	3.79	2.76	2.00	1.86	1.76	1.66	1.68	1.47	2.50
T9	3.76	4.38	3.84	2.81	2.05	1.91	1.81	1.71	1.73	1.52	2.55
T10	5.75	6.28	5.53	4.33	3.16	2.30	1.88	1.83	1.94	1.80	3.48
T11	5.76	6.29	5.54	4.34	3.17	2.31	1.89	1.84	1.95	1.81	3.49
T12	5.79	6.32	5.57	4.37	3.20	2.34	1.92	1.87	1.98	1.84	3.52
T13	5.89	6.42	5.67	4.47	3.30	2.44	2.02	1.97	2.08	1.94	3.62
T14	5.88	6.41	5.66	4.46	3.29	2.43	2.01	1.96	2.07	1.93	3.61
T15	5.90	6.43	5.68	4.48	3.31	2.45	2.03	1.98	2.09	1.95	3.63
T16	5.94	6.47	5.72	4.52	3.35	2.49	2.07	2.02	2.13	1.99	3.67
T17	5.93	6.46	5.71	4.51	3.34	2.48	2.06	2.01	2.12	1.98	3.66
T18	5.95	6.48	5.73	4.53	3.36	2.50	2.08	2.03	2.14	2.00	3.68
T19	5.74	6.27	5.52	4.32	3.15	2.29	1.87	1.82	1.93	1.79	3.47
T20	5.71	6.24	5.49	4.29	3.12	2.26	1.84	1.79	1.90	1.76	3.44
T21	5.74	6.27	5.52	4.32	3.15	2.29	1.87	1.82	1.93	1.79	3.47
T22	5.84	6.37	5.62	4.42	3.25	2.39	1.97	1.92	2.03	1.89	3.57
T23	5.85	6.38	5.63	4.43	3.26	2.40	1.98	1.93	2.04	1.90	3.58
T24	5.86	6.39	5.64	4.44	3.27	2.41	1.99	1.94	2.05	1.91	3.59
T25	5.90	6.43	5.68	4.48	3.31	2.45	2.03	1.98	2.09	1.95	3.63
T26	5.92	6.45	5.70	4.50	3.33	2.47	2.05	2.00	2.11	1.97	3.65
T27	5.91	6.44	5.69	4.49	3.32	2.46	2.04	1.99	2.10	1.96	3.64
T28	3.87	4.48	4.04	3.43	2.84	2.38	2.13	2.05	2.07	2.02	2.93
Mean B	5.05	5.64	4.97	3.93	2.95	2.28	1.93	1.86	1.94	1.85	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.025		0.015		0.078						
CD5%	0.068		0.041		0.216						

Effect of various treatments, pore volume and their combination on the EC of leachates at 45 DAI:

At 45 DAI the decrease in the mean EC value was observed for every treatment, the mean lowest EC was observed in treatment T2 and the highest in case of T18 (Table.9.and Fig.15). Amendment treatments showed variable response and affected mean EC of leachate differently. The maximum mean EC concentration in the leached was found in the treatment T18 (3.68 dS/m^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments and the lowest EC was found in the treatment T2 (4.41 dSm^{-1}) this treatment was found significantly inferior to the rest of the treatments except T1 which was found at par with T2. In case of conventional treatment, EC of leachate was T28 (2.93 dSm^{-1}). The conventional method was found statistically inferior to the treatments T20 (3.44 dSm^{-1}), T19 (3.47 dSm^{-1})T21 (3.47 dSm^{-1}) , T10 (3.48 dSm^{-1}), T11 (3.49 dSm^{-1}), , T12 (3.52 dSm^{-1}), , T22 (3.57 dSm^{-1}), T23 (3.58 dSm^{-1}), T24 (3.59 dSm^{-1}) , T14 (3.61 dSm^{-1}) T13 (3.62 dSm^{-1}) T15 (3.63 dSm^{-1}), T25 (3.63 dSm^{-1}), T26 (3.64 dSm^{-1}), T27(3.65 dSm^{-1}), T17(3.66 dSm^{-1}), T16 (3.67 dSm^{-1})T18 (3.68 dSm^{-1}), and statistically superior to rest of the treatments.

All treatments had significantly higher leachate EC's at about 1 PV compared to the control demonstrating that amendments increased the salt concentration of the leachate. The highest leachate EC was recorded in the treatment combination T18PV1 which has 6.48 dSm^{-1}. Data presented in Table No. and Fig. No. representing leachate EC for various treatments during the leaching process. For all the treatments, EC initially increased reaching a maximum value by approximately 1 PV. EC values then decreased gradually with further leaching; this trend may be attributed to the movement of soluble salts to the upper part of the soil column along with the wetting front while the columns were initially saturated from the bottom. Therefore, the first sample of leachate had a low salt concentration followed by increasing concentration due to the movement of the accumulated salts downward from the top of the soil profile. This was followed by

a continuous decrease in EC due to additional leaching of salts. Addition of nano gypsum to organic amendments significantly increased leachate EC of the combined applications at 1 PV. This can be ascribed to added Na^+ from leaching water and also its increased replacement from exchange sites into the soil solution by the combined applications.

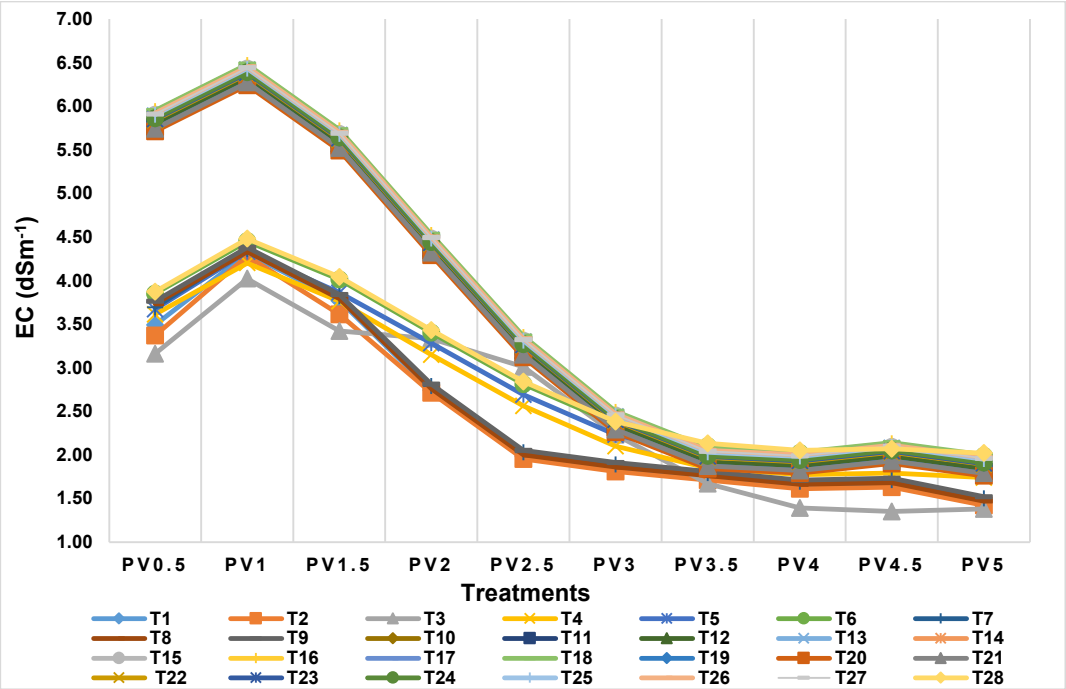


Fig. 15: Interactive effect of various treatments on EC of leachate at 45 DAI

Table. 10 Effect of various treatments and pore volume and their combination on the soil EC at 15 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	3.56	3.49	3.44	3.33	3.27	3.19	3.12	3.04	3.01	2.93	**3.24**
T2	3.59	3.52	3.47	3.36	3.30	3.22	3.15	3.07	3.04	2.96	**3.27**
T3	3.62	3.55	3.50	3.39	3.33	3.25	3.18	3.10	3.07	2.99	**3.30**
T4	3.42	3.35	3.28	3.23	3.06	2.98	2.89	2.86	2.80	2.73	**3.06**
T5	3.39	3.32	3.25	3.20	3.03	2.95	2.86	2.83	2.77	2.70	**3.03**
T6	3.34	3.28	3.21	3.15	2.98	2.90	2.81	2.78	2.72	2.65	**2.98**
T7	3.53	3.46	3.41	3.30	3.24	3.16	3.09	3.01	2.98	2.90	**3.21**
T8	3.54	3.47	3.42	3.31	3.25	3.17	3.10	3.02	2.99	2.91	**3.22**
T9	3.52	3.45	3.40	3.29	3.23	3.15	3.08	3.00	2.97	2.89	**3.20**
T10	2.87	2.78	2.71	2.66	2.55	2.36	2.19	2.09	2.01	2.12	**2.43**
T11	2.85	2.76	2.69	2.64	2.53	2.34	2.17	2.07	1.99	2.10	**2.41**
T12	2.88	2.79	2.72	2.67	2.56	2.37	2.20	2.10	2.02	2.13	**2.44**
T13	2.67	2.59	2.50	2.49	2.47	2.28	2.15	2.09	2.10	2.04	**2.34**
T14	2.65	2.57	2.48	2.47	2.45	2.26	2.13	2.07	2.08	2.02	**2.32**
T15	2.68	2.60	2.51	2.50	2.48	2.29	2.16	2.10	2.11	2.05	**2.35**
T16	2.64	2.56	2.47	2.40	2.24	2.06	1.99	2.01	1.96	1.89	**2.22**
T17	2.62	2.54	2.45	2.37	2.22	2.04	1.97	1.99	1.93	1.87	**2.20**
T18	2.60	2.52	2.44	2.36	2.20	2.02	1.95	1.98	1.92	1.86	**2.19**
T19	2.86	2.77	2.70	2.65	2.54	2.35	2.18	2.08	2.00	2.11	**2.42**
T20	2.84	2.75	2.68	2.63	2.52	2.33	2.16	2.06	1.98	2.09	**2.40**
T21	2.86	2.77	2.70	2.65	2.54	2.35	2.18	2.08	2.00	2.11	**2.42**
T22	2.66	2.58	2.49	2.48	2.46	2.27	2.14	2.08	2.09	2.03	**2.33**
T23	2.64	2.56	2.47	2.46	2.44	2.25	2.12	2.06	2.07	2.01	**2.31**
T24	2.66	2.58	2.49	2.48	2.46	2.27	2.14	2.08	2.09	2.03	**2.33**
T25	2.62	2.54	2.45	2.38	2.22	2.04	1.97	1.99	1.94	1.87	**2.20**
T26	2.63	2.55	2.47	2.39	2.23	2.05	1.98	2.01	1.95	1.89	**2.22**
T27	2.62	2.54	2.46	2.38	2.22	2.04	1.97	2.00	1.94	1.88	**2.21**
T28	3.32	3.26	3.19	3.13	2.96	2.88	2.79	2.76	2.70	2.63	**2.96**
Mean B	**2.99**	**2.91**	**2.84**	**2.78**	**2.68**	**2.53**	**2.42**	**2.37**	**2.33**	**2.30**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.011**		**0.007**		**0.035**						
CD5%	**0.031**		**0.018**		**0.097**						

Effect of various treatments and pore volume and their combination on the soil EC at 15 DAI:

The EC of soil as influenced by various treatments under study was measured at 15, 30 and 45 Days after Incubation (DAI) and

A: Post leaching soil analysis data of 15 DAI are presented in Table.10. and Fig.16. revealed that soil EC was significantly lower as compared to initial soil EC. Among various treatments the mean lowest soil EC (2.19 dSm^{-1}) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 EC (2.21 dSm^{-1}) was (Vermicompost + NG45% + Biomes) having. The measured EC of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from EC reduction point of view are T18 followed by T27, T25, T16, T17 in all these treatments the measured soil EC was found less than 3. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reducing the soil EC by 40.14% reducing from original EC of soil i. e. 3.65 dSm^{-1}.

The soil EC decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil EC continuously at 15, 30, and 45 DAI. At 15 DAI the lowest mean soil EC (2.30 dSm^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil EC in comparison to original soil for mean values of various treatments at different pore volumes was 18.11,20.25,22.25,23.92 26.63,30.71,33.64,35.01,36.16,36.99 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 15the data are presented in Table.10. and Fig.16., it is evident that the at 15 DAI, most effective treatment for the reclamation of soil EC was T18PV5 (1.86 dSm^{-1}) which was closely followed by the treatment T27 PV5 (1.88 dSm^{-1}), similarly at lower pore volumes reduced EC was recorded from 3.5 pore volume i.e., T18

PV3.5 (1.95 dSm^{-1}),T27 PV3.5 (1.99 dSm^{-1}), T18PV4 (1.98 dSm^{-1}), T27 PV4 (1.97 dSm^{-1}), T18 PV4.5 (1.92 dSm^{-1}) T27 PV4.5 (1.94 dSm^{-1}).

Thus, from the above results it is concluded that for reducing EC of soil the application of Biochar/ Vermicompost along with NG45% of GR along with leaching with 3 and above pore volume can be recommended for EC correction of Salt affected Soils.

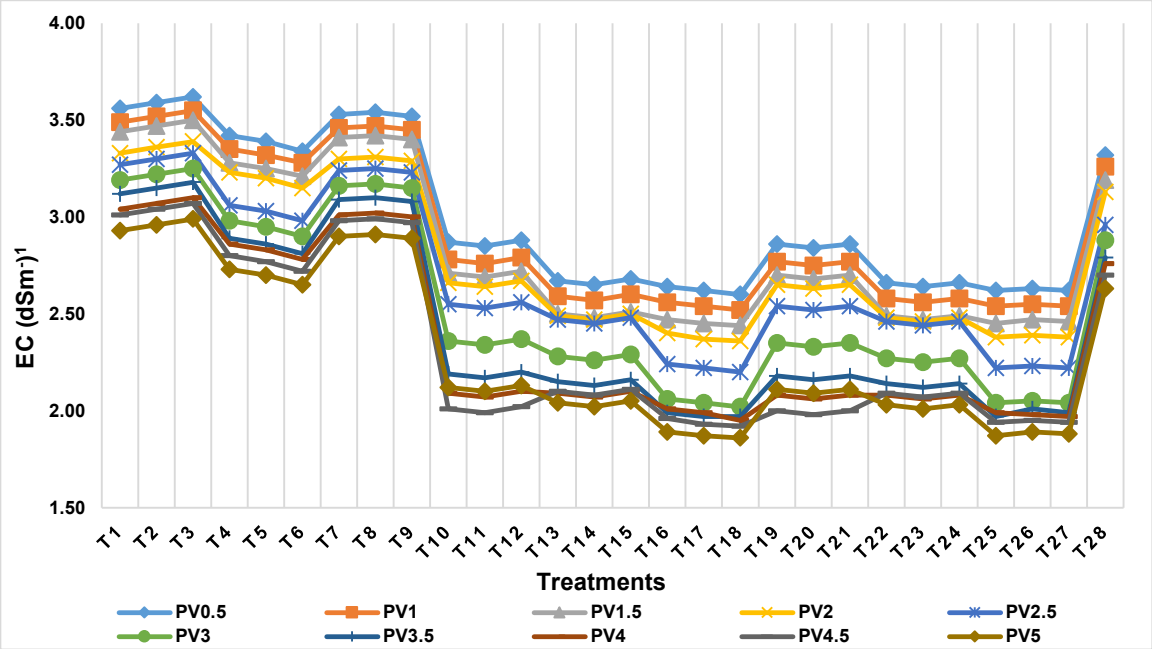


Fig.16: Interactive effect of various treatments on soil EC at 15 DAI

Table. 11. Effect of various treatments and pore volume and their combination on the soil EC at 30 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	3.48	3.32	3.26	3.17	3.02	2.95	2.86	2.84	2.70	2.68	**3.03**
T2	3.51	3.35	3.29	2.96	2.95	2.89	2.82	2.77	2.78	2.73	**3.00**
T3	3.54	3.34	3.17	3.20	3.05	2.98	2.89	2.87	2.73	2.71	**3.06**
T4	3.11	2.90	2.83	2.71	2.59	2.48	2.42	2.27	2.14	1.91	**2.54**
T5	3.08	2.87	2.80	2.68	2.56	2.45	2.39	2.24	2.11	1.88	**2.51**
T6	3.03	2.82	2.75	2.63	2.51	2.40	2.34	2.19	2.06	1.83	**2.46**
T7	3.45	3.25	3.08	2.87	2.86	2.80	2.73	2.68	2.69	2.64	**2.91**
T8	3.46	3.26	3.09	2.88	2.87	2.81	2.74	2.69	2.70	2.65	**2.92**
T9	3.44	3.24	3.07	2.86	2.85	2.79	2.72	2.67	2.68	2.63	**2.90**
T10	2.64	2.56	2.45	2.32	2.27	2.25	2.18	2.03	1.95	1.79	**2.25**
T11	2.62	2.54	2.43	2.30	2.25	2.23	2.16	2.01	1.93	1.77	**2.23**
T12	2.65	2.57	2.46	2.33	2.28	2.26	2.19	2.04	1.96	1.80	**2.26**
T13	2.17	2.10	2.02	1.97	1.95	1.85	1.70	1.63	1.62	1.62	**1.87**
T14	2.15	2.08	2.00	1.95	1.93	1.83	1.68	1.61	1.60	1.60	**1.85**
T15	2.18	2.11	2.03	1.98	1.96	1.86	1.71	1.64	1.63	1.63	**1.88**
T16	2.03	1.95	1.81	1.75	1.62	1.53	1.45	1.34	1.31	1.32	**1.61**
T17	2.00	1.92	1.78	1.72	1.59	1.50	1.42	1.31	1.28	1.29	**1.58**
T18	1.99	1.91	1.77	1.71	1.58	1.49	1.41	1.30	1.27	1.28	**1.57**
T19	2.62	2.55	2.44	2.31	2.25	2.23	2.16	2.02	1.94	1.78	**2.23**
T20	2.61	2.53	2.42	2.29	2.24	2.22	2.15	2.00	1.92	1.76	**2.22**
T21	2.63	2.55	2.44	2.31	2.26	2.24	2.17	2.02	1.94	1.78	**2.24**
T22	2.16	2.09	2.01	1.96	1.94	1.84	1.69	1.62	1.61	1.61	**1.86**
T23	2.14	2.07	1.99	1.94	1.92	1.82	1.67	1.60	1.59	1.59	**1.84**
T24	2.16	2.09	2.01	1.96	1.94	1.84	1.69	1.62	1.61	1.61	**1.86**
T25	2.01	1.93	1.79	1.73	1.60	1.51	1.43	1.32	1.29	1.30	**1.59**
T26	2.02	1.94	1.80	1.74	1.61	1.52	1.44	1.33	1.30	1.31	**1.60**
T27	2.01	1.93	1.79	1.73	1.60	1.51	1.43	1.32	1.29	1.30	**1.59**
T28	3.01	2.80	2.73	2.61	2.49	2.38	2.32	2.17	2.04	1.81	**2.44**
Mean B	**2.64**	**2.52**	**2.41**	**2.31**	**2.24**	**2.16**	**2.07**	**1.97**	**1.92**	**1.85**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.007**		**0.004**		**0.023**						
CD5%	**0.021**		**0.012**		**0.065**						

B: Effect of various treatments and pore volume and their combination on the soil EC at 30 DAI:

Post leaching soil analysis at 30 DAI represented in Table.11. and Fig.17.,revealed that soil EC was significantly lower as compared to initial soil EC. Among various treatments the mean lowest soil EC (1.57 dSm^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found at par with the treatment T27 EC (1.59 dSm^{-1}) was (Vermicompost + NG45% +Biomes) having. The measured EC of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from EC reduction point of view are T18 ,the measured soil EC was found less than 2. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reducing the soil EC by 56.9% reducing from original EC of soil i. e. 3.65 dSm^{-1}.

The soil EC decreased continuously as soil leaching was perform in 10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil EC continuously at 15, 30, and 45 DAI. At 30 DAI the lowest mean soil EC (1.85 dSm^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil EC in comparison to original soil for mean values of various treatments at different pore volumes was 27.59 30.85 33.86 36.74 38.71 40.74 43.21 45.95 47.40 49.40 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 30 DAI the data are presented in Table.11.and Fig.17.,it is evident that at 30 DAI, the most effective treatment for the reclamation of soil EC was T18PV5 (1.28 dSm^{-1}) which was closely followed by the treatment T27 PV5 (1.30 dSm^{-1}), similarly at lower pore volumes the rerecorded from 3.5 pore volume i.e., T18PV4 (1.30 dSm^{-1}), T27 PV4 (1.32 dSm^{-1}), T18 PV4.5 (1.27 dSm^{-1}) T27 PV4.5 (1.29 dSm^{-1}).

Thus, from the above results it is concluded that for reducing EC of soil the application of Biochar/ Vermicompost along with NG45% of GR along with leaching

with 3.5 and above pore volume can be recommended for EC correction of Salt affected Soils.

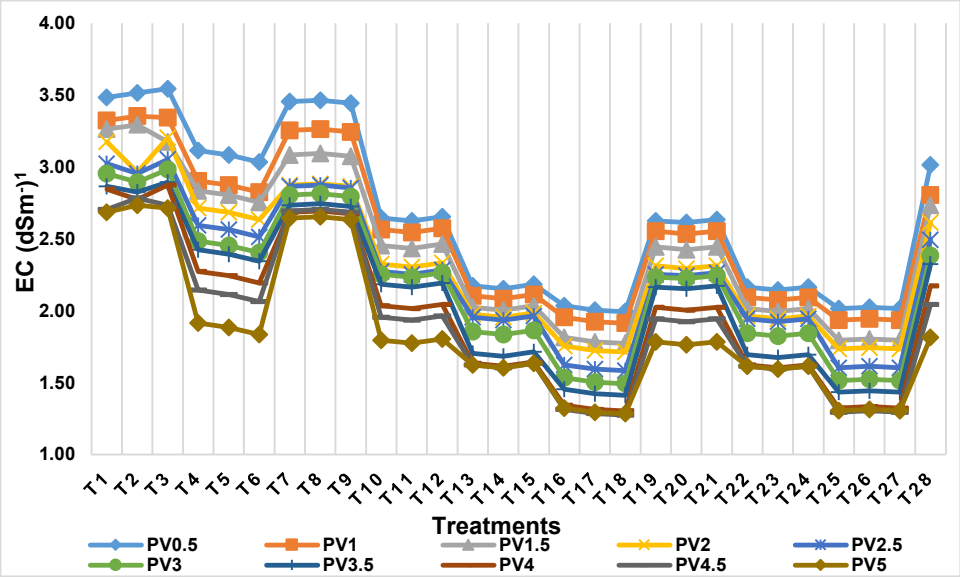


Fig. 17: Interactive effect of various treatments on soil EC at 30 DAI

Table. 12. Effect of various treatments and pore volume and their combination on the soil EC at 45 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	3.41	3.25	3.19	3.10	2.95	2.88	2.79	2.77	2.63	2.61	**2.96**
T2	3.44	3.28	3.22	2.89	2.88	2.82	2.75	2.70	2.71	2.64	**2.93**
T3	3.47	3.27	3.10	3.13	2.98	2.91	2.82	2.80	2.66	2.66	**2.99**
T4	3.04	2.83	2.76	2.64	2.52	2.41	2.35	2.20	2.07	1.84	**2.47**
T5	3.01	2.80	2.73	2.61	2.49	2.38	2.32	2.17	2.04	1.81	**2.44**
T6	2.96	2.75	2.68	2.56	2.44	2.33	2.27	2.12	1.99	1.76	**2.39**
T7	3.38	3.18	3.01	2.80	2.79	2.73	2.66	2.61	2.62	2.57	**2.84**
T8	3.39	3.19	3.02	2.81	2.80	2.74	2.67	2.62	2.63	2.58	**2.85**
T9	3.37	3.17	3.00	2.79	2.78	2.72	2.65	2.60	2.61	2.56	**2.83**
T10	2.57	2.49	2.38	2.25	2.20	2.18	2.11	1.96	1.88	1.72	**2.18**
T11	2.55	2.47	2.36	2.23	2.18	2.16	2.09	1.94	1.86	1.70	**2.16**
T12	2.58	2.50	2.39	2.26	2.21	2.19	2.12	1.97	1.89	1.73	**2.19**
T13	2.10	2.03	1.95	1.90	1.88	1.78	1.63	1.56	1.55	1.55	**1.80**
T14	2.08	2.01	1.93	1.88	1.86	1.76	1.61	1.54	1.53	1.53	**1.78**
T15	2.11	2.04	1.96	1.91	1.89	1.79	1.64	1.57	1.56	1.56	**1.81**
T16	1.96	1.88	1.74	1.68	1.55	1.46	1.38	1.27	1.24	1.25	**1.54**
T17	1.93	1.85	1.71	1.65	1.52	1.43	1.35	1.24	1.21	1.22	**1.51**
T18	1.92	1.84	1.70	1.64	1.51	1.42	1.34	1.23	1.20	1.21	**1.50**
T19	2.55	2.48	2.37	2.24	2.18	2.16	2.09	1.95	1.87	1.71	**2.16**
T20	2.54	2.46	2.35	2.22	2.17	2.15	2.08	1.93	1.85	1.69	**2.15**
T21	2.56	2.48	2.37	2.24	2.19	2.17	2.10	1.95	1.87	1.71	**2.17**
T22	2.09	2.02	1.94	1.89	1.87	1.77	1.62	1.55	1.54	1.54	**1.79**
T23	2.07	2.00	1.92	1.87	1.85	1.75	1.60	1.53	1.52	1.52	**1.77**
T24	2.09	2.02	1.94	1.89	1.87	1.77	1.62	1.55	1.54	1.54	**1.79**
T25	1.94	1.86	1.72	1.66	1.53	1.44	1.36	1.25	1.22	1.23	**1.52**
T26	1.95	1.87	1.73	1.67	1.54	1.45	1.37	1.26	1.23	1.24	**1.53**
T27	1.94	1.86	1.72	1.66	1.53	1.44	1.36	1.25	1.22	1.23	**1.52**
T28	2.94	2.73	2.66	2.54	2.42	2.31	2.25	2.10	1.97	1.74	**2.37**
Mean B	**2.57**	**2.45**	**2.34**	**2.24**	**2.17**	**2.09**	**2.00**	**1.90**	**1.85**	**1.78**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.011**		**0.007**		**0.035**						
CD5%	**0.031**		**0.018**		**0.097**						

C: Effect of various treatments and pore volume and their combination on the soil EC after 45 days of Incubation:

Post leaching soil analysis data of 45 DAI are presented in Table.12. and Fig. 18., revealed that soil EC was significantly lower as compared to initial soil EC. Among various treatments the mean lowest soil EC (1.50 dSm^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found at par with the treatment T27 EC (1.52 dSm^{-1}) was (Vermicompost + NG45% +Biomes) having. The measured EC of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from EC reduction point of view are T18 ,the measured soil EC was found around 1.5 dSm^{-1}. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reducing the soil EC by 58.79 % reducing from original EC of soil i. e. 3.65 dSm^{-1}. The soil EC decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil EC continuously at 15, 30, and 45 DAI. At 45 DAI the lowest mean soil EC (1.78 dSm^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil EC in comparison to original soil for mean values of various treatments at different pore volumes was 29.51 32.77 35.78 38.66 40.63 42.66 45.12 47.86 49.32 51.32 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume the at 45 DAI data are presented in Table.12.Fig.18. From which it is evident that the most effective treatment for the reclamation of soil EC was T18PV5 (1.21 dSm^{-1}) which was closely followed by the treatment T27 PV5 (1.23 dSm^{-1}), similarly at lower pore volumes the reduced EC was recorded from 4 pore volume i.e., T18PV4 (1.23 dSm^{-1}), T27 PV4 (1.25 dSm^{-1}), T18 PV4.5 (1.20 dSm^{-1}) T27 PV4.5 (1.22 dSm^{-1}).

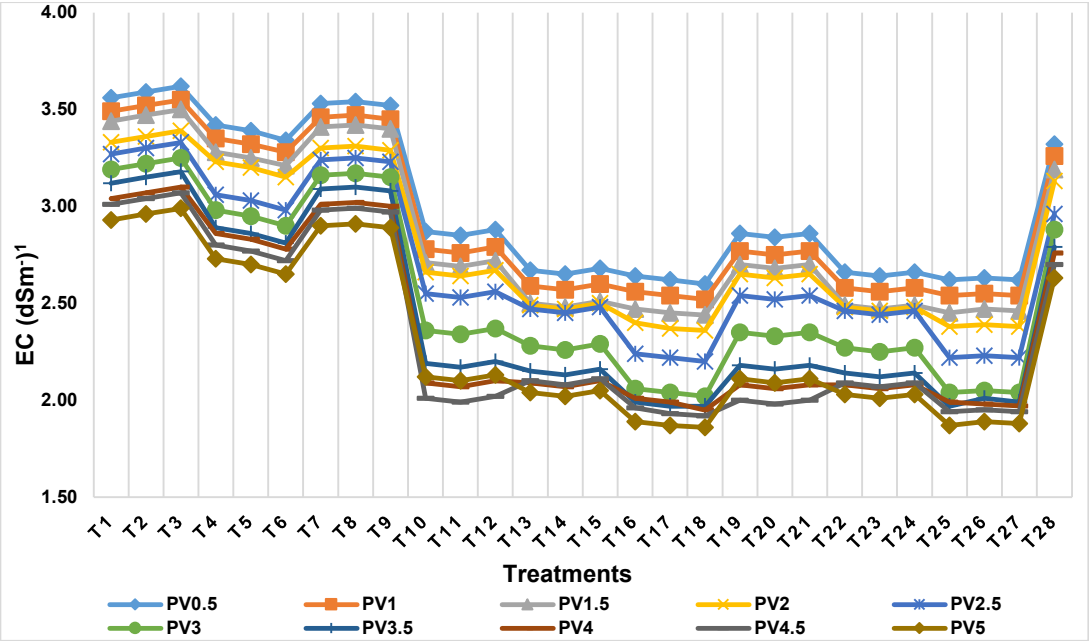


Fig.18: Interactive effect of various treatments on soil EC at 45 DAI

Table.16. Effect of various treatments, pore volume and their combination on the concentration of Ca^{+} in leachates at 15 DAI:											
Pore Volume / Treatment	**PV0.5**	**PV1**	**PV1.5**	**PV2**	**PV2.5**	**PV3**	**PV3.5**	**PV4**	**PV4.5**	**PV5**	**Mean**
T1	4.50	4.30	4.52	4.73	4.95	5.20	5.46	5.70	5.84	5.78	**5.10**
T2	4.51	4.31	4.53	4.74	4.96	5.21	5.47	5.71	5.85	5.79	**5.11**
T3	4.41	4.22	4.39	4.58	4.87	5.15	5.38	5.61	5.78	5.73	**5.01**
T4	2.08	3.85	3.33	4.89	5.34	5.69	6.09	6.35	6.71	6.69	**5.10**
T5	3.15	3.94	3.42	4.96	5.41	5.77	6.15	6.43	6.82	6.80	**5.29**
T6	3.20	4.00	4.59	5.05	5.45	5.82	6.18	6.48	6.71	6.76	**5.42**
T7	4.48	4.28	4.50	4.71	4.93	5.18	5.44	5.68	5.82	5.76	**5.08**
T8	4.49	4.29	4.51	4.72	4.94	5.19	5.45	5.69	5.83	5.77	**5.09**
T9	4.41	4.20	4.38	4.56	4.85	5.13	5.36	5.60	5.77	5.71	**5.00**
T10	3.69	4.60	5.06	5.37	5.52	5.64	5.93	6.26	6.47	6.49	**5.50**
T11	3.70	4.58	5.07	5.36	5.57	5.79	6.03	6.29	6.48	6.48	**5.54**
T12	3.40	3.92	4.36	4.80	5.27	5.78	6.31	6.80	7.17	7.30	**5.51**
T13	4.54	5.45	5.79	5.86	5.84	5.86	5.96	6.09	6.37	6.25	**5.80**
T14	4.56	5.47	5.81	5.88	5.86	5.88	5.98	6.11	6.39	6.27	**5.82**
T15	4.58	5.49	5.83	5.90	5.88	5.90	6.00	6.13	6.41	6.29	**5.84**
T16	4.49	5.69	6.35	6.68	6.86	6.99	7.13	7.29	7.41	7.39	**6.63**
T17	4.47	5.67	6.33	6.66	6.84	6.97	7.11	7.27	7.39	7.37	**6.61**
T18	4.39	5.58	5.92	6.45	6.65	6.77	6.92	7.08	7.24	7.25	**6.43**
T19	4.57	5.48	5.82	5.89	5.87	5.89	5.99	6.12	6.40	6.28	**5.83**
T20	4.59	5.50	5.84	5.91	5.89	5.91	6.01	6.14	6.42	6.30	**5.85**
T21	4.58	5.49	5.83	5.90	5.88	5.90	6.00	6.13	6.41	6.29	**5.84**
T22	3.36	3.88	4.26	4.64	5.02	5.62	6.14	6.62	6.95	7.11	**5.36**
T23	3.38	3.91	4.34	4.79	5.12	5.73	6.27	6.76	7.11	7.23	**5.46**
T24	3.32	3.84	4.22	4.48	4.96	5.44	6.04	6.56	6.91	7.08	**5.29**
T25	4.50	5.70	6.36	6.69	6.87	7.00	7.14	7.30	7.42	7.40	**6.64**
T26	4.48	5.68	6.34	6.67	6.85	6.98	7.12	7.28	7.40	7.38	**6.62**
T27	4.41	5.60	5.94	6.47	6.67	6.79	6.94	7.10	7.26	7.27	**6.45**
T28	2.09	3.87	3.37	4.92	5.37	5.72	6.12	6.37	6.73	6.72	**5.13**
Mean B	**4.01**	**4.74**	**5.04**	**5.44**	**5.66**	**5.89**	**6.15**	**6.39**	**6.62**	**6.61**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.019		0.011		0.06						
CD5%	0.053		0.032		0.167						

Effect of various treatments, pore volume and their combinations on the concentration of Ca^{+} in leachates at 15,30,45 DAI:

The effects of leaching and amendments viz. nano gypsum, biochar biomes and their combinations on saline soil reclamation have been studied separately. Therefore, a column experiment was designed with soils that were subjected to leaching with 0.5 and 5 pore volume (PV) of water to observe the effects of leaching leachate characteristics under different treatment combinations with 15, 30 and 45 DAI.

Results revealed that the concentrations of calcium (Ca^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Ca^{+} concentration in the leached was found at par with 4.5 pore volume as the pore volume increases beyond 4.5 up to 5 pore volume.

The comparison of different amendment treatments revealed that in general, the mean lowest concentration of Ca+ was observed in treatment T9 and the highest in case of T25 (Table.16. and Fig.22.). Amendment treatments showed variable response and affected mean Ca^{+} concentration significantly. The maximum mean Ca^{+} concentration in the leached was found in the treatment T 25 (6.64 Cmolc (+) kg^{-1}). This treatment was found statistically superior to the rest of the treatments except treatment T17 (6.63 Cmolc (+)kg^{-1}) and T18 (6.61 Cmolc (+)kg^{-1}) these treatments were statistically at par with each other,and the lowest removal of Ca+ from the soil was found in the treatment T9 (5.00 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Ca^{+} concentration in the leached was 5.13 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T10 (5.50Cmolc (+) kg^{-1}), T11 (5.54 Cmolc (+) kg^{-1}),T12 (5.51Cmolc (+) kg^{-1}), T13 (5.80Cmolc (+) kg^{-1}), T14 (5.82 Cmolc (+) kg^{-1}), , T15 (5.84 Cmolc (+) kg^{-1}), T16 (6.63 Cmolc (+) kg^{-1}), T17 (6.61 Cmolc (+) kg^{-1})T18 (6.43 Cmolc (+) kg^{-1})T19 (5.83 Cmolc (+) kg^{-1}), T 20 (5.85 Cmolc (+) kg^{-1}), T21 (5.84 Cmolc (+) kg^{-1}), T22 (5.36 Cmolc (+) kg^{-1}) , T23 (5.46 Cmolc (+) kg^{-1}), T24 (5.29 Cmolc (+) kg^{-1}),T25

(6.64Cmolc (+) kg^{-1}), T26 (6.62 Cmolc (+) kg^{-1}), T27 (6.45 Cmolc (+) kg^{-1}), , and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Ca^{+} leaching is presented in Table.16.and Fig.22. It is evident from the data that the Ca^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Ca^{+} was T25 which content 7.42 Cmolc (+) kg^{-1} Ca^{+} in the leached when the soil column is subjected to leaching with 4.5 pore volume. This treatment combination was found statistically superior to rest of the treatments. As we increase the pore volume the concentration of Ca^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Ca^{+} was found in treatment combination T9 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

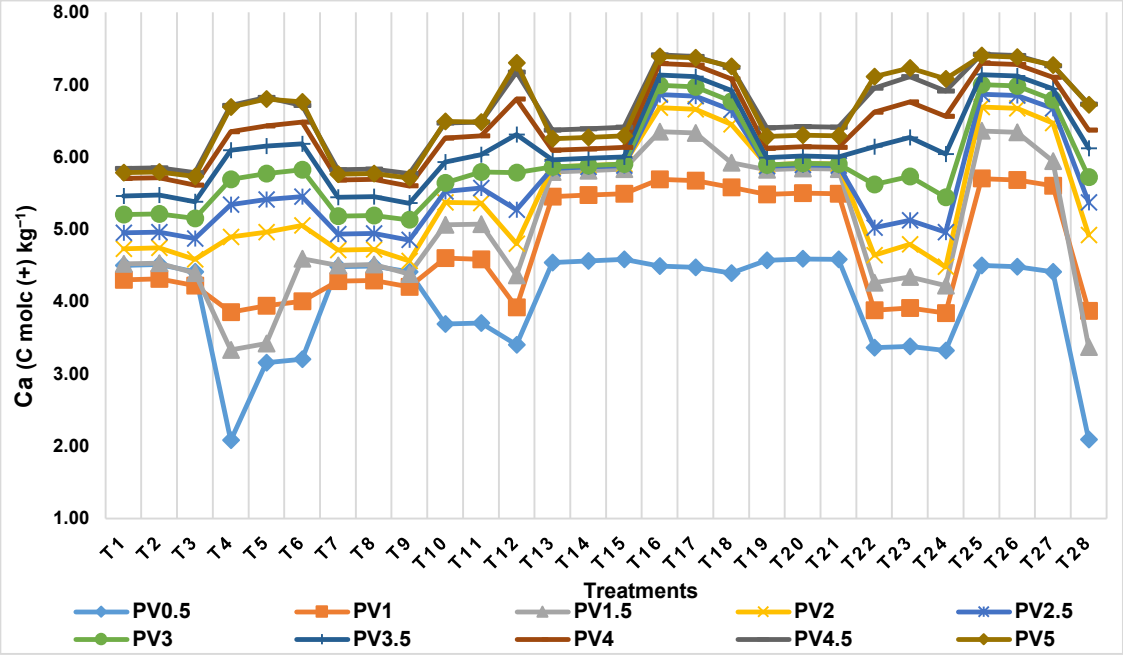


Fig.22: Interactive effect of various treatments on mean leached Calcium at 15 DAI

Table. 17. Effect of various treatments, pore volume and their combination on the concentration of Ca^{+} in leachates at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	5.94	6.50	7.08	7.63	8.06	8.54	8.79	8.90	8.90	8.96	**7.93**
T2	5.96	6.53	7.16	7.78	7.96	8.65	8.66	8.76	9.06	8.84	**7.93**
T3	5.97	6.54	7.18	7.79	8.31	8.70	8.96	9.08	9.12	9.15	**8.08**
T4	5.67	6.45	6.77	6.95	5.56	7.15	7.25	5.94	7.61	7.46	**6.68**
T5	5.64	6.42	6.78	6.97	5.58	7.13	7.24	7.36	7.60	7.48	**6.82**
T6	5.62	6.40	6.77	6.93	7.02	7.12	7.24	7.35	7.59	7.46	**6.95**
T7	6.76	7.45	7.92	8.30	8.50	8.56	8.71	8.84	8.91	8.98	**8.29**
T8	6.77	7.43	7.93	8.29	8.55	8.71	8.81	8.87	8.92	8.97	**8.32**
T9	5.90	6.46	7.04	7.47	7.70	8.36	8.43	8.56	8.86	8.69	**7.74**
T10	5.77	6.17	6.43	6.66	6.93	7.26	7.63	7.96	8.16	8.05	**7.10**
T11	5.72	6.11	5.26	6.57	6.89	7.21	7.57	7.91	8.27	8.01	**6.95**
T12	5.65	6.02	5.17	6.50	6.82	7.97	7.97	7.83	8.16	7.90	**7.00**
T13	5.75	6.15	6.50	6.81	7.09	7.35	7.57	7.75	7.85	7.84	**7.06**
T14	5.76	6.16	6.51	6.82	7.10	7.36	7.58	7.76	7.86	7.55	**7.24**
T15	5.68	6.07	6.38	6.66	7.01	7.30	7.49	7.67	7.80	7.49	**7.15**
T16	8.06	8.56	8.83	8.98	9.07	9.16	9.26	9.36	9.42	9.40	**9.01**
T17	8.04	8.54	8.81	8.96	9.05	9.14	9.24	9.34	9.40	9.38	**8.99**
T18	7.96	8.45	8.40	8.75	8.86	8.94	9.05	9.15	9.25	9.26	**8.80**
T19	5.65	6.43	6.80	6.95	7.04	7.15	7.26	7.37	7.61	7.49	**6.97**
T20	5.66	6.44	6.79	6.96	5.57	7.17	7.28	7.35	7.62	7.47	**6.93**
T21	5.64	6.42	6.79	6.94	7.03	7.14	7.25	7.36	7.60	7.48	**6.96**
T22	5.77	6.17	6.52	6.83	7.11	7.37	7.59	7.77	7.87	7.86	**7.08**
T23	5.78	6.18	6.53	6.84	7.12	7.38	7.60	7.78	7.88	7.87	**7.09**
T24	5.70	6.09	6.39	6.68	7.03	7.32	7.51	7.68	7.81	9.51	**7.17**
T25	8.07	8.57	8.84	8.99	9.08	9.17	9.27	9.37	9.43	9.41	**9.02**
T26	8.05	8.55	8.82	8.97	9.06	9.15	9.25	9.35	9.41	9.39	**9.00**
T27	7.98	8.47	8.42	8.77	8.88	8.96	9.07	9.17	9.27	9.28	**8.82**
T28	5.66	6.04	5.21	6.53	6.85	7.16	7.54	7.85	8.18	7.93	**7.01**
Mean B	**6.30**	**6.85**	**7.07**	**7.47**	**7.53**	**7.95**	**8.11**	**8.19**	**8.50**	**8.52**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.02		0.012		0.062						
CD5%	0.054		0.032		0.172						

B: Effect of various treatments, pore volume and their combination on the concentration of Ca^{+} in leachates after 30 DAI:

At 30 DAI results revealed that the concentrations of calcium (Ca^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Ca^{+} concentration in the leached was found at par with 4.5 pore volume as the pore volume increases beyond 4.5 up to 5 pore volume.

In general, the mean lowest concentration of Ca+ was observed in treatment T4 and the highest in case of T25(Table.17.Fig.23.). Amendment treatments showed variable response and affected mean Ca^{+} concentration differently. The maximum mean Ca^{+} concentration in the leached was found in the treatment T 25 (9.02 Cmolc (+) kg^{-1}). This treatment was found statistically superior to the rest of the treatments except T16(9.01 Cmolc (+) kg^{-1}),T18(8.99 Cmolc (+) kg^{-1}) and T26(9.0 Cmolc (+) kg^{-1}), and the lowest removal of Ca+ from the soil was found in the treatment T4 (6.68 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Ca^{+} concentration in the leached was 7.01 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T1 (7.93 Cmolc (+) kg^{-1}), T2 (7.93 Cmolc (+) kg^{-1}), T3 (8.08 Cmolc (+) kg^{-1}), T7 (8.29 Cmolc (+) kg^{-1}), T8 (8.32 Cmolc (+) kg^{-1}), T 9 (7.74 Cmolc (+) kg^{-1}), (T13 7.06 Cmolc (+) kg^{-1}), T14 (7.24 Cmolc (+), T15 (7.15 Cmolc (+) kg^{-1}), kg^{-1}), , T18 (8.80Cmolc (+) kg^{-1}), T17 (8.99 Cmolc (+) kg^{-1}), T16 (9.01 Cmolc (+) kg^{-1}), T22 (7.08 Cmolc (+) kg^{-1}) , T 23 (7.09 Cmolc (+) kg^{-1}),T26 (9.00 Cmolc (+) kg^{-1}), T 25 (9.02 Cmolc (+) kg^{-1}), T27 (8.82 Cmolc (+) kg^{-1}) and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Ca^{+} leaching is presented in Table.17.and Fig.23. It is evident from the data that the Ca^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Ca^{+} was T25 which content 9.43 Cmolc (+) kg^{-1} Ca^{+} in the leached when the soil column is subjected to leaching with 4.5 pore

volume. This treatment was found statistically superior to rest of the treatments. As we increase the pore volume the concentration of Ca^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Ca^{+} was found in treatment combination T4 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

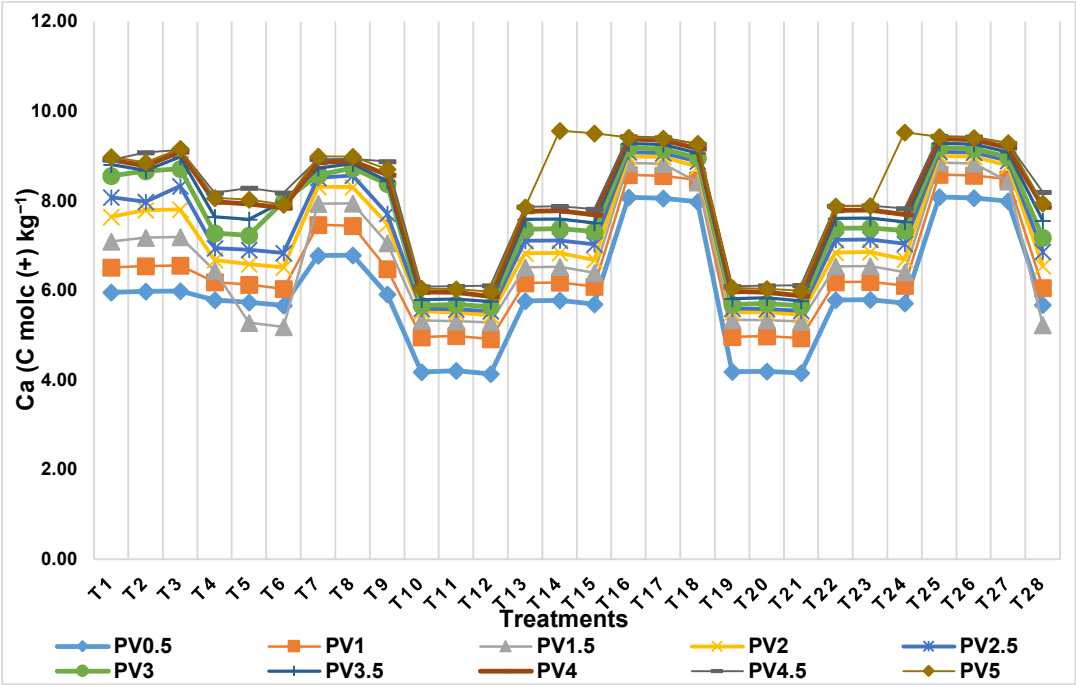


Fig.23: Interactive effect of various treatmnts on lechate Calcium at DAI

Table. 18. Effect of various treatments, pore volume and their combination on the concentration of Ca^{+} in leachates at 45 DAI

Pore Volume / Treatment	PV0	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	9.26	9.55	9.59	9.63	9.54	9.63	9.72	9.81	9.87	9.90	**9.65**
T2	9.28	9.58	9.67	9.78	9.64	9.74	9.85	9.95	10.03	10.02	**9.75**
T3	9.33	9.58	9.69	9.74	9.77	9.82	9.89	9.97	10.04	10.04	**9.78**
T4	7.27	8.14	7.53	8.53	8.98	9.06	9.30	9.46	9.79	9.54	**8.76**
T5	7.34	8.23	7.62	8.80	9.05	9.14	9.36	9.54	9.90	9.65	**8.86**
T6	7.38	8.30	8.74	8.94	9.05	9.18	9.37	9.58	9.74	9.69	**8.99**
T7	7.87	8.17	8.47	8.77	9.07	9.27	9.37	9.47	9.47	9.57	**8.95**
T8	7.88	8.18	8.48	8.78	9.08	9.28	9.38	9.48	9.48	9.58	**8.96**
T9	7.80	8.09	8.35	8.62	8.99	9.22	9.29	9.39	9.42	9.52	**8.87**
T10	8.43	8.73	8.92	9.12	9.22	9.43	9.52	9.57	9.79	9.70	**9.24**
T11	8.45	8.75	8.94	9.14	9.24	9.45	9.54	9.59	9.81	9.72	**9.26**
T12	8.44	8.74	8.93	9.13	9.23	9.44	9.53	9.58	9.80	9.71	**9.25**
T13	8.78	9.21	9.38	9.50	9.54	9.44	9.59	9.76	9.88	9.90	**9.50**
T14	8.78	9.16	9.37	9.49	9.57	9.63	9.71	9.79	9.85	9.86	**9.52**
T15	9.22	9.51	9.55	9.47	9.38	9.45	9.62	9.75	9.83	9.87	**9.56**
T16	8.78	8.98	9.38	9.78	10.18	10.48	10.58	10.68	10.68	10.68	**10.02**
T17	8.76	8.96	9.36	9.76	10.16	10.87	10.56	10.66	10.66	10.66	**10.04**
T18	8.68	8.87	8.95	9.55	9.97	10.67	10.37	10.47	10.51	10.54	**9.86**
T19	8.45	8.75	8.94	9.14	9.24	9.45	9.54	9.59	9.81	9.72	**9.26**
T20	8.47	8.77	8.96	9.16	9.26	9.47	9.56	9.61	9.83	9.74	**9.28**
T21	8.46	8.76	8.95	9.15	9.25	9.46	9.55	9.60	9.82	9.73	**9.27**
T22	7.88	8.18	8.51	8.82	9.08	9.28	9.42	9.49	9.53	9.56	**8.97**
T23	7.90	8.20	8.50	8.80	9.10	9.30	9.40	9.50	9.50	9.60	**8.98**
T24	7.82	8.11	8.36	8.64	9.01	9.24	9.31	9.40	9.43	9.54	**8.88**
T25	8.78	8.98	9.37	9.81	10.20	10.48	10.63	10.67	10.66	10.67	**10.03**
T26	8.77	8.97	9.37	9.77	10.17	10.88	10.57	10.67	10.67	10.70	**10.05**
T27	8.70	8.89	8.97	9.57	9.99	10.69	10.39	10.49	10.53	10.56	**9.88**
T28	7.28	8.16	7.57	8.76	9.01	9.09	9.33	9.48	9.81	9.57	**8.80**
Mean B	**8.36**	**8.73**	**8.87**	**9.22**	**9.42**	**9.66**	**9.72**	**9.82**	**9.93**	**9.91**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.018		0.011		0.058						
CD5%	0.051		0.031		0.161						

C: Effect of various treatments, pore volume and their combination on the concentration of Ca^{+} in leachates after 45 DAI:

Results revealed that the concentrations of Calcium (Ca^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Ca^{+} concentration in the leached was found at par with 3.5 pore volume as the pore volume increases beyond 4.5 up to 5 pore volume.

In general, the mean lowest concentration of Ca+ was observed in treatment T4 and the highest in case of T25 (Table.18.and Fig.24) Amendment treatments showed variable response and affected mean Ca^{+} concentration differently. The maximum mean Ca^{+} concentration in the leached was found in the treatment T 25 (9.02 Cmolc (+) kg^{-1}). This treatment was found statistically superior to the rest of the treatments except the treatments T16(10.02 Cmolc (+) kg^{-1}),T17 (10.04 Cmolc (+) kg^{-1}),T26(10.05 Cmolc (+) kg^{-1}), all the treatments were statistically at par with each other and the lowest removal of Ca+ from the soil was found in the treatment T4 (6.98 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Ca^{+} concentration in the leached was 7.01 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T1 (7.93 Cmolc (+) kg^{-1}), , T2 (7.93 Cmolc (+) kg^{-1}), T3 (8.08 Cmolc (+) kg^{-1}), T7 (8.29 Cmolc (+) kg^{-1}), T8 (8.32 Cmolc (+) kg^{-1}), T 9 (7.74 Cmolc (+) kg^{-1} ,T13 (7.06 Cmolc (+) kg^{-1}), T14 (7.24 Cmolc (+) kg^{-1}),T15 (7.15 Cmolc (+) kg^{-1}), T16 (9.01 Cmolc (+) kg^{-1}), T17 (8.99 Cmolc (+) kg^{-1}), T18 (8.80Cmolc (+) kg^{-1}), T22 (7.08 Cmolc (+) kg^{-1}) , T 23 (7.09 Cmolc (+) kg^{-1}), T 25 (9.02 Cmolc (+) kg^{-1}), T26 (9.00 Cmolc (+) kg^{-1}), T27 (8.82 Cmolc (+) kg^{-1}) and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Ca^{+} leaching is presented in Table.18. and Fig.24. It is evident from the data that the Ca^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Ca^{+} was T25 which content 9.43 Cmolc (+)

kg^{-1} Ca^{+} in the leached when the soil column is subjected to leaching with 4.5 pore volume. This treatment was found statistically superior to rest of the treatments. As we increase the pore volume the concentration of Ca^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Ca^{+} was found in treatment combination T4 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

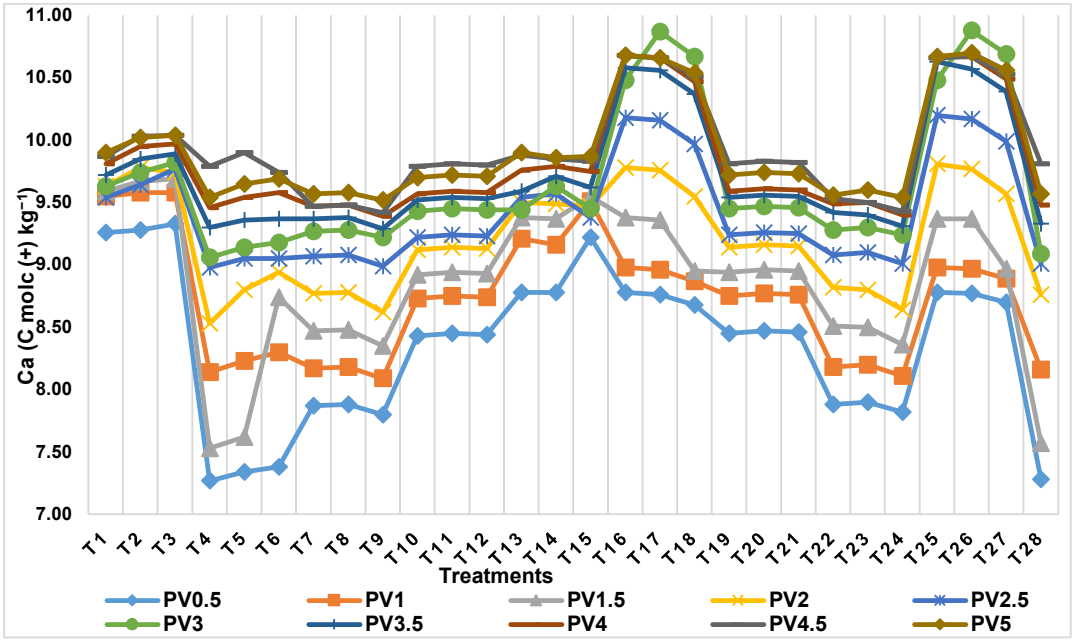


Fig.24: Interactive effect of various treatments on leachate Calcium at 45 DAI

Table.19. Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	28.37	28.99	29.46	29.63	30.60	30.59	30.81	31.19	31.31	31.99	**30.29**
T2	28.39	29.02	29.54	29.78	30.70	30.70	30.94	31.33	31.47	32.11	**30.40**
T3	27.55	27.79	27.86	27.86	27.86	27.90	28.00	28.12	28.21	28.20	**27.94**
T4	31.12	33.19	33.95	33.99	33.78	33.59	33.58	33.75	33.92	33.81	**33.47**
T5	31.12	33.15	33.90	33.78	33.59	33.58	34.57	34.59	34.81	35.19	**33.83**
T6	31.13	33.37	34.39	34.78	34.91	35.06	35.35	35.77	36.14	36.16	**34.71**
T7	29.65	30.96	31.43	31.49	31.44	31.46	31.65	31.97	32.26	32.28	**31.46**
T8	28.33	28.95	29.42	29.47	30.44	30.41	30.71	31.13	31.27	31.96	**30.51**
T9	29.68	30.99	31.46	31.52	31.47	31.49	31.68	32.00	32.29	32.31	**31.49**
T10	28.91	28.15	28.97	29.70	30.37	30.99	32.13	32.87	33.27	33.46	**30.88**
T11	28.18	29.01	29.70	30.39	31.16	32.01	32.90	33.71	34.26	34.31	**31.56**
T12	28.20	29.03	29.72	30.41	31.18	32.03	32.92	33.73	34.28	34.33	**31.58**
T13	30.75	32.57	33.20	33.24	33.14	33.17	33.43	33.86	34.23	34.15	**33.17**
T14	32.96	32.51	33.10	33.11	33.08	33.14	33.37	33.80	34.20	34.21	**33.35**
T15	30.91	32.89	33.68	33.87	33.88	33.99	34.31	34.79	35.24	35.29	**33.89**
T16	31.55	33.91	34.93	35.26	35.39	35.61	36.04	36.62	37.09	37.03	**35.84**
T17	31.62	33.98	35.00	35.33	35.46	35.68	36.11	36.69	37.16	37.10	**35.71**
T18	32.24	34.99	36.14	36.43	36.39	36.39	36.60	37.00	37.40	37.41	**36.10**
T19	28.92	28.16	28.99	29.68	30.37	31.01	32.15	32.88	33.28	33.47	**30.89**
T20	28.16	28.99	29.68	30.37	31.14	31.99	32.88	33.69	34.24	34.29	**31.54**
T21	28.12	28.95	29.64	30.33	31.10	31.95	32.84	33.65	34.20	34.25	**31.50**
T22	30.77	32.59	33.22	33.26	33.16	33.19	33.45	33.88	34.25	34.17	**33.19**
T23	30.78	32.60	33.23	33.27	33.17	33.20	33.46	33.89	34.26	34.18	**33.20**
T24	30.85	32.83	33.62	33.81	33.82	33.93	34.25	34.73	35.18	35.23	**33.83**
T25	31.53	33.89	34.91	35.24	35.37	35.59	36.02	36.60	37.07	37.01	**35.73**
T26	31.54	33.90	34.92	35.25	35.38	35.60	36.03	36.61	37.08	37.02	**35.61**
T27	32.20	34.95	36.10	36.39	36.35	36.35	36.56	36.96	37.36	37.37	**36.06**
T28	31.13	33.37	34.39	34.78	34.91	35.06	35.35	35.77	36.14	36.16	**34.71**
Mean B	**30.17**	**31.56**	**32.31**	**32.59**	**32.84**	**33.06**	**33.50**	**33.99**	**34.35**	**34.45**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.184		0.11		0.583						
CD5%	0.512		0.306		1.62						

Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 15, 30 and 45 DAI:

The calcium concentration of soil as influenced by various treatments under study was measured at 15, 30 and 45 Days after Incubation (DAI),

A: The findings of 15 days of incubation are presented in Table.19. and Fig.25. Among various treatments the mean highest Ca (36.10 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% + Biomes) having concentration 36.06 cmol(+)/kg. The measured Av. Ca concentration of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from Ca concentration point of view are T18 followed by T27, T16, T26, T15, T25, in all these treatments the measured soil Av. Ca was found more than 35 cmol(+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil by enhancing calcium in exchange sites as its concentration increase from 27 to < 36.10 cmol (+)/kg.

The Ca concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in10 steps with different amount of water based on pore volumes(pv) and time duration. The concentration of calcium was found at par for pore volume 4.5 and 5 and significant increase in concentration was observed with increase in pore volume. The percentage increase in the concertation in comparison to original soil for mean values of various treatments at different pore volumes was 11.7,16.9, 19.6 20.7, 21.6, 22.4, 24.1, 25, 27.2, 27.6 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 15 DAI are presented in Table.19. and Fig.25. It is evident that the most effective treatment for the reclamation of soil pH was T18 which was closely followed by the treatment T27 these two treatments were statistically at par with each other and

T16, T26, T15, T25. The concentration of Ca in T18 PV2.5 to 5 were at par with each other, similar trend was obtained T27 similarly the Ca concentration at 3.5 to 5 PV were at par with treatment T16.T17, T25, T26, respectively and for conventional gypsum the significant concentration was observed at PV 4.5.

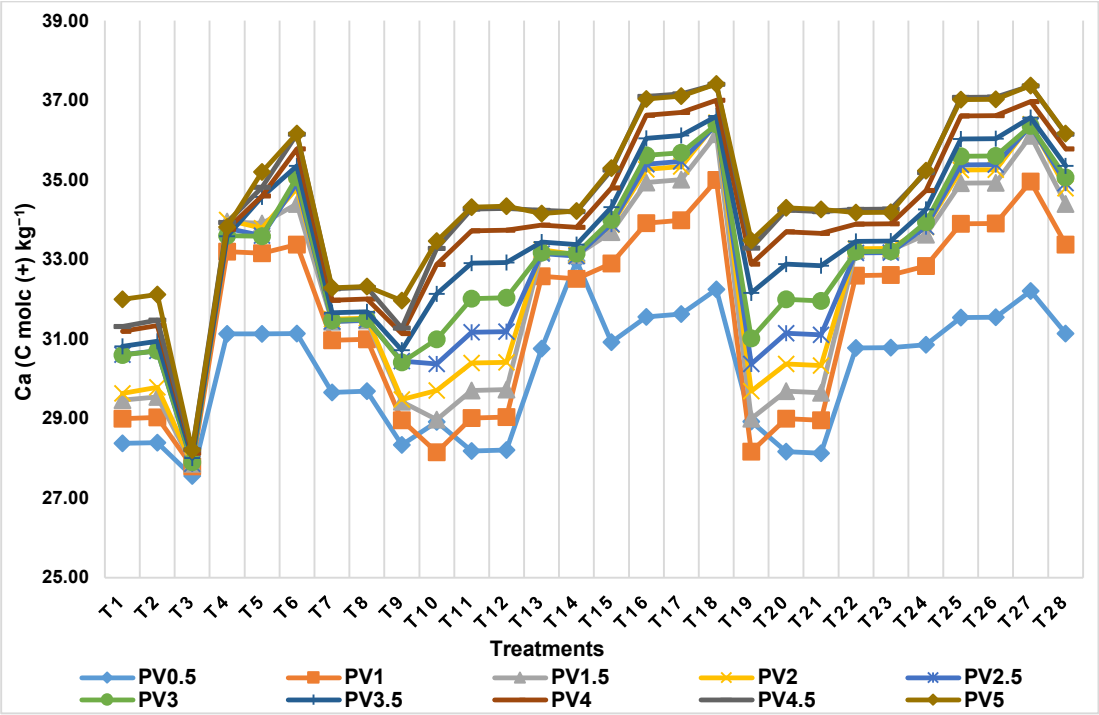


Fig.25: Interactive effect of various treatments on Soil Calcium at 15 DAI

Table.20. Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 30 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	28.10	28.72	28.90	28.86	28.78	28.77	28.86	29.01	29.15	29.10	28.83
T2	27.95	28.57	28.75	28.71	28.63	28.62	28.71	28.86	29.00	28.95	28.68
T3	27.23	27.42	27.35	27.10	26.73	26.32	25.92	25.61	25.46	25.42	26.46
T4	30.92	32.92	33.56	33.49	33.21	33.02	33.07	33.33	33.58	33.44	33.06
T5	31.87	34.32	35.08	34.96	34.56	34.27	34.27	34.52	34.79	34.62	34.33
T6	32.49	35.32	35.56	36.25	36.30	36.72	36.96	37.27	37.52	37.59	36.20
T7	26.71	27.23	27.99	28.79	29.46	29.93	30.17	30.24	30.23	30.35	29.11
T8	26.70	27.22	27.98	28.78	29.45	29.92	30.16	30.23	30.22	30.34	29.10
T9	29.48	30.72	31.05	30.95	30.77	30.72	30.89	31.23	31.55	31.54	30.89
T10	29.96	31.61	32.28	32.51	32.56	32.70	33.04	33.52	33.92	33.93	32.61
T11	29.95	31.64	32.27	32.49	32.54	32.72	33.11	33.52	33.93	33.91	32.61
T12	30.62	32.72	33.68	34.01	34.11	34.22	34.46	34.82	35.14	35.12	33.89
T13	32.53	35.48	36.57	36.72	36.58	36.58	36.90	37.49	38.04	38.00	36.49
T14	32.58	35.53	36.62	36.77	36.63	36.63	36.95	37.54	38.09	38.05	36.54
T15	32.67	35.62	36.71	36.86	36.72	36.72	37.04	37.63	38.18	38.14	36.63
T16	32.64	35.72	37.00	37.30	37.24	37.22	37.43	37.83	38.18	38.03	37.86
T17	32.59	35.67	36.95	37.25	37.19	37.17	37.38	37.78	38.13	37.98	37.92
T18	33.64	37.22	38.65	38.92	38.74	38.61	38.77	39.23	39.74	39.84	38.34
T19	29.97	31.62	32.30	32.49	32.56	32.72	33.06	33.53	33.93	33.94	32.62
T20	29.94	31.63	32.29	32.50	32.55	32.74	33.08	33.52	33.94	33.92	32.61
T21	30.50	32.60	33.56	33.89	33.99	34.10	34.34	34.70	35.02	35.00	33.77
T22	32.43	35.38	36.47	36.62	36.48	36.48	36.80	37.39	37.94	37.90	36.39
T23	32.46	35.41	36.50	36.65	36.51	36.51	36.83	37.42	37.97	37.93	36.42
T24	32.52	35.47	36.56	36.71	36.57	36.57	36.89	37.48	38.03	37.99	36.48
T25	32.24	35.32	36.60	36.90	36.84	36.82	37.03	37.43	37.78	37.63	37.90
T26	32.36	35.44	36.72	37.02	36.96	36.94	37.15	37.55	37.90	37.75	37.89
T27	33.53	37.11	38.54	38.81	38.63	38.50	38.66	39.12	39.63	39.73	38.23
T28	32.57	35.40	35.64	36.33	36.38	36.80	37.04	37.35	37.60	37.67	36.28
Mean B	30.97	33.18	34.01	34.24	34.21	34.26	34.89	34.90	35.17	35.14	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.17		0.101		0.536						
CD5%	0.471		0.282		1.491						

B: Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 30 DAI:

The findings of 30 days of incubation are presented in Table.20 and Fig.26. Among various treatments the mean highest Ca (38.34 cmol (+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% + Biomes) having concentration 38.23 cmol (+)/kg. The measured Ca concentration of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from Ca concentration point of view are T18 (38.34 cmol (+)/kg)followed by T27 (38.23 cmol (+)/kg), T17 (37.92 cmol (+)/kg), T25 (37.90 cmol (+)/kg), T26 (37.89 cmol (+)/kg), T16 (37.86 cmol (+)/kg), in all these treatments the measured soil Ca was found more than 36 cmol (+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil by enhancing calcium in exchange sites as its concentration increase from its initial value 27 cmol (+)/kg to < 36 cmol (+)/kg.

The Ca concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in10 steps with different amount of water based on pore volumes (PV) and time duration. The concentration of calcium was found at par for pore volume 1.5,2,2.5,3,3.5,4,4.5 and 5, these treatments were statistically superior to PV0.5 and PV 1 but PV1 (33.18 cmol (+)/kg) was also significantly superior to PV0.5. The percentage increase in the concertation in comparison to original soil for mean values of various treatments at different pore volumes was 14.7,22.9,26.0,26.8 ,26.7,26.9, 29.2, 29.3, 30.2 30.1 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

The concentration of Ca in the treatment combination T18 PV5 was found maximum (39.84 cmol (+)/kg) this treatment combination was found at par with T18 PV1.5 to T18PV4.5 and T27PV1.5 to PV 5 and rest of the treatments were significantly inferior.

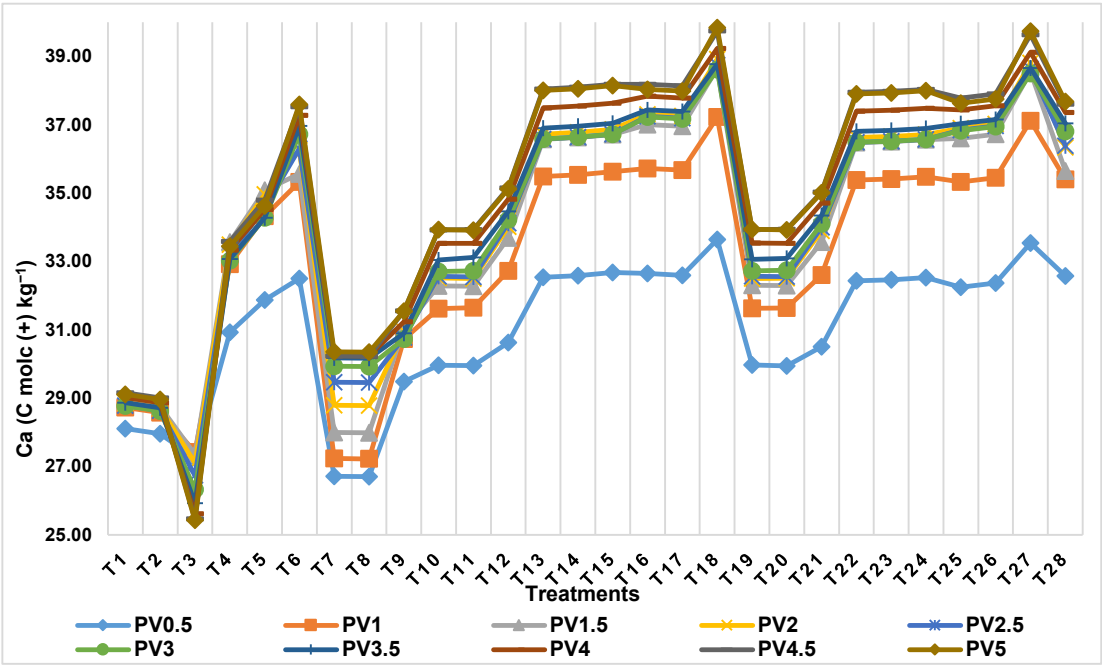


Fig. 26. Interactive effect of various treatments soil Calcium at 30 DAI

Thus, from the above results it is concluded that for attending higher Ca^{+} content in soil, the application of Biochar/ Vermicompost along with NG45% of GR along with leaching from PV 1.5 to PV 5 has been found most effective for enhancing Av. Ca^{+} content in the soil. The treatment combination T27PV1.5 to PV5 was also found equally effective to enhance Av. Ca^{+} in the soil as the difference among these treatments were non-significant.

Table.21 Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	28.12	28.85	29.12	29.20	29.23	29.33	29.51	29.74	29.89	29.79	**29.28**
T2	28.20	28.93	29.20	29.28	29.31	29.41	29.59	29.82	29.97	29.87	**29.36**
T3	27.43	27.69	27.70	27.53	27.25	26.92	26.61	26.36	26.23	26.24	**26.99**
T4	31.11	33.19	33.89	33.86	33.58	33.36	33.35	33.54	33.74	33.62	**33.32**
T5	32.13	34.72	35.64	35.69	35.45	35.31	35.43	35.79	36.15	36.03	**35.23**
T6	34.22	37.74	38.89	38.88	38.53	38.39	38.69	39.34	39.93	39.73	**38.43**
T7	28.06	28.78	29.00	28.89	28.97	29.04	29.28	29.54	29.69	29.64	**29.09**
T8	28.01	28.73	28.95	28.84	28.92	28.99	29.23	29.49	29.64	29.59	**29.04**
T9	28.14	28.86	29.08	28.97	29.05	29.12	29.36	29.62	29.77	29.72	**29.17**
T10	30.03	31.71	32.38	32.61	32.66	32.80	33.14	33.62	34.02	34.03	**32.70**
T11	30.09	31.74	32.37	32.59	32.64	32.82	33.21	33.62	34.03	34.01	**32.71**
T12	32.23	34.99	36.12	36.39	36.37	36.42	36.73	37.23	37.69	37.67	**36.18**
T13	33.56	36.93	38.12	38.20	37.94	37.83	38.09	38.67	39.21	39.11	**37.76**
T14	33.61	36.98	38.17	38.25	37.99	37.88	38.14	38.72	39.26	39.16	**37.81**
T15	33.72	37.09	38.28	38.36	38.10	37.99	38.25	38.83	39.37	39.27	**37.92**
T16	33.83	37.32	38.63	38.78	38.55	38.42	38.62	39.09	39.52	39.30	**39.20**
T17	33.78	37.27	38.58	38.73	38.50	38.37	38.57	39.04	39.47	39.25	**39.15**
T18	34.91	38.82	40.16	40.16	39.74	39.49	39.67	40.23	40.79	40.64	**39.46**
T19	30.86	32.82	33.53	33.58	33.44	33.39	33.56	33.92	34.27	34.25	**33.36**
T20	30.04	31.73	32.39	32.60	32.65	32.84	33.18	33.62	34.04	34.02	**32.71**
T21	32.08	34.84	35.97	36.24	36.22	36.27	36.58	37.08	37.54	37.52	**36.03**
T22	33.40	36.77	37.96	38.04	37.78	37.67	37.93	38.51	39.05	38.95	**37.60**
T23	33.45	36.82	38.01	38.09	37.83	37.72	37.98	38.56	39.10	39.00	**37.65**
T24	33.54	36.91	38.10	38.18	37.92	37.81	38.07	38.65	39.19	39.09	**37.74**
T25	33.43	36.92	38.23	38.38	38.15	38.02	38.22	38.69	39.12	38.90	**39.03**
T26	33.55	37.04	38.35	38.50	38.27	38.14	38.34	38.81	39.24	39.02	**39.09**
T27	34.80	38.71	40.05	40.05	39.63	39.38	39.56	40.12	40.68	40.53	**39.35**
T28	34.23	37.76	38.93	38.91	38.56	38.42	38.72	39.36	39.95	39.76	**38.46**
Mean B	**31.80**	**34.31**	**35.20**	**35.28**	**35.11**	**35.45**	**35.89**	**35.90**	**36.09**	**35.99**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.141		0.085		0.447						
CD5%	0.393		0.235		1.243						

C: Effect of various treatments and pore volume and their combination on the Calcium concentration of soil at 45 DAI:

The findings of 45 days of incubation are presented in Table. 21. and Fig.27. Among various treatments the mean highest Av. Ca^{+} (39.46 cmol (+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% +Biomes) having concentration 39.35 cmol(+)/kg, T26(39.35 cmol (+)/kg),T25(39.09 cmol (+)/kg),T16(39.20 cmol (+)/kg),T17(39.15 cmol (+)/kg) The measured Ca^{+} concentration of these treatments were significantly higher than the rest of the treatments under study and difference are non significant, in all these treatments the measured soil Ca was found more than 39 cmol (+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil by enhancing calcium in exchange sites as its concentration increase from 27 to >39 cmol (+)/kg.

The Ca^{+} concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in 10 steps with different amount of water based on pore volumes(pv) and time duration. The concentration of calcium was found at par for pore volume 3,3.5,4,4.5 and 5 and significant increase in concentration of these treatments as these statistically at par. The pore volume PV0.5, PV1, PV1,5, PV2, PV2.5 were found significantly inferior. The percentage increase in the concertation in comparison to original soil for mean values of various treatments at different pore volumes was 17.79, 27.06, 30.39, 30.65, 30.04, 31.30, 32.93 32.96 33.66 33.28 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

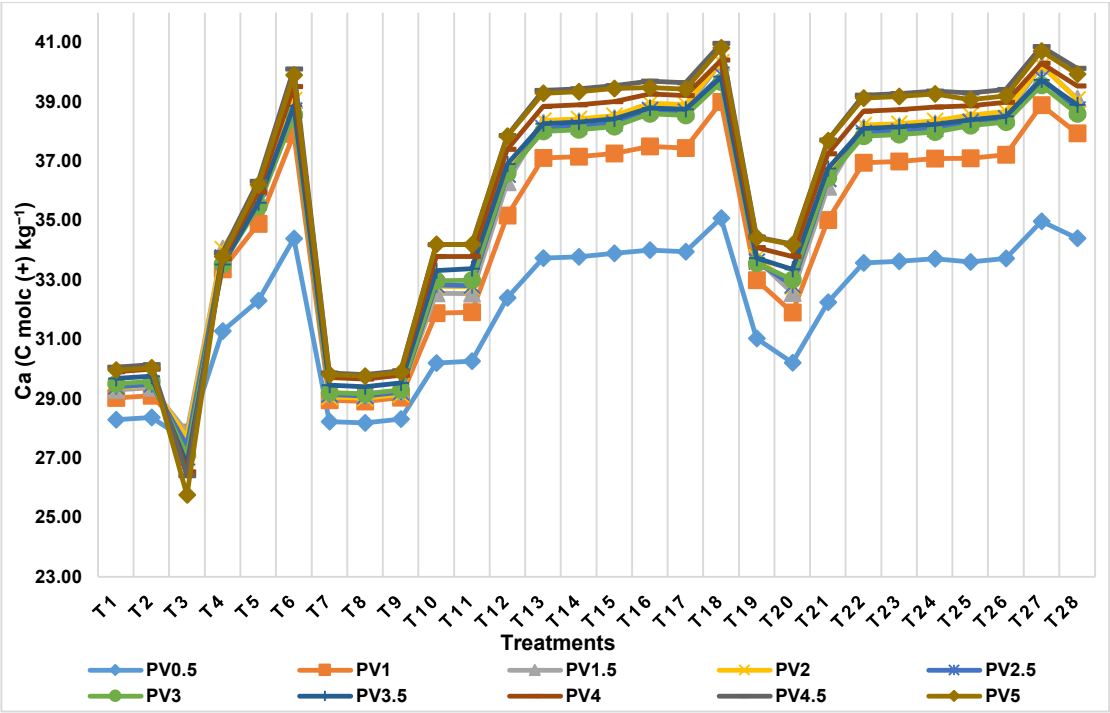


Fig.27: Interactive effect of various treatments on Soil Calcium at 45 DAI

Table.22. Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates at15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	1.68	1.78	1.51	1.42	1.46	1.58	1.73	1.87	1.94	1.90	**1.69**
T2	1.17	1.25	0.22	1.45	1.69	1.89	2.15	2.29	2.56	2.50	**1.72**
T3	1.00	1.00	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	**1.03**
T4	1.97	1.15	1.26	1.35	1.41	1.46	1.48	1.47	1.43	1.37	**1.44**
T5	1.27	1.35	1.47	1.58	1.66	1.73	1.79	1.83	1.87	1.90	**1.65**
T6	1.68	1.68	1.66	1.70	1.78	1.88	1.98	2.08	2.15	2.17	**1.88**
T7	1.58	1.62	1.68	1.74	1.82	1.90	2.00	1.56	1.56	1.56	**1.70**
T8	1.69	1.71	1.74	1.77	1.83	1.90	2.00	1.58	1.55	1.60	**1.71**
T9	1.54	1.59	1.67	1.76	1.86	1.96	2.04	1.56	1.58	1.59	**1.70**
T10	1.28	1.38	1.44	1.58	1.77	1.99	2.21	2.40	2.55	2.62	**1.92**
T11	1.48	1.58	1.68	1.85	2.04	2.24	2.43	2.58	2.67	2.68	**2.12**
T12	1.69	1.84	1.97	2.07	2.16	2.24	2.33	2.42	2.53	2.65	**2.19**
T13	1.99	2.17	2.31	2.43	2.53	2.60	2.66	2.71	2.75	2.79	**2.49**
T14	2.13	2.36	2.55	2.70	2.82	2.91	2.99	3.05	3.12	3.19	**2.78**
T15	2.19	2.37	2.53	2.67	2.79	2.90	2.99	3.06	3.13	3.18	**2.78**
T16	2.35	2.62	2.84	3.00	3.11	3.19	3.24	3.28	3.32	3.30	**3.03**
T17	2.39	2.55	2.69	2.81	2.91	2.99	3.07	3.14	3.22	3.30	**2.91**
T18	2.54	2.77	2.94	3.05	3.11	3.15	3.18	3.20	3.24	3.36	**3.05**
T19	1.21	1.35	1.51	1.68	1.86	2.04	2.19	2.33	2.44	2.50	**1.91**
T20	1.55	1.65	1.74	1.81	1.87	1.93	1.98	2.03	2.09	2.15	**1.88**
T21	1.38	1.59	1.78	1.95	2.10	2.22	2.32	2.40	2.45	2.47	**2.07**
T22	1.37	1.47	1.58	1.71	1.83	1.96	2.07	2.16	2.24	2.28	**1.87**
T23	1.55	1.67	1.77	1.85	1.92	1.97	2.02	2.07	2.11	2.17	**1.91**
T24	1.45	1.57	1.65	1.72	1.77	1.80	1.83	1.86	1.90	1.94	**1.75**
T25	1.69	1.88	2.03	2.14	2.23	2.29	2.34	2.38	2.41	2.44	**2.18**
T26	1.73	1.96	2.14	2.27	2.37	2.44	2.50	2.55	2.60	2.66	**2.32**
T27	2.10	2.28	2.42	2.52	2.60	2.66	2.70	2.74	2.79	2.85	**2.57**
T28	1.38	1.52	1.51	1.59	1.72	1.88	2.04	2.18	2.27	2.28	**1.84**
Mean B	**1.68**	**1.78**	**1.83**	**1.97**	**2.07**	**2.17**	**2.26**	**2.32**	**2.39**	**2.41**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.01		0.006		0.032						
CD5%	0.028		0.017		0.089						

Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates at 15,30 and DAI:

Results of column study for Mg^{+} revealed that the concentrations of magnesium (Mg^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume.

A: The amendment effect at 15 DAI showed that, the mean lowest concentration of Mg^{+} was observed in treatment T3 and the highest in case of T18 (Table.22. Fig.28.). Amendment treatments showed variable response and affected mean Mg^{+} concentration significantly. The maximum mean Mg^{+} concentration in the leached was found in the treatment T18 (3.05 Cmolc (+) kg^{-1}). This treatment was found statistically superior to the rest of the treatments and the lowest removal of Mg^{+} from the soil was found in the treatment T3 (1.03 Cmolc (+) kg^{-1}) except treatment T16. This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Mg^{+} concentration in the leached was 1.84 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T10 (1.92 Cmolc (+) kg^{-1}), T11 (2.12 Cmolc (+) kg^{-1}),T12 (2.19 Cmolc (+) kg^{-1}), T13 (2.49 Cmolc (+) kg^{-1}), T14 (2.78 Cmolc (+) kg^{-1}), T15 (2.78 Cmolc (+) kg^{-1}),T16 (3.03 Cmolc (+) kg^{-1}),T17 (2.91 Cmolc (+) kg^{-1}), T18 (3.05 Cmolc (+) kg^{-1}), T19 (1.91 Cmolc (+) kg^{-1}), T20 (1.88 Cmolc (+) kg^{-1}), T21(2.07 Cmolc (+) kg^{-1}), T22 (1.87 Cmolc (+) kg^{-1}), T23(1.91 Cmolc (+) kg^{-1}), T25 (2.18 Cmolc (+) kg^{-1}), T26(2.32 Cmolc (+) kg^{-1}), T27 (2.57 Cmolc (+) kg^{-1}), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leaching is presented in Table.22. and Fig.28. It is evident from the data that the Mg^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Mg^{+} wasT18 which content 3.36 Cmolc (+) kg^{-1} Mg^{+} in the leached when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically superior to rest of the treatments except T17PV5, T18PV5, T16PV5, T17PV4.5, T18PV4.5, T16PV4.5, T16PV3.5,

T18PV3.5. As we increase the pore volume the concentration of Mg^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Mg^{+} was found in treatment combination T3 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

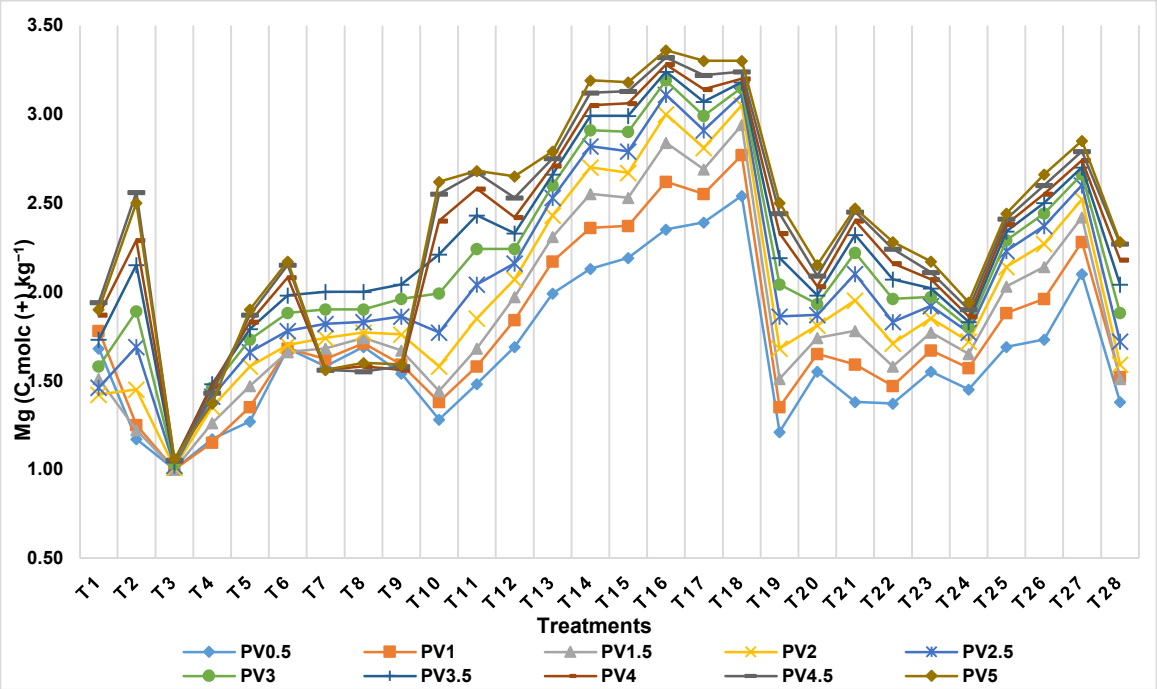


Fig.28: Interactive effect of various treatmnts on soil Magnesium at15 DAI

Table. 23. Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates after 30 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	0.79	1.07	1.29	1.51	1.74	2.00	2.26	2.51	2.67	2.68	**1.85**
T2	0.78	1.06	1.27	1.50	1.59	1.94	2.22	2.47	2.61	2.61	**1.80**
T3	0.72	0.99	1.15	1.28	1.33	1.65	1.99	2.27	2.41	2.46	**1.62**
T4	2.09	2.29	2.36	2.38	2.38	2.39	2.42	2.47	2.52	2.50	**2.38**
T5	2.04	2.23	1.19	1.29	2.34	2.34	2.39	2.42	2.63	2.46	**2.13**
T6	1.97	2.14	1.10	1.22	2.27	2.26	2.33	3.34	2.52	2.35	**2.15**
T7	1.58	1.81	1.88	1.94	1.91	1.84	1.94	2.06	2.13	2.16	**1.92**
T8	1.59	1.79	1.89	1.93	1.96	1.99	2.04	2.09	2.14	2.15	**1.95**
T9	0.76	1.03	1.19	1.35	1.49	1.83	2.09	2.33	2.45	2.49	**1.70**
T10	1.78	2.08	2.21	2.31	2.32	2.34	2.41	2.49	2.43	2.56	**2.29**
T11	1.81	2.11	2.20	2.29	2.30	2.36	2.42	2.48	2.44	2.54	**2.29**
T12	1.74	2.04	2.17	2.23	2.26	2.31	2.37	2.39	2.45	2.49	**2.24**
T13	1.87	1.97	2.10	2.22	2.33	2.40	2.45	2.48	2.50	2.54	**2.28**
T14	1.88	1.98	2.11	2.23	2.34	2.41	2.46	2.49	2.51	2.55	**2.29**
T15	1.87	1.97	2.10	2.22	2.33	2.40	2.45	2.48	2.50	2.54	**2.28**
T16	1.98	2.08	2.22	2.36	2.48	2.58	2.64	2.67	2.69	2.70	**2.44**
T17	1.96	2.06	2.20	2.34	2.46	2.56	2.62	2.65	2.67	2.69	**2.42**
T18	1.97	2.06	2.20	2.34	2.46	2.56	2.62	2.65	2.67	2.71	**2.43**
T19	1.79	2.09	2.23	2.29	2.32	2.36	2.43	2.50	2.56	2.57	**2.31**
T20	1.80	2.10	2.22	2.30	2.31	2.38	2.45	2.48	2.45	2.55	**2.30**
T21	1.76	2.06	2.19	2.24	2.27	2.33	2.38	2.40	2.46	2.51	**2.26**
T22	1.89	1.99	2.12	2.24	2.35	2.42	2.47	2.50	2.52	2.56	**2.30**
T23	1.90	2.00	2.13	2.25	2.36	2.43	2.48	2.51	2.53	2.57	**2.31**
T24	1.82	1.91	1.99	1.09	2.27	2.37	2.39	2.41	2.46	2.51	**2.12**
T25	1.99	2.09	2.23	2.37	2.49	2.59	2.65	2.68	2.70	2.72	**2.45**
T26	1.97	2.07	2.21	2.35	2.47	2.57	2.63	2.66	2.68	2.70	**2.43**
T27	1.95	2.06	2.20	2.33	2.45	2.55	2.61	2.64	2.66	2.68	**2.42**
T28	1.98	2.16	1.14	1.25	2.30	2.29	2.36	3.36	2.54	2.38	**2.17**
Mean B	**1.71**	**1.89**	**1.89**	**1.97**	**2.20**	**2.29**	**2.38**	**2.52**	**2.50**	**2.52**	

	Treatment (A)	Pore Volume (B)	Interaction (A*B)
S.Em. ±	0.008	0.005	0.026
CD5%	0.023	0.014	0.072

B: Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates at 30 DAI:

Results of column study for Mg^{+} revealed that the concentrations of magnesium (Mg^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume.

The amendment effect at 30 DAI showed that, the mean lowest concentration of Mg^{+} was observed in treatment T3 and the highest in case of T18 (Table.23. Fig.29.). Amendment treatments showed variable response and affected mean Mg^{+} concentration significantly. The maximum mean Mg^{+} concentration in the leached was found in the treatment T25 (2.72 Cmolc (+) kg^{-1}) which was at par with T16, (2.70 Cmolc (+) kg^{-1}) T18(2.71 Cmolc (+) kg^{-1}) and T26(2.70 Cmolc (+) kg^{-1}). These treatment was found statistically superior to the rest of the treatments and the lowest removal of Mg^{+} from the soil was found in the treatment T3 (1.62 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Mg^{+} concentration in the leached was 2.17 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T10 (2.28 Cmolc (+) kg^{-1}), T11(2.29 Cmolc (+) kg^{-1}), T12 (2.26 Cmolc (+) kg^{-1}), T13 (2.26Cmolc (+) kg^{-1}), T14 (2.29 Cmolc (+) kg^{-1}) T15 (2.28 Cmolc (+) kg^{-1}), T16 (2.44Cmolc (+) kg^{-1}), T17 (2.31 Cmolc (+) kg^{-1}), T18 (2.42 Cmolc (+) kg^{-1}), T19 (2.30 Cmolc (+) kg^{-1}), T20 (2.29Cmolc (+) kg^{-1}),T21 (2.26 Cmolc (+) kg^{-1}) , T22 (2.30 Cmolc (+) kg^{-1}), T23 (2.31 Cmolc (+) kg^{-1}), T25 (2.45 Cmolc (+) kg^{-1}), T26 (2.43 Cmolc (+) kg^{-1}), T27 (2.42 Cmolc (+) kg^{-1}) and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leaching is presented in Table.23. and Fig.29.It is evident from the data that the Mg^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Mg^{+} was T25 which content 2.72 Cmolc (+) kg^{-1} Mg^{+} in the leachate when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically at par with the treatment combination T16 PV 3.5 to PV5,T17PV4 to PV5, T18 PV3.5 to PV 5 ,T25 PV3.5 to PV5,T26 PV 4 to PV 5 T27 PV4 to PV 5 but these were superior to rest of the treatment

combinations. As we increase the pore volume the concentration of Mg^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Mg^{+} was found in treatment combination T3 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

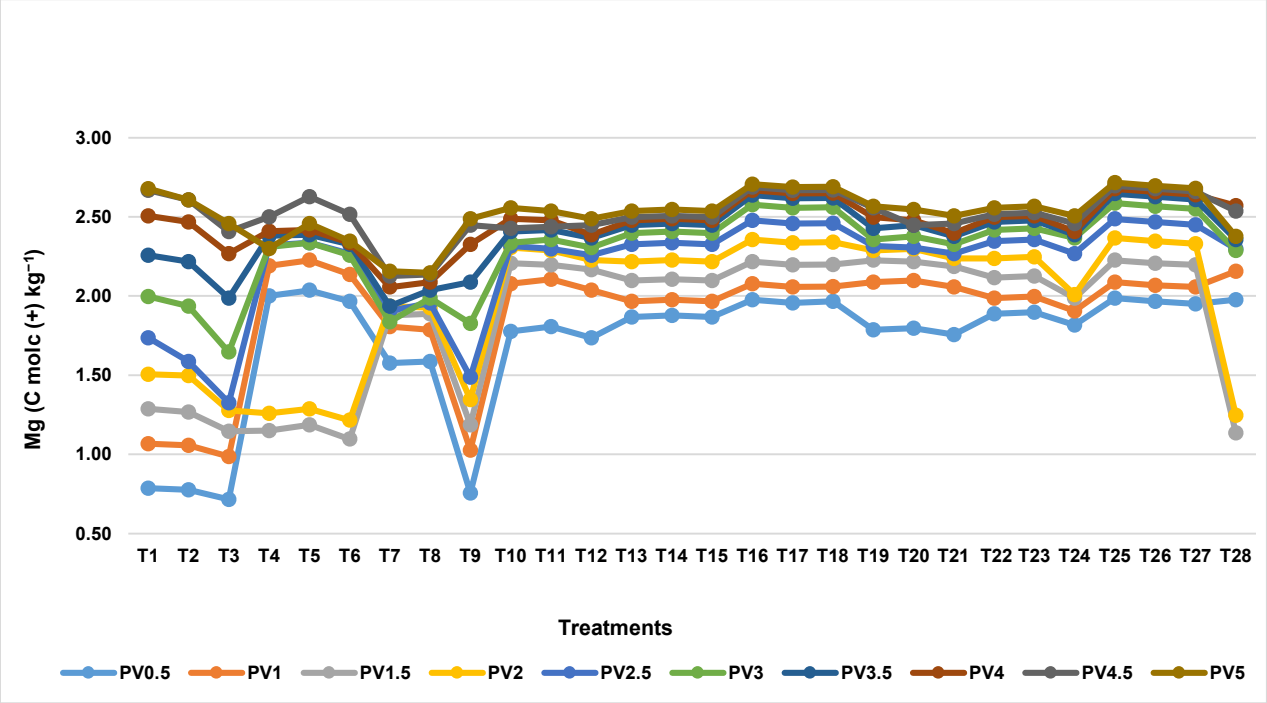


Fig.29: Interactive effect of various treatments on leachate Magnesium at 30 DAI

Table. 23. Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates after 30 DAI:

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	0.79	1.07	1.29	1.51	1.74	2.00	2.26	2.51	2.67	2.68	**1.85**
T2	0.78	1.06	1.27	1.50	1.59	1.94	2.22	2.47	2.61	2.61	**1.80**
T3	0.72	0.99	1.15	1.28	1.33	1.65	1.99	2.27	2.41	2.46	**1.62**
T4	2.09	2.29	2.36	2.38	2.38	2.39	2.42	2.47	2.52	2.50	**2.38**
T5	2.04	2.23	1.19	1.29	2.34	2.34	2.39	2.42	2.63	2.46	**2.13**
T6	1.97	2.14	1.10	1.22	2.27	2.26	2.33	3.34	2.52	2.35	**2.15**
T7	1.58	1.81	1.88	1.94	1.91	1.84	1.94	2.06	2.13	2.16	**1.92**
T8	1.59	1.79	1.89	1.93	1.96	1.99	2.04	2.09	2.14	2.15	**1.95**
T9	0.76	1.03	1.19	1.35	1.49	1.83	2.09	2.33	2.45	2.49	**1.70**
T10	1.78	2.08	2.21	2.31	2.32	2.34	2.41	2.49	2.43	2.56	**2.29**
T11	1.81	2.11	2.20	2.29	2.30	2.36	2.42	2.48	2.44	2.54	**2.29**
T12	1.74	2.04	2.17	2.23	2.26	2.31	2.37	2.39	2.45	2.49	**2.24**
T13	1.87	1.97	2.10	2.22	2.33	2.40	2.45	2.48	2.50	2.54	**2.28**
T14	1.88	1.98	2.11	2.23	2.34	2.41	2.46	2.49	2.51	2.55	**2.29**
T15	1.87	1.97	2.10	2.22	2.33	2.40	2.45	2.48	2.50	2.54	**2.28**
T16	1.98	2.08	2.22	2.36	2.48	2.58	2.64	2.67	2.69	2.70	**2.44**
T17	1.96	2.06	2.20	2.34	2.46	2.56	2.62	2.65	2.67	2.69	**2.42**
T18	1.97	2.06	2.20	2.34	2.46	2.56	2.62	2.65	2.67	2.71	**2.43**
T19	1.79	2.09	2.23	2.29	2.32	2.36	2.43	2.50	2.56	2.57	**2.31**
T20	1.80	2.10	2.22	2.30	2.31	2.38	2.45	2.48	2.45	2.55	**2.30**
T21	1.76	2.06	2.19	2.24	2.27	2.33	2.38	2.40	2.46	2.51	**2.26**
T22	1.89	1.99	2.12	2.24	2.35	2.42	2.47	2.50	2.52	2.56	**2.30**
T23	1.90	2.00	2.13	2.25	2.36	2.43	2.48	2.51	2.53	2.57	**2.31**
T24	1.82	1.91	1.99	1.09	2.27	2.37	2.39	2.41	2.46	2.51	**2.12**
T25	1.99	2.09	2.23	2.37	2.49	2.59	2.65	2.68	2.70	2.72	**2.45**
T26	1.97	2.07	2.21	2.35	2.47	2.57	2.63	2.66	2.68	2.70	**2.43**
T27	1.95	2.06	2.20	2.33	2.45	2.55	2.61	2.64	2.66	2.68	**2.42**
T28	1.98	2.16	1.14	1.25	2.30	2.29	2.36	3.36	2.54	2.38	**2.17**
Mean B	**1.71**	**1.89**	**1.89**	**1.97**	**2.20**	**2.29**	**2.38**	**2.52**	**2.50**	**2.52**	

	Treatment (A)	Pore Volume (B)	Interaction (A*B)
S.Em. ±	0.008	0.005	0.026
CD5%	0.023	0.014	0.072

B: Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates at 30 DAI:

Results of column study for Mg^{+} revealed that the concentrations of magnesium (Mg^{+}) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume.

The amendment effect at 30 DAI showed that, the mean lowest concentration of Mg^{+} was observed in treatment T3 and the highest in case of T18 (Table.23. Fig.29.). Amendment treatments showed variable response and affected mean Mg^{+} concentration significantly. The maximum mean Mg^{+} concentration in the leached was found in the treatment T25 (2.72 Cmolc (+) kg^{-1}) which was at par with T16, (2.70 Cmolc (+) kg^{-1}) T18(2.71 Cmolc (+) kg^{-1}) and T26(2.70 Cmolc (+) kg^{-1}). This treatment combination was found statistically superior to the rest of the treatments and the lowest removal of Mg^{+} from the soil was found in the treatment T3 (1.62 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Mg^{+} concentration in the leached was 2.17 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T10 (2.28 Cmolc (+) kg^{-1}), T11(2.29 Cmolc (+) kg^{-1}), T12 (2.26 Cmolc (+) kg^{-1}), T13 (2.26Cmolc (+) kg^{-1}), T14 (2.29 Cmolc (+) kg^{-1}) T15 (2.28 Cmolc (+) kg^{-1}), T16 (2.44Cmolc (+) kg^{-1}), T17 (2.31 Cmolc (+) kg^{-1}), T18 (2.42 Cmolc (+) kg^{-1}), T19 (2.30 Cmolc (+) kg^{-1}), T20 (2.29Cmolc (+) kg^{-1}),T21 (2.26 Cmolc (+) kg^{-1}) , T22 (2.30 Cmolc (+) kg^{-1}), T23 (2.31 Cmolc (+) kg^{-1}), T25 (2.45 Cmolc (+) kg^{-1}), T26 (2.43 Cmolc (+) kg^{-1}), T27 (2.42 Cmolc (+) kg^{-1}) and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leaching is presented in Table.23. and Fig.29.It is evident from the data that the Mg^{+} concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Mg^{+} was T25 which content 2.72 Cmolc (+) kg^{-1} Mg^{+} in the leachate when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically at par with the treatment

combination T16 PV 3.5 to PV5,T17PV4 to PV5, T18 PV3.5 to PV 5 ,T25 PV3.5 to PV5,T26 PV 4 to PV 5 T27 PV4 to PV 5 but these were superior to rest of the treatment combinations. As we increase the pore volume the concentration of Mg^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Mg^{+} was found in treatment combination T3 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

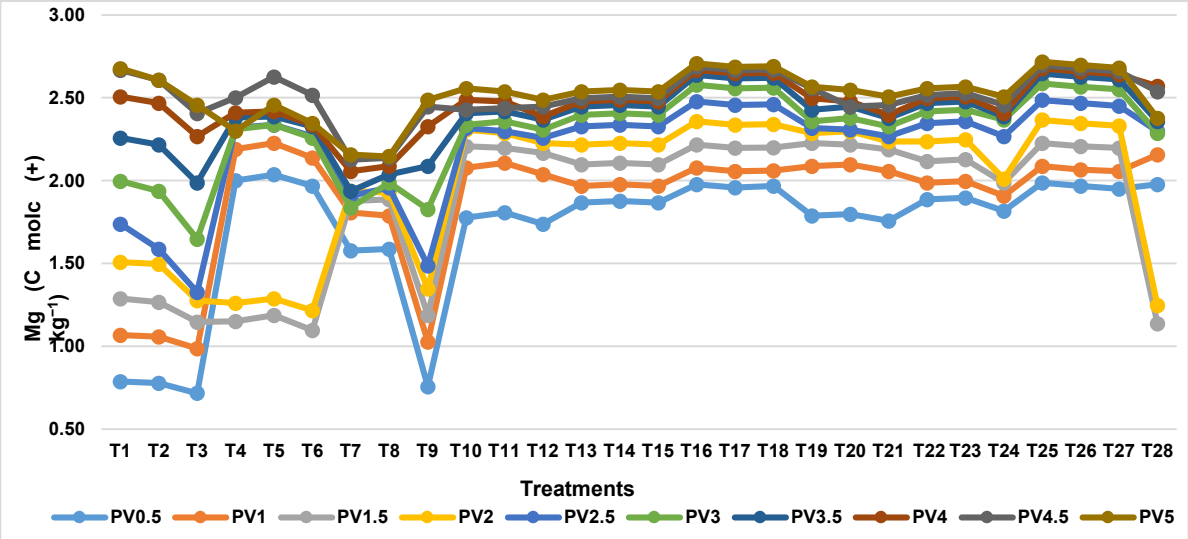


Fig.29: Interactive effect of various treatments on leachate Magnesium at 30 DAI

Table.24. Effect of various treatments, pore volume and their combination on the concentration of Mg^{+} in leachates at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	1.90	1.94	1.90	1.86	1.79	1.92	1.96	2.00	1.99	2.02	**1.93**
T2	1.92	1.97	1.98	2.01	1.89	2.03	2.09	2.14	2.15	2.14	**2.03**
T3	1.86	1.90	1.86	1.70	1.63	1.74	1.86	1.94	1.95	1.99	**1.84**
T4	2.15	2.39	2.54	2.64	2.70	2.76	2.81	2.87	2.92	2.95	**2.67**
T5	2.10	2.33	1.37	2.55	2.66	2.71	2.78	2.82	2.81	2.91	**2.50**
T6	2.04	2.26	1.32	2.51	2.62	2.66	2.75	2.76	2.72	2.83	**2.45**
T7	1.92	1.99	2.01	2.03	2.05	2.09	2.13	2.16	2.22	2.20	**2.07**
T8	1.91	1.96	2.03	2.05	2.06	2.07	2.15	2.19	2.20	2.19	**2.07**
T9	1.93	1.98	2.00	2.02	2.04	2.08	2.13	2.18	2.21	2.21	**2.08**
T10	2.32	2.39	2.48	2.63	2.70	2.75	2.80	2.84	2.85	2.88	**2.66**
T11	2.35	2.42	2.47	2.61	2.68	2.77	2.81	2.83	2.86	2.86	**2.67**
T12	2.30	2.35	2.44	2.55	2.64	2.72	2.76	2.74	2.87	2.81	**2.62**
T13	2.65	2.76	2.82	2.86	2.90	2.96	3.04	3.12	3.18	3.18	**2.95**
T14	2.66	2.77	2.83	2.87	2.91	2.97	3.05	3.13	3.19	3.19	**2.96**
T15	2.58	2.68	2.70	2.71	2.82	2.91	2.96	3.04	3.13	3.13	**2.87**
T16	3.24	3.37	3.46	3.53	3.56	3.56	3.53	3.47	3.38	3.26	**3.44**
T17	3.22	3.35	3.44	3.51	3.54	3.54	3.51	3.45	3.36	3.24	**3.42**
T18	3.14	3.26	3.03	3.30	3.35	3.34	3.32	3.26	3.21	3.12	**3.23**
T19	2.33	2.40	2.50	2.61	2.70	2.77	2.82	2.85	2.86	2.89	**2.67**
T20	2.34	2.41	2.49	2.62	2.69	2.79	2.84	2.83	2.87	2.87	**2.68**
T21	2.32	2.37	2.46	2.56	2.65	2.74	2.77	2.75	2.88	2.83	**2.63**
T22	2.67	2.78	2.84	2.88	2.92	2.98	3.06	3.14	3.20	3.20	**2.97**
T23	2.68	2.79	2.85	2.89	2.93	2.99	3.07	3.15	3.21	3.21	**2.98**
T24	2.60	2.70	2.71	2.73	2.84	2.93	2.98	3.05	3.14	3.15	**2.88**
T25	3.25	3.38	3.47	3.53	3.57	3.57	3.54	3.48	3.39	3.27	**3.45**
T26	3.23	3.36	3.45	3.52	3.55	3.55	3.52	3.46	3.37	3.25	**3.43**
T27	3.16	3.28	3.05	3.32	3.37	3.36	3.34	3.28	3.23	3.14	**3.25**
T28	2.04	2.26	1.32	2.51	2.62	2.66	2.75	2.76	2.72	2.83	**2.47**
Mean B	**2.46**	**2.57**	**2.51**	**2.70**	**2.75**	**2.81**	**2.87**	**2.90**	**2.92**	**2.91**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.014		0.008		0.044						
CD5%	0.038		0.023		0.121						

C: Effect of various treatments, pore volume and their combination on the concentration of Mg^+ in leachates at 45 DAI:

Results revealed that the concentrations of magnesium (Mg^+) in the leachate at 45 DAI increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Mg^+ concentration in the leached was found at par with 3 pore volume as the pore volume increases beyond 3 up to 5 pore volume.

In general, the mean lowest concentration of Mg^+ was observed in treatment T3 and the highest in case of T18 (Table.24. and Figure.30.). Amendment treatments showed variable response and affected mean Mg^+ concentration differently. The maximum mean Mg^+ concentration in the leached was found in the treatment T25 (3.45 Cmolc (+) kg^{-1}). This treatment was found statistically superior to the rest of the treatments except 17 and the lowest removal of Mg^+ from the soil was found in the treatment T3 (1.84 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Mg^+ concentration in the leached was 1.84 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments. T10 (2.66 Cmolc (+) kg^{-1}), T11(2.67 Cmolc (+) kg^{-1}), T12 (2.62 Cmolc (+) kg^{-1}), T13 (2.95 Cmolc (+) kg^{-1}),T14 (2.96 Cmolc (+) T15(2.87Cmolc (+) kg^{-1}), T16 (3.44 Cmolc (+) kg^{-1}),kg^{-1}),T17 (3.42 Cmolc (+) kg^{-1}), T18 (3.23 Cmolc (+) kg^{-1}) T19 (2.67 Cmolc (+) kg^{-1}), T20 (2.68 Cmolc (+) kg^{-1}), T21 (2.63 Cmolc (+) kg^{-1}), T22(2.97 Cmolc (+) kg^{-1}),T23 (2.98 Cmolc (+) kg^{-1}), T24 (2.88 Cmolc (+) kg^{-1}), T25 (3.45 Cmolc (+) kg^{-1}), T26 (3.43 Cmolc (+) kg^{-1}), T27 (3.25 Cmolc (+) kg^{-1}), statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on leaching is presented in Table.24. and Fig.30. It is evident from the data that the Mg^+ concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The treatment combination with highest leached Mg^+ was T25 which content Cmolc (+) kg^{-1} Mg^+ in the leached when the soil column is subjected to leaching with 3 pore volume.

This treatment was found statistically superior to rest of the treatments. As we increase the pore volume the concentration of Mg^{+} increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least amount leached Mg^{+} was found in treatment combination T3 at each pore volume. This treatment was found statistically inferior to rest of the treatment combination.

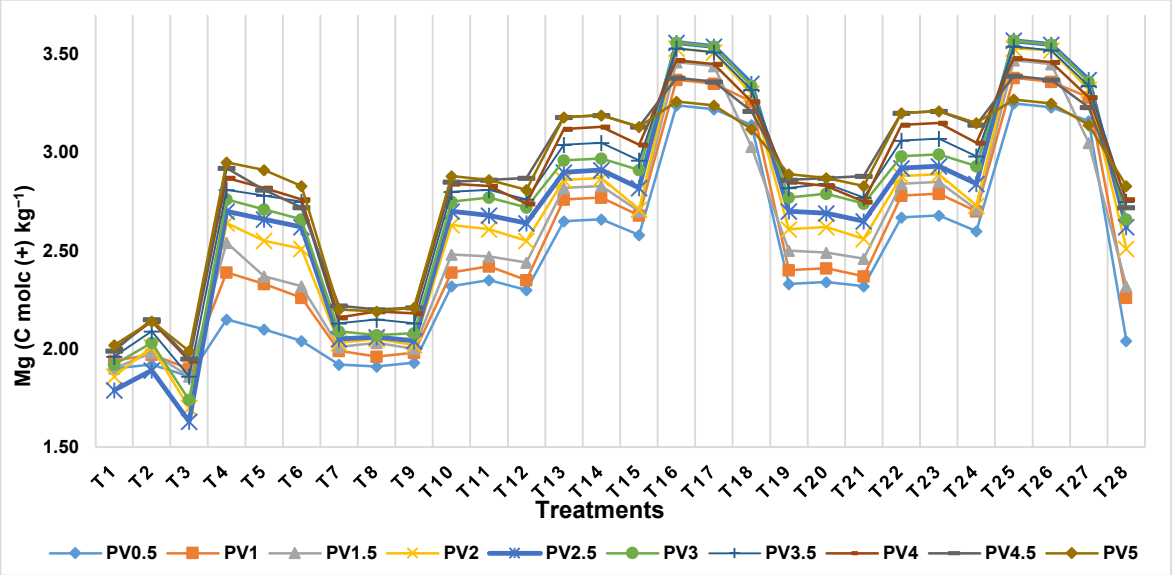


Fig.30: Interactive effect of various treatment on leachate Magnesium at 45 DAI

Table. 25. Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil at 15 DAI

Pore Volume / Treatment	PV0	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	10.08	9.80	9.62	9.51	9.44	9.39	9.34	9.30	9.27	9.26	**9.50**
T2	10.10	9.83	9.70	9.66	9.54	9.50	9.47	9.44	9.43	9.38	**9.60**
T3	9.89	9.70	9.69	9.66	9.51	9.20	8.76	8.29	7.98	8.08	**9.07**
T4	10.19	10.00	9.89	9.80	9.72	9.62	9.51	9.41	9.33	9.32	**9.68**
T5	10.37	10.29	10.20	10.16	10.05	9.93	9.82	9.74	9.68	9.69	**9.99**
T6	10.53	10.50	10.44	10.36	10.28	10.20	10.14	10.10	10.08	10.08	**10.27**
T7	9.92	9.60	9.44	9.34	9.25	9.14	8.98	8.79	8.60	8.48	**9.15**
T8	9.92	9.60	9.44	9.34	9.25	9.14	8.98	8.79	8.60	8.48	**9.15**
T9	10.04	9.76	9.58	9.35	9.28	9.21	9.24	9.24	9.23	9.23	**9.41**
T10	10.54	10.50	10.42	10.31	10.20	10.10	10.01	9.95	9.91	9.90	**10.18**
T11	10.51	10.50	10.45	10.37	10.25	10.10	9.94	9.80	9.70	9.70	**10.13**
T12	10.64	10.68	10.66	10.58	10.46	10.31	10.16	10.02	9.93	9.92	**10.33**
T13	10.65	10.70	10.68	10.60	10.48	10.35	10.23	10.12	10.07	10.07	**10.39**
T14	10.72	10.77	10.75	10.67	10.55	10.42	10.30	10.19	10.14	10.14	**10.46**
T15	10.58	10.61	10.59	10.57	10.53	10.47	10.42	10.39	10.37	10.38	**10.49**
T16	10.93	11.48	11.88	11.99	11.74	11.14	10.33	9.49	8.92	9.00	**10.69**
T17	10.22	11.42	11.78	11.86	11.68	11.11	10.27	9.43	8.89	9.06	**10.57**
T18	11.52	12.00	12.10	11.96	11.69	11.38	11.10	10.90	10.80	10.80	**11.42**
T19	10.38	10.30	10.22	10.14	10.05	9.95	9.84	9.75	9.69	9.70	**10.00**
T20	10.13	9.94	9.83	9.74	9.66	9.56	9.45	9.35	9.27	9.26	**9.62**
T21	10.43	10.42	10.37	10.29	10.17	10.02	9.86	9.72	9.62	9.62	**10.05**
T22	10.62	10.66	10.64	10.56	10.44	10.29	10.14	10.00	9.91	9.90	**10.31**
T23	10.63	10.68	10.66	10.58	10.46	10.33	10.21	10.10	10.05	10.05	**10.37**
T24	10.64	10.69	10.67	10.59	10.47	10.34	10.22	10.11	10.06	10.06	**10.38**
T25	10.95	11.50	11.90	12.01	11.76	11.16	10.35	9.51	8.94	9.02	**10.71**
T26	10.96	11.51	11.91	12.02	11.77	11.17	10.36	9.52	8.95	9.03	**10.72**
T27	11.48	11.96	12.06	11.92	11.65	11.34	11.06	10.86	10.76	10.76	**11.38**
T28	10.59	10.63	10.63	10.60	10.56	10.50	10.45	10.41	10.39	10.41	**10.51**
Mean B	**10.50**	**10.57**	**10.58**	**10.52**	**10.46**	**10.19**	**9.96**	**9.74**	**9.59**	**9.60**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.092		0.055		0.292						
CD5%	0.256		0.153		0.81						

Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil after 15,30 and 45 DAI:

The magnesium concentration of soil as influenced by various treatments under study was measured at 15, 30 and 45 Days after Incubation (DAI).

A: The findings of 15 days of incubation are presented in Table.25. and Fig.31. Among various treatments the mean highest Mg (11.42 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Trichoderma + Biomes) which was found at par with the treatment T27 (Vermicompost + NG45% + Biomes having concentration 11.38 cmol (+)/kg. The measured available Mg concentration of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from Mg concentration point of view are T18. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil by enhancing calcium in exchange sites as its concentration increase from 9.9 to >11 cmol (+)/kg.

The Mg concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in 10 steps with different amount of water based on pore volumes(pv) and time duration. The concentration of magnesium at PV 0.5, PV1,PV1.5,PV2,:PV2.5 was found significantly at par and significantly superior to the pore volume PV3, PV3.5, PV4, PV4.5 and PV5 increase in concentration was observed with increase in pore volume. The percentage change in the concertation of Mg in comparison to original soil for mean values of various treatments at different pore volumes was 5.02,5.69, 5.75,5.16, 4.6, 1.88, 0.41 2.63 4.12 4.04 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

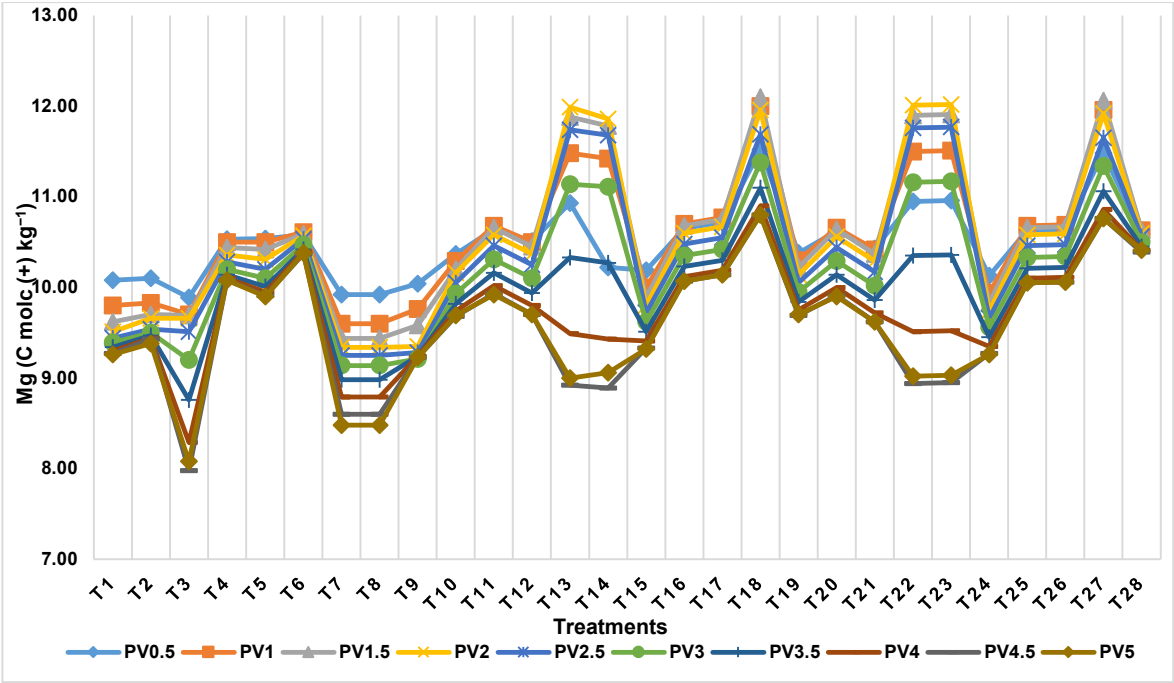


Fig.31: Interactive effect of various treatments on Soil magnesium at 15 DAI

Table.26. Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil at 30 DAI

Pore Volume / Treatment	PV0	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	8.81	8.48	8.21	8.10	8.08	8.07	8.03	7.94	7.81	7.68	**8.12**
T2	8.88	8.33	8.06	7.95	7.93	7.92	7.88	7.79	7.66	7.53	**7.99**
T3	9.02	8.54	8.36	8.32	8.31	8.26	8.15	8.00	7.88	7.90	**8.27**
T4	9.61	9.41	9.30	9.23	9.16	9.05	8.92	8.78	8.68	8.66	**9.08**
T5	9.64	9.44	9.33	9.25	9.18	9.10	9.00	8.90	8.82	8.82	**9.15**
T6	8.84	8.22	7.94	7.84	7.80	7.73	7.61	7.46	7.33	7.32	**7.81**
T7	8.81	8.19	7.93	7.84	7.80	7.73	7.59	7.41	7.24	7.21	**7.77**
T8	8.80	8.18	7.92	7.83	7.79	7.72	7.58	7.40	7.23	7.20	**7.76**
T9	9.12	8.66	8.45	8.36	8.31	8.24	8.13	7.99	7.88	7.88	**8.30**
T10	9.75	9.61	9.53	9.46	9.38	9.26	9.13	8.98	8.88	8.86	**9.28**
T11	9.74	9.59	9.50	9.43	9.35	9.25	9.12	9.00	8.90	8.89	**9.27**
T12	9.75	9.62	9.54	9.47	9.39	9.28	9.14	9.00	8.88	8.84	**9.29**
T13	10.00	10.04	10.01	9.92	9.81	9.70	9.59	9.50	9.45	9.44	**9.74**
T14	10.05	10.09	10.06	9.97	9.86	9.75	9.64	9.55	9.50	9.49	**9.79**
T15	10.14	10.18	10.15	10.06	9.95	9.84	9.73	9.64	9.59	9.58	**9.88**
T16	10.38	10.54	10.55	10.47	10.35	10.21	10.08	9.99	9.93	9.92	**10.24**
T17	10.33	10.49	10.50	10.42	10.30	10.16	10.03	9.94	9.88	9.87	**10.19**
T18	10.51	10.72	10.74	10.64	10.49	10.33	10.20	10.11	10.05	10.02	**10.38**
T19	9.41	9.10	8.96	8.89	8.84	8.76	8.64	8.51	8.42	8.42	**8.79**
T20	9.64	9.42	9.28	9.20	9.12	9.05	8.97	8.90	8.84	8.84	**9.12**
T21	9.63	9.50	9.42	9.35	9.27	9.16	9.02	8.88	8.76	8.72	**9.17**
T22	9.66	9.44	9.30	9.19	9.10	8.99	8.89	8.78	8.71	8.71	**9.07**
T23	9.66	9.45	9.33	9.24	9.17	9.08	8.99	8.88	8.80	8.76	**9.13**
T24	9.99	10.03	10.00	9.91	9.80	9.69	9.58	9.49	9.44	9.43	**9.73**
T25	9.98	10.14	10.15	10.07	9.95	9.81	9.68	9.59	9.53	9.52	**9.84**
T26	10.10	10.26	10.27	10.19	10.07	9.93	9.80	9.71	9.65	9.64	**9.96**
T27	10.40	10.61	10.63	10.53	10.38	10.22	10.09	10.00	9.94	9.91	**10.27**
T28	8.92	8.30	8.02	7.92	7.88	7.81	7.69	7.54	7.41	7.40	**7.89**
Mean B	**9.62**	**9.45**	**9.33**	**9.25**	**9.17**	**9.07**	**8.96**	**8.84**	**8.75**	**8.73**	

	Treatment (A)	**Pore Volume (B)**	**Interaction (A*B)**
S.Em. ±	0.012	0.007	0.038
CD5%	0.033	0.02	0.105

B: Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil at 30 DAI:

The findings of 30 days of incubation are presented in Table 26 and Fig.32.Among various treatments the mean highest Mg (10.38 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes) which was followed by the treatment T27 (Vermicompost + NG45% Biomes) having concentration 10.27 cmol(+)/kg. The measured Av. Mg^{+} concentration of these two treatments was significantly higher than the rest of the treatments under study, the treatments with high concentration of Mg were T18, the measured soil Mg was found more than 10 cmol (+)/kg. The significant reduction in concentration of mg was observed in all the treatments comprising Biochar/ Vermicompost and its combination with 15, 30 and 45%(GR) NG + Biomes with increase in days of incubation.

The Mg concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in10 steps with different amount of water based on pore volumes(pv) and time duration. The concentration of magnesium. was found highest in for PV 0.5 , PV 0.5 further significant decrease in concentration of Mg was obtained till PV 4.5 which might be due to leaching with increase in concentration of water. The percentage decrease in the concertation of Mg in comparison to original soil for mean values of various treatments at different pore volumes was 3.76,5.54,6.66, 7.52,8.31,9.28,10.43,11.58,12.5,12.73 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

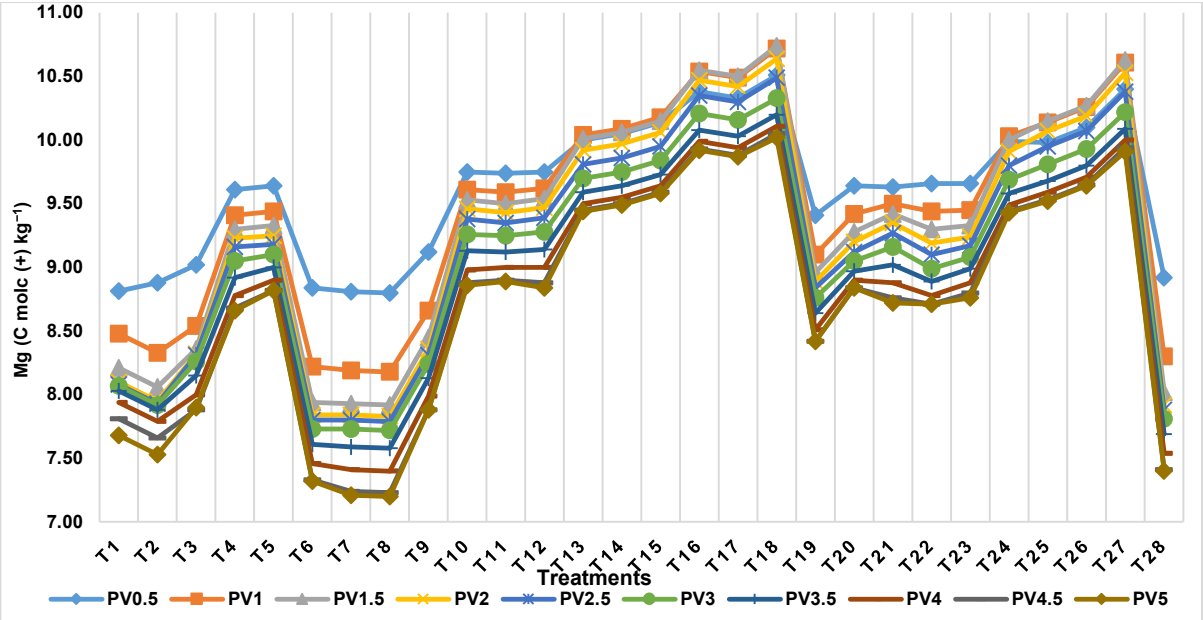


Fig.32. Interactive effect of various treatments on Soil magnesium at 30 DAI

Table. 27. Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	8.42	7.62	7.29	7.20	7.20	7.18	7.09	6.95	6.83	6.86	**7.26**
T2	8.50	7.70	7.37	7.28	7.28	7.26	7.17	7.03	6.91	6.94	**7.34**
T3	8.60	7.97	7.79	7.82	7.91	7.94	7.89	7.77	7.66	7.73	**7.91**
T4	9.09	8.67	8.51	8.45	8.40	8.29	8.11	7.91	7.76	7.79	**8.30**
T5	9.17	8.72	8.50	8.42	8.39	8.37	8.33	8.26	8.18	8.12	**8.44**
T6	9.62	9.40	9.25	9.17	9.11	9.04	8.98	8.92	8.87	8.84	**9.12**
T7	8.36	7.55	7.17	6.89	6.94	6.89	6.86	6.75	6.63	6.71	**7.07**
T8	8.31	7.50	7.12	6.84	6.89	6.84	6.81	6.70	6.58	6.66	**7.02**
T9	8.44	7.63	7.25	6.97	7.02	6.97	6.94	6.83	6.71	6.79	**7.15**
T10	9.17	8.81	8.65	8.58	8.52	8.42	8.27	8.06	7.86	7.74	**8.41**
T11	9.36	8.97	8.78	8.70	8.66	8.61	8.55	8.47	8.41	8.43	**8.69**
T12	9.28	8.90	8.71	8.62	8.57	8.52	8.45	8.36	8.29	8.28	**8.60**
T13	9.78	9.65	9.56	9.48	9.39	9.27	9.14	9.02	8.93	8.93	**9.31**
T14	9.64	9.49	9.41	9.35	9.25	9.11	8.93	8.76	8.64	8.67	**9.12**
T15	9.65	9.46	9.35	9.26	9.18	9.08	8.97	8.87	8.79	8.78	**9.14**
T16	9.88	9.77	9.61	9.39	9.13	8.81	8.46	8.08	7.71	7.36	**8.82**
T17	9.83	9.72	9.56	9.34	9.08	8.76	8.41	8.03	7.66	7.31	**8.77**
T18	9.95	9.90	9.83	9.73	9.61	9.48	9.36	9.26	9.21	9.22	**9.55**
T19	8.92	8.36	8.10	8.01	8.00	7.98	7.93	7.86	7.79	7.80	**8.07**
T20	9.08	8.62	8.41	8.33	8.29	8.24	8.16	8.05	7.96	7.96	**8.31**
T21	9.13	8.75	8.56	8.47	8.42	8.37	8.30	8.21	8.14	8.13	**8.45**
T22	9.33	9.14	9.03	8.94	8.86	8.76	8.65	8.55	8.47	8.46	**8.82**
T23	9.38	9.19	9.08	8.99	8.91	8.81	8.70	8.60	8.52	8.51	**8.87**
T24	9.47	9.28	9.17	9.08	9.00	8.90	8.79	8.69	8.61	8.60	**8.96**
T25	9.48	9.37	9.21	8.99	8.73	8.41	8.06	7.68	7.31	6.96	**8.42**
T26	9.60	9.49	9.33	9.11	8.85	8.53	8.18	7.80	7.43	7.08	**8.54**
T27	9.84	9.79	9.72	9.62	9.50	9.37	9.25	9.15	9.10	9.11	**9.44**
T28	9.63	9.42	9.29	9.20	9.14	9.07	9.01	8.94	8.89	8.87	**9.14**
Mean B	**9.24**	**8.88**	**8.70**	**8.58**	**8.51**	**8.40**	**8.27**	**8.12**	**7.99**	**7.95**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.026		0.016		0.083						
CD5%	0.073		0.043		0.229						

C: Effect of various treatments and pore volume and their combination on the Magnesium concentration of soil after 45 days of incubation:

The findings of 45 days of incubation are presented in Table.27 and Fig.33. Among various treatments the mean highest Mg (9.55 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% +Biomes) which was followed by the treatment T27 (Vermicompost + NG45% +Biomes) having concentration 9.44 cmol(+)/kg. The measured Mg concentration of these two treatments was significantly higher than the rest of the treatments under study, the treatments with high concentration of Av. Mg^+ The significant reduction in concentration of Av. Mg^+ was observed in all the treatments comprising Biochar/ Vermicompost and its combination with 15, 30 and 45%(GR) NG + Biomes with increase in days of incubation.

The Mg concentration in soil increased continuously till certain pore volumes, as soil leaching was performed in10 steps with different amount of water based on pore volumes (PV) and time duration. The concentration of magnesium PV 0.5, 1,1.5,2,2.5 was found statistically at par with each other, after 2.5 further decrease in concentration of Mg was obtained due to dilution of leachate. The percentage change in the concertation of Mg in comparison to original soil for mean values of various treatments at different pore volumes was 7.57 11.16, 13.03, 14.24, 14.95, 16, 17.27, 18.76, 20.09, 20.52 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

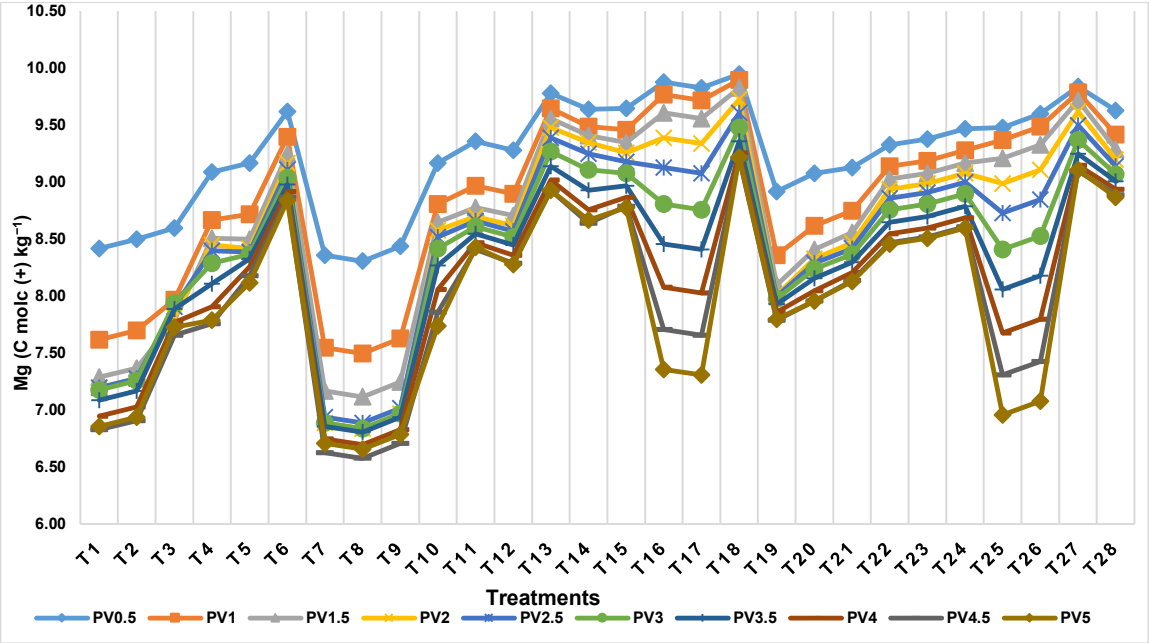


Fig.33: Interactive effect of various treatments on Soil magnesium at 45 DAI

Table.28. Effect of various treatments, pore volume and their combination on the concentration of Na^+ in leachates at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	5.09	6.09	7.29	8.03	8.32	9.60	9.60	9.59	9.54	9.58	**8.27**
T2	4.07	6.07	7.27	8.01	8.30	9.15	9.09	9.13	9.08	9.04	**7.92**
T3	3.88	5.88	7.08	7.82	8.11	8.88	10.06	10.02	10.01	10.01	**8.17**
T4	4.00	6.00	7.20	7.94	8.23	9.51	9.51	9.49	9.51	9.50	**8.09**
T5	6.50	8.00	8.84	9.36	9.58	10.91	10.90	10.86	10.90	10.88	**9.67**
T6	7.00	9.37	10.84	11.70	11.98	12.77	12.78	12.75	12.74	12.76	**11.47**
T7	5.36	6.36	7.56	8.30	8.59	9.87	9.84	9.85	9.87	9.86	**8.54**
T8	5.35	6.35	7.55	8.29	8.58	9.86	9.84	9.81	9.84	9.86	**8.53**
T9	5.47	6.47	7.67	8.41	8.70	9.99	9.97	9.98	9.99	9.98	**8.66**
T10	8.29	10.99	12.58	13.56	13.93	15.75	15.74	15.72	15.74	15.71	**13.80**
T11	8.00	12.00	14.34	15.66	16.10	17.55	17.51	17.52	17.51	17.53	**15.37**
T12	9.00	13.00	15.59	17.23	17.81	19.56	19.55	19.52	19.51	19.54	**17.03**
T13	10.00	15.00	17.47	18.62	18.97	20.01	20.00	19.96	19.99	19.98	**18.00**
T14	10.00	14.00	17.07	19.34	20.21	22.01	21.99	21.98	22.00	21.99	**19.06**
T15	12.00	16.00	18.87	20.91	21.71	24.35	24.34	24.37	24.34	24.31	**21.12**
T16	18.00	21.00	23.65	25.88	26.82	29.00	29.01	29.02	28.98	28.97	**26.03**
T17	17.95	20.95	23.60	25.83	26.77	29.87	29.88	29.87	29.86	29.87	**26.44**
T18	19.00	22.20	25.88	29.33	30.81	32.13	32.97	33.01	33.02	33.05	**28.24**
T19	7.00	9.80	11.31	12.10	12.36	13.49	13.46	13.48	13.46	13.47	**11.99**
T20	7.10	9.63	10.95	11.60	11.80	12.73	12.71	12.72	12.74	12.73	**11.47**
T21	8.72	12.72	15.31	16.95	17.53	18.79	18.76	18.74	18.72	18.75	**16.50**
T22	10.93	14.93	17.80	19.84	20.64	22.44	22.43	22.41	22.42	22.43	**19.62**
T23	10.96	14.96	17.83	19.87	20.67	22.46	22.43	22.42	22.49	22.46	**19.65**
T24	11.02	15.02	17.89	19.93	20.73	22.52	22.53	22.54	22.51	22.52	**19.72**
T25	17.60	20.60	23.25	25.48	26.42	28.60	28.61	28.62	28.59	28.60	**25.63**
T26	17.72	20.72	23.37	25.60	26.54	28.72	29.64	29.66	29.67	29.68	**26.13**
T27	16.60	19.80	23.48	26.93	28.41	32.41	32.40	32.40	32.40	32.40	**27.72**
T28	7.08	9.45	10.92	11.78	12.06	12.61	12.52	12.58	12.77	12.60	**11.43**
Mean B	**9.77**	**12.62**	**14.73**	**16.22**	**16.81**	**18.52**	**18.57**	**18.57**	**18.58**	**18.57**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.011		0.007		0.036						
CD5%	0.031		0.019		0.099						

Effect of various treatments, pore volume and their combination on the concentration of Na^+ in leachates at 15,30 and 45 DAI:

A: The results of column study for leaching at 15 DAI, revealed that the concentrations of sodium (Na^+) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Na^+ concentration in the leached was found at par, in the treatment PV3(18.52 Cmolc (+) kg^{-1}), PV3.5(18.57 Cmolc (+) kg^{-1}), PV4(18.57 Cmolc (+) kg^{-1}), PV4.5(15.58 Cmolc (+) kg^{-1})PV5(18.58 Cmolc (+) kg^{-1}). All the treatments were found statistically superior to rest of treatments from pore volume pointof view .

In general, the mean lowest concentration of Na^+ was observed in treatment T3 and the highest in case of T18 (Table.28. Fig.34.) Amendment treatments showed variable response and affected mean Na^+ concentration significantly. The maximum mean Na^+ concentration in the leached was found in the treatment T18 (28.24 Cmolc (+) kg^{-1}). This amendment treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest removal of Na+ from the soil was found in the treatment T2 (8.11 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments except T3 and T4. In case of conventional treatment, the amount of Na^+ concentration in the leached was 11.43 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments (T10 13.80 Cmolc (+) kg^{-1}),(T11 15.37 Cmolc (+) kg^{-1}) , T12 (17.03 Cmolc (+) kg^{-1}), T13 (18.00 Cmolc (+) kg^{-1}), T15 (21.12 Cmolc (+) kg^{-1}),T16 (26.03Cmolc (+) kg^{-1}), T17(26.44 Cmolc (+) kg^{-1}), T18 (28.24 Cmolc(+) kg^{-1}) T19 (11.99 Cmolc (+) kg^{-1}), T20 (11.47 Cmolc (+) kg^{-1}), T22 (19.62 Cmolc (+) kg^{-1}), T23 (19.65 Cmolc (+) kg^{-1}), T24 (19.72 Cmolc (+) kg^{-1}), T25 (25.63 Cmolc (+) kg^{-1}), T26 (26.13 Cmolc (+) kg^{-1}), T27(27.72 Cmolc (+) kg^{-1}), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Na^+ leaching is presented in Table.28. and Fig.34.It is evident from the data that the Na^+ concentration in the leached was affected significantly by different treatment combinations i.e. amendment and pore volume combinations. The most effective treatment combination was T18 which content 33.05 Cmolc (+) kg^{-1} Na^+ in the leached when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically superior to rest of the treatments. In case of T18 as we increase the pore volume the concentration of Na^+ increases significantly in the leached. Overall results suggest that as we treat the soil with different amendments the sodium removal from the soil increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 with 5 pore volume which is at par with PV 3.5, which removed 32.05 % more sodium from the soil as compared to treatment T28 which comprised of addition of normal gypsum as per gypsum requirement of the soil with 5 pore volume.

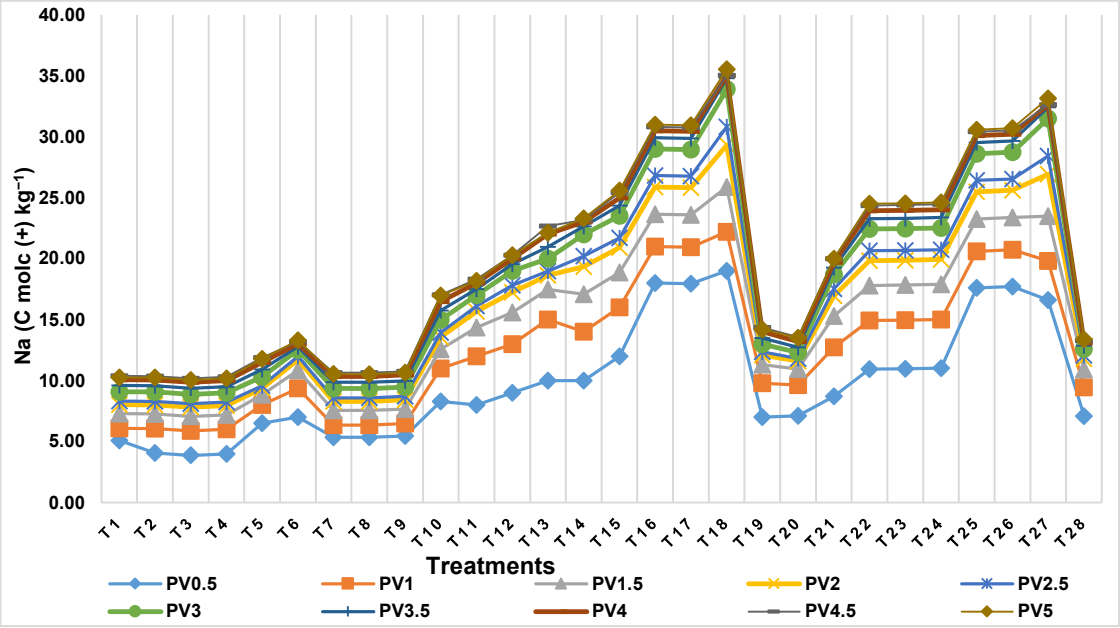


Fig.34: Interactive effect of various treatments on leachate sodium at 15 DAI

Table.29. Effect of various treatments, pore volume and their combination on the concentration of Na+ in leachates at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	9.30	13.30	18.91	24.73	27.39	33.41	35.52	36.29	36.36	36.77	27.20
T2	8.00	12.00	17.61	19.10	23.89	28.88	32.11	34.22	34.99	35.06	24.58
T3	5.50	8.50	11.04	13.19	14.14	16.50	17.67	18.49	18.92	18.88	14.28
T4	7.00	10.00	12.54	14.69	15.64	18.00	19.17	19.99	20.42	20.38	15.78
T5	12.00	16.00	21.61	27.43	30.09	36.11	38.22	38.99	39.06	39.47	29.90
T6	16.00	20.20	27.52	35.67	39.52	48.51	51.77	53.02	53.11	53.53	39.88
T7	9.57	13.57	19.18	25.00	27.66	33.68	35.79	36.56	36.63	37.04	27.47
T8	9.56	13.56	19.17	24.99	27.65	33.67	35.78	36.55	36.62	37.03	27.46
T9	9.68	13.68	19.29	25.11	27.77	33.79	35.90	36.67	36.74	37.15	27.58
T10	13.12	19.12	26.10	32.92	36.00	43.12	45.85	45.79	45.72	46.27	35.40
T11	13.00	19.00	25.98	32.80	35.88	43.00	45.73	46.99	47.30	47.48	35.71
T12	14.00	22.00	30.57	38.42	41.80	49.00	51.28	51.99	51.97	52.48	40.35
T13	13.80	22.00	29.90	37.07	40.27	48.00	51.44	53.50	56.28	58.01	41.02
T14	16.00	24.00	29.69	34.30	36.47	43.00	47.31	53.05	57.47	58.96	40.02
T15	18.00	28.50	37.67	45.31	48.52	55.68	58.51	60.00	60.46	60.30	47.29
T16	19.90	29.50	39.74	49.27	53.47	62.90	66.38	67.90	68.20	68.41	52.56
T17	19.85	29.45	39.69	49.22	53.42	62.85	66.33	67.85	68.15	68.36	52.51
T18	26.00	35.60	45.84	55.37	59.57	69.00	72.48	74.00	74.30	74.51	58.66
T19	9.09	13.29	20.32	25.38	33.23	36.61	43.81	46.09	46.80	46.78	32.14
T20	9.00	13.20	20.23	25.29	33.14	36.52	43.72	46.00	46.71	46.69	32.05
T21	13.42	21.42	29.99	37.84	41.22	48.42	50.70	51.41	51.39	51.90	39.77
T22	16.93	27.43	36.60	44.24	47.45	54.61	57.44	58.93	59.39	59.23	46.22
T23	16.96	27.46	36.63	44.27	47.48	54.64	57.47	58.96	59.42	59.26	46.25
T24	17.02	27.52	36.69	44.33	47.54	54.70	57.53	59.02	59.48	59.32	46.31
T25	19.50	29.10	39.34	48.87	53.07	62.50	65.98	67.50	67.80	68.01	52.16
T26	19.62	29.22	39.46	48.99	53.19	62.62	66.10	67.62	67.92	68.13	52.28
T27	23.60	33.20	43.44	52.97	57.17	66.60	70.08	71.60	71.90	72.11	56.26
T28	16.15	20.35	27.67	35.82	39.67	48.66	51.92	53.17	53.26	53.68	40.03
Mean B	14.34	21.15	28.66	35.45	39.01	45.89	49.00	50.43	50.95	51.25	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.011		0.007		0.035						
CD5%	0.031		0.018		0.097						

B: Effect of various treatments, pore volume and their combination on the concentration of Na+ in leachates at 30 DAI:

Results revealed that the concentrations of sodium (Na^+) in the leachate increased significantly with increased pore volume i.e. from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in Na+ concentration in the leached was found significantly higher in PV5 as compared to rest of the treatments. The difference among all other treatments were also significant, Lower values of Na^+ in the leachate in the PV0.5(14.34 Cmolc (+) kg^{-1}) which was statistically inferior to rest of the treatments from pore volume point of view.

Amendment treatments showed variable response and affected mean Na+ concentration significantly (Table.29.Fig.35.). The maximum mean Na+ concentration in the leached was found in the treatment T18 (58.66 Cmolc (+) kg^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest removal of Na+ from the soil was found in the treatment T3 (14.28 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Na+ concentration in the leached was 40.03 Cmolc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments T12 (40.35 Cmolc (+) kg^{-1}), T13(41.02 Cmolc (+) kg^{-1}), T15 (47.29 Cmolc (+) kg^{-1}), T16 (52.56 Cmolc (+) kg^{-1}), T17(52.51 Cmolc (+) kg^{-1}), T18 (58.66 Cmolc (+) kg^{-1}), T22 (46.22 Cmolc (+) kg^{-1}), T23 (46.25 Cmolc (+) kg^{-1}), T24 (46.31 Cmolc (+) kg^{-1}), T25 (52.16), T26 (52.28 Cmolc (+) kg^{-1}), T27(56.26 Cmolc (+) kg^{-1}), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Na^+ leaching is presented in Table.29. and Fig.35. It is evident from the data that the Na^+ concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most

effective treatment combination was T18 which content 74.51 Cmolc (+) kg^{-1} Na^+ in the leached when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically superior to rest of the treatments. In case of T18 as we increase the pore volume the concentration of Na^+ increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for Na+ leaching was T3 at 0.5 pore volume. This treatment was found statistically inferior to rest of the treatment combination. This trend persisted in all the treatment combinations. The most effective treatment was T18 with 5 pore volume, which removed 38.80% more sodium from the soil as compared to treatment T28 which comprised of addition of normal gypsum as per gypsum requirement of the soil with 5 pore volume,

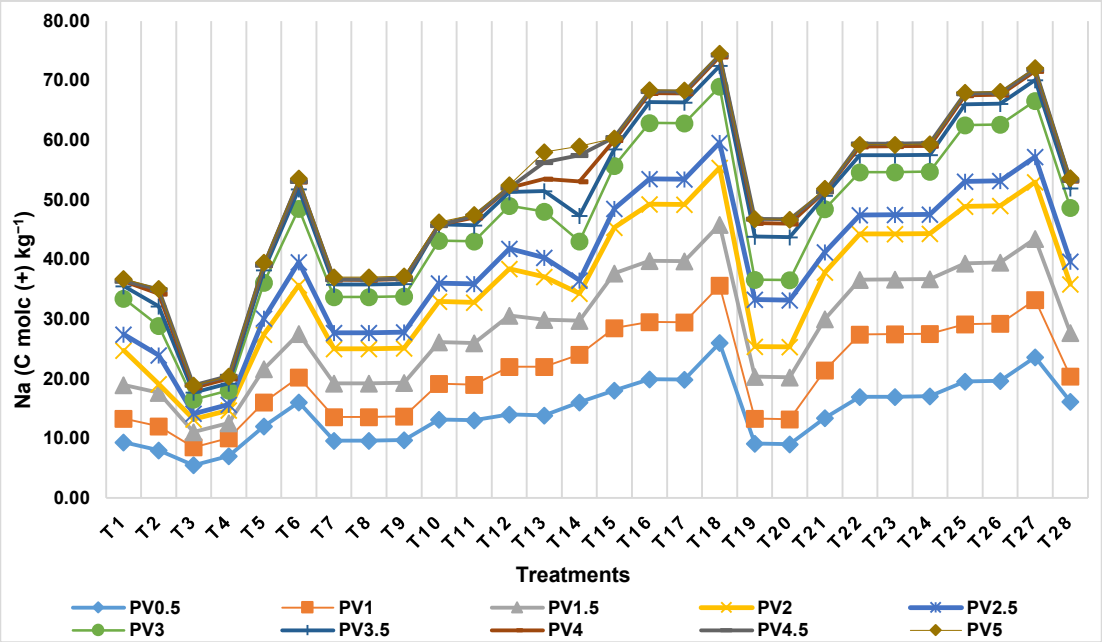


Fig.35: Interactive effect of various treatments on leachate sodium at 30 DAI

Table.30. Effect of various treatments, pore volume and their combination on the concentration of Na^+ in leachates at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	11.92	15.92	21.53	27.35	30.01	36.03	38.14	38.91	38.98	39.39	**29.82**
T2	10.27	14.27	19.88	21.37	26.16	31.15	34.38	36.49	37.26	37.33	**26.86**
T3	7.87	10.87	13.41	15.56	16.51	18.87	20.04	20.86	21.29	21.25	**16.66**
T4	13.17	20.20	26.28	29.46	30.77	33.97	35.66	36.96	37.68	37.46	**30.16**
T5	15.97	21.97	25.26	33.11	36.49	43.69	45.97	46.68	46.66	46.96	**36.28**
T6	17.97	28.47	37.64	45.28	48.49	55.65	58.48	59.97	60.43	60.27	**47.27**
T7	12.19	16.19	21.80	27.62	30.28	36.30	38.41	39.18	39.25	39.66	**30.09**
T8	12.18	16.18	21.79	27.61	30.27	36.29	38.40	39.17	39.24	39.65	**30.08**
T9	12.30	16.30	21.91	27.73	30.39	36.41	38.52	39.29	39.36	39.77	**30.20**
T10	35.97	39.97	45.20	50.85	53.63	60.97	64.60	66.97	68.06	67.98	**55.42**
T11	37.97	44.97	51.35	56.90	59.31	64.97	67.44	68.97	69.73	69.98	**59.16**
T12	38.97	50.97	58.77	63.86	65.74	69.97	72.17	73.98	75.07	74.78	**64.43**
T13	39.97	50.97	58.81	64.33	66.44	70.97	72.94	74.27	74.98	74.87	**64.86**
T14	37.97	49.97	56.56	60.06	61.20	63.98	65.96	67.98	69.28	68.50	**60.15**
T15	47.97	57.61	64.09	68.51	70.22	74.22	76.31	77.96	78.86	78.44	**69.42**
T16	48.97	57.97	67.17	75.49	79.08	86.97	89.77	90.97	91.28	91.77	**77.95**
T17	48.92	57.92	67.12	75.44	79.03	86.92	89.72	90.92	91.23	91.72	**77.90**
T18	49.07	60.87	70.78	78.62	81.75	88.12	90.61	91.73	91.34	91.78	**79.36**
T19	36.85	44.82	48.44	50.00	50.54	52.72	55.06	57.68	59.44	58.54	**51.41**
T20	43.75	51.72	55.34	56.90	57.44	59.62	61.96	64.58	66.34	65.44	**58.31**
T21	37.39	49.39	57.19	62.28	64.16	68.39	70.59	72.40	73.49	73.20	**62.85**
T22	46.90	56.54	63.02	67.44	69.15	73.15	75.24	76.89	77.79	77.37	**68.35**
T23	46.93	56.57	63.05	67.47	69.18	73.18	75.27	76.92	77.82	77.40	**68.38**
T24	46.99	56.63	63.11	67.53	69.24	73.24	75.33	76.98	77.88	77.46	**68.44**
T25	48.57	57.57	66.77	75.09	78.68	86.57	89.37	90.57	90.88	91.37	**77.55**
T26	48.69	57.69	66.89	75.21	78.80	86.69	89.49	90.69	91.00	91.49	**77.67**
T27	48.67	60.47	70.38	78.22	81.35	87.72	89.81	90.67	90.94	91.38	**78.96**
T28	18.12	28.62	37.79	45.43	48.64	55.80	58.63	60.12	60.58	60.42	**47.42**
Mean B	**32.95**	**41.13**	**47.91**	**53.39**	**55.82**	**61.17**	**60.57**	**64.56**	**65.58**	**65.56**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.021		0.013		0.067						
CD5%	0.059		0.035		0.186						

C: Effect of various treatments, pore volume and their combination on the concentration of Na^+ in leachates at 45 DAI:

Results revealed that the concentrations of sodium (Na^+) in the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 4.5 pore volume but the differences in Na^+ concentration in the leached was found at par with 5 pore volume as the pore volume increases beyond PV4.5 (65.58 Cmolc (+) kg^{-1}), PV5 (65.56 Cmolc (+) kg^{-1}).

Amendment treatments showed variable response and affected mean Na+ concentration significantly (Table.30 and Fig.36.). The maximum mean Na^+ concentration in the leached was found in the treatment T18(79.36 Cmolc (+) kg^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest removal of Na^+ from the soil was found in the treatment T3 (16.66 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment, the amount of Na^+ concentration in the leached was 47.43 C molc (+) kg^{-1}). The conventional method was found statistically inferior to the treatments (T10 55.42 Cmolc (+) kg^{-1}), T11 (59.16 Cmolc (+) kg^{-1}) , T12 (64.43 Cmolc (+) kg^{-1}), T13 (64.86 Cmolc (+) kg^{-1}), T14 (60.15 Cmolc (+) kg^{-1}), T15 (69.42 Cmolc (+) kg^{-1}),T16 (77.90 Cmolc (+) kg^{-1}), T17(77.95 Cmolc (+) kg^{-1}), T18 (79.36Cmolc (+) kg^{-1}), T19 (51.41 Cmolc (+) kg^{-1}), T20 (58 .31 Cmolc (+) kg^{-1}), T22 (68.35 Cmolc (+) kg^{-1}), T23 (68.38 Cmolc (+) kg^{-1}), T24 (68.44 Cmolc (+) kg^{-1}), , T25 (77.55 Cmolc (+) kg^{-1}), T26 (78.96 Cmolc (+) kg^{-1}), T27 (78.96 Cmolc (+) kg^{-1}), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect on Na^+ leaching is presented in Table.30.and Fig.36.It is evident from the data that the Na^+ concentration in the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most effective treatment combination was T18 which content 79.36 Cmolc (+) kg^{-1} Na^+ in the leached when the soil column is subjected to leaching with 5 pore volume. This treatment was found statistically superior to rest of the treatments. In case of T18 as we increase the pore volume the concentration of Na^+ increases significantly in the leached. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for Na^+ leaching was T4 at 5 pore volume. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the sodium removal from the soil increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 with 5 pore volume which is at par with PV 4, which removed 51.90% more sodium from the soil as compared to treatment T28 which comprised of addition of normal gypsum as per gypsum requirement of the soil with 5 pore volume.

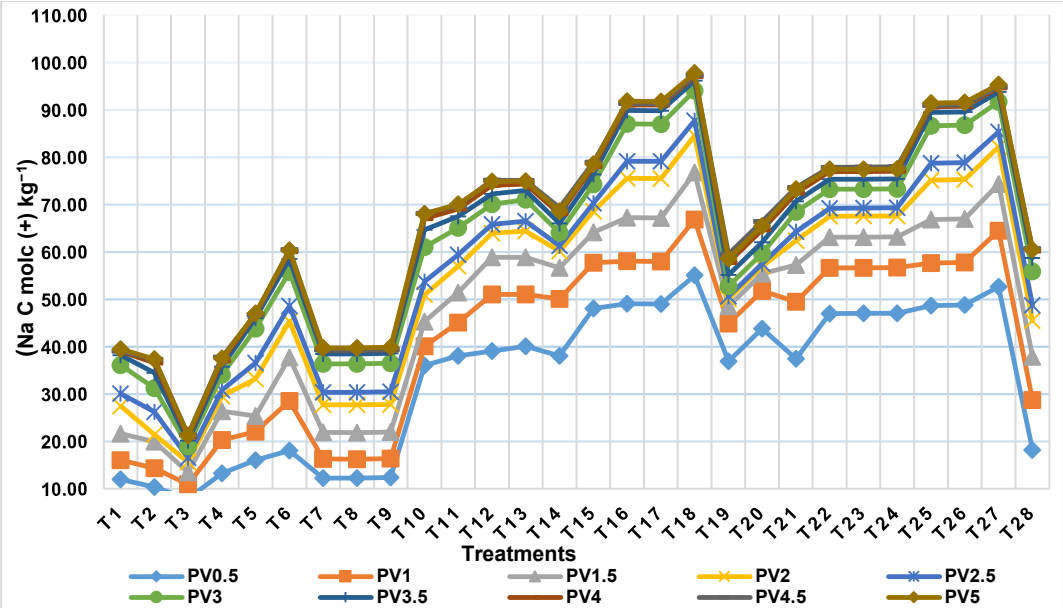


Fig.36: Interactive effect of various treatments on leachate Sodium at 45 DAI

Table. 31. Effect of various treatments and pore volume and their combination on the soil Na^+ at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	242.2	234.2	224.9	215.4	206.6	199.1	193.2	189.2	186.9	186.2	**207.8**
T2	228.7	216.0	206.8	199.0	191.3	183.2	174.9	167.2	161.5	160.2	**188.9**
T3	248.5	243.1	235.8	227.8	219.8	212.5	206.3	201.1	196.9	193.1	**218.5**
T4	183.9	150.1	134.7	128.7	125.6	121.4	114.6	106.1	99.3	100.1	**126.5**
T5	197.2	172.0	161.1	160.3	160.9	160.3	157.2	152.0	147.6	148.0	**161.7**
T6	163.7	119.3	100.3	95.6	96.6	97.8	96.3	91.9	87.3	87.9	**103.7**
T7	241.9	233.0	222.7	212.6	203.4	195.9	190.6	186.9	184.1	181.0	**205.2**
T8	241.9	233.0	222.8	212.6	203.6	196.2	190.8	187.0	184.2	181.0	**205.3**
T9	237.0	228.9	219.7	210.3	201.5	193.9	188.1	184.1	181.8	181.0	**202.6**
T10	173.1	131.2	110.9	103.3	101.8	101.6	99.9	96.0	91.2	88.9	**109.8**
T11	181.5	145.4	128.6	122.3	119.9	117.3	112.1	104.6	97.0	93.8	**122.3**
T12	196.6	169.3	156.2	150.9	148.7	146.6	142.8	161.5	132.5	130.6	**153.6**
T13	199.7	172.2	157.9	151.3	148.1	145.4	141.8	137.2	133.1	132.2	**151.9**
T14	199.5	172.0	157.7	151.1	147.9	145.2	141.6	137.0	132.9	132.0	**151.7**
T15	201.1	132.0	114.9	110.4	110.6	110.2	106.7	100.6	94.6	94.6	**117.6**
T16	181.7	147.6	133.6	130.3	130.7	130.3	127.1	121.3	116.0	116.4	**133.5**
T17	181.3	147.2	133.2	129.9	130.3	129.9	126.7	120.9	115.6	116.0	**133.1**
T18	179.2	143.2	127.7	123.6	124.0	124.4	122.5	118.5	114.6	115.5	**129.3**
T19	199.1	171.8	158.6	153.3	151.2	149.0	145.3	140.0	134.9	133.1	**153.6**
T20	198.3	171.0	157.8	152.5	150.4	148.3	144.5	139.2	134.1	132.2	**152.8**
T21	196.6	169.3	156.2	150.8	148.7	146.6	142.8	161.5	132.5	130.5	**153.6**
T22	199.5	172.0	157.8	151.2	147.9	145.2	141.6	137.0	132.9	132.0	**151.7**
T23	199.6	172.0	157.8	151.2	147.9	145.2	141.6	137.0	132.9	132.0	**151.7**
T24	198.3	170.7	156.5	149.8	146.7	144.0	140.3	135.8	131.7	130.8	**150.5**
T25	182.4	148.3	134.3	131.0	131.4	131.1	127.8	122.1	116.7	117.1	**134.2**
T26	181.3	147.2	133.2	129.9	130.3	129.9	126.7	121.0	115.6	116.0	**133.1**
T27	179.7	143.8	128.3	124.2	124.6	124.9	123.1	119.1	115.2	116.1	**129.9**
T28	193.5	167.0	157.0	155.6	156.9	157.1	154.4	149.0	143.1	141.0	**157.5**
Mean B	**200.3**	**172.2**	**158.8**	**153.0**	**150.3**	**147.6**	**143.6**	**140.2**	**133.0**	**132.8**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.015		0.009		0.047						
CD5%	0.041		0.025		0.13						

Effect of various treatments and pore volume and their combination on the Sodium concentration at 15,30 and 45 DAI:

The SAR of soil as influenced by various treatments under study was measured at 15, 30 and 45 Days after Incubation (DAI).

A: Post leaching soil analysis data after 15 days of incubation are presented in Table.31.and Fig.37., revealed that Na^+ was significantly lower as compared to initial. Among various treatments the mean lowest Na^+ (129.3 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found to be closely followed by the treatment Na^+ (Vermicompost + NG45% + Biomes) having Na^+ (129.9 Cmolc (+) kg^{-1}). The measured SAR of these treatments was significantly higher than the rest of the treatments under study, the most effective treatments from Na^+ reduction point of view are T18 followed byT27 in both the treatment combination the measured soil Na^+ was found approximately 47% less them of the original soil Na^+. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil.

The soil Na^+ decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil Na^+. At 15 DAI the lowest mean soil Na^+ (132.8 Cmolc (+) kg^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil Na^+ in comparison to original soil for mean values of various treatments at different pore volumes was 17.30, 28.86, 34.40,36.79, 37.93 39.03 40.67 42.09 44.71 45.12 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatment combination with pore volume the data are presented in Table.31.and Fig.37., it is evident that the most effective treatment combination for the reclamation of Na^+ was T18PV5 (115.5 Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV5 (116.1 Cmolc (+) kg^{-1})

Table. 32. Effect of various treatments and pore volume and their combination on the soil Na^+ at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	228.6	215.9	206.6	198.7	191.0	183.0	174.6	166.9	161.2	159.9	**188.6**
T2	228.4	215.7	206.4	198.7	190.9	182.9	174.6	166.8	161.2	159.8	**188.5**
T3	232.5	222.7	216.9	212.1	206.4	199.2	190.9	182.7	177.5	178.7	**202.0**
T4	213.6	202.3	197.2	195.2	194.1	192.7	190.5	187.6	185.4	185.6	**194.4**
T5	183.5	149.6	133.1	128.2	125.1	121.0	114.2	105.7	99.1	99.7	**125.9**
T6	163.3	118.9	99.9	95.2	96.3	97.5	96.0	91.6	87.0	87.6	**103.3**
T7	206.3	179.7	162.6	151.7	144.0	137.6	131.9	126.6	122.3	120.7	**148.3**
T8	206.4	179.7	162.7	151.8	144.1	137.9	132.2	126.7	122.4	120.7	**148.5**
T9	199.3	169.8	151.2	139.9	133.1	128.6	125.0	121.5	118.1	115.5	**140.2**
T10	172.8	130.9	110.5	103.0	101.5	101.2	99.5	95.6	90.9	88.6	**109.5**
T11	181.1	145.1	128.2	122.0	119.6	117.0	111.8	104.3	96.7	93.5	**121.9**
T12	171.4	129.4	109.1	101.5	100.0	99.8	98.1	102.7	89.5	87.2	**108.9**
T13	170.5	130.3	113.2	108.7	108.8	108.4	105.0	98.8	92.9	92.8	**113.0**
T14	174.1	134.9	117.8	113.1	113.3	113.6	111.5	106.8	101.7	100.8	**118.8**
T15	171.9	131.6	114.5	110.0	110.2	109.9	106.4	100.2	94.3	94.2	**114.3**
T16	166.1	124.3	107.7	104.6	106.4	107.5	105.2	100.0	95.1	97.0	**111.4**
T17	165.7	123.9	107.3	104.2	106.0	107.1	104.8	99.6	94.7	96.6	**111.0**
T18	157.2	111.9	94.3	91.2	92.9	92.9	88.5	80.2	72.0	71.3	**95.3**
T19	172.9	130.9	110.6	103.1	101.6	101.3	99.6	95.7	91.0	88.7	**109.5**
T20	173.0	131.1	110.8	103.2	101.7	101.5	99.8	95.8	91.1	88.8	**109.7**
T21	171.4	129.4	109.1	101.5	100.0	99.8	98.1	102.6	89.5	87.2	**108.9**
T22	170.4	130.1	113.1	108.6	108.7	108.3	104.9	98.7	92.7	92.7	**112.8**
T23	170.3	130.1	113.0	108.5	108.7	108.3	104.8	98.7	92.7	92.6	**112.8**
T24	169.1	128.8	111.7	107.2	107.4	107.0	103.6	97.4	91.4	91.4	**111.5**
T25	166.9	125.2	108.6	105.5	107.3	108.4	106.1	100.9	96.0	97.8	**112.3**
T26	166.9	125.1	108.5	105.4	107.2	108.3	106.1	100.8	95.9	97.8	**112.2**
T27	158.3	113.1	95.5	92.4	94.0	94.1	89.7	81.4	73.2	72.5	**96.4**
T28	183.5	149.7	133.2	128.2	125.2	121.0	114.3	105.7	99.1	99.7	**126.0**
Mean B	**182.0**	**146.8**	**130.5**	**124.8**	**123.1**	**121.3**	**117.4**	**112.2**	**106.2**	**106.0**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.009**		**0.005**		**0.027**						
CD5%	**0.024**		**0.014**		**0.075**						

B: Effect of various treatments and pore volume and their combination on the Sodium concentration at 15,30 and 45 DAI:

The post leaching soil analysis data after 30 days of incubation are presented in Table.32.and Fig.38., revealed that SAR was significantly lower as compared to initial. Among various treatments the mean lowest Na^+ (95.3 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found to be closely followed by the treatment T27 (Vermicompost + NG45% + Biomes) having Na^+ (96,4 Cmolc (+) kg^{-1}). The measured Na^+ of these treatments was significantly lower than the rest of the treatments under study, the most effective treatments from Na^+ reduction point of view are T18, the measured soil Na^+ was found less than 60% of the original soil Na^+. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil.

The soil NA+ decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil Na^+. At 15 DAI the lowest mean soil Na^+ (106 Cmolc (+) kg^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil Na^+ in comparison to original soil for mean values of various treatments at different pore volumes was 24.87,39.39,46.13,48.49,49.19,49.92,51.52,53.67,56.14, 56.26 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatment combination with pore volume the data are presented in Table.32.and Fig.38., it is evident that the most effective treatment combination for the reclamation of Na^+ was T18PV5 (71. Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV5 (72.5 Cmolc (+) kg^{-1}).

Table. 33. Effect of various treatments and pore volume and their combination on the soil Na^+ at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	176.9	137.5	119.2	112.4	109.9	107.1	101.7	93.9	86.3	84.3	**112.9**
T2	174.9	135.6	117.3	110.5	108.0	105.2	99.8	92.0	84.1	82.2	**111.0**
T3	180.1	140.7	122.5	115.7	113.3	110.4	105.0	97.2	89.7	87.6	**116.2**
T4	132.4	76.0	56.3	55.4	60.4	63.0	59.6	51.0	43.1	46.0	**64.3**
T5	134.1	77.7	56.8	57.0	62.2	64.7	61.3	52.7	44.9	47.6	**65.9**
T6	130.3	74.0	53.1	53.3	58.5	61.0	57.5	49.0	41.2	44.0	**62.2**
T7	160.6	112.0	88.4	79.4	77.0	75.8	72.9	67.9	63.0	62.9	**86.0**
T8	160.6	111.9	88.4	79.4	77.1	75.9	73.0	68.0	63.1	62.9	**86.0**
T9	159.9	111.2	87.6	78.7	76.3	75.1	72.2	67.2	62.3	62.2	**85.3**
T10	132.4	76.0	56.3	55.4	60.4	63.0	59.6	51.0	43.1	46.0	**64.3**
T11	132.4	76.1	56.3	55.4	60.4	63.1	59.6	63.0	43.1	46.0	**75.5**
T12	131.7	75.4	55.6	54.7	59.7	62.4	58.9	62.3	42.4	45.3	**64.8**
T13	122.5	58.3	36.4	36.8	45.2	52.3	53.3	48.1	41.6	43.2	**53.8**
T14	120.5	56.4	34.4	34.8	43.2	50.3	51.3	46.1	39.6	41.2	**51.8**
T15	124.9	60.7	38.7	39.0	47.6	54.7	55.6	50.5	44.0	45.6	**56.1**
T16	117.8	54.7	43.7	40.2	41.5	43.0	42.8	38.0	33.3	27.5	**48.2**
T17	118.2	55.1	44.1	40.6	41.9	43.4	43.2	38.4	33.7	27.9	**48.6**
T18	116.1	50.8	27.4	25.9	31.5	34.6	31.0	21.4	12.1	14.2	**36.5**
T19	132.6	74.5	52.7	50.7	56.1	60.7	60.3	55.2	49.3	51.2	**64.3**
T20	134.4	78.1	58.3	57.4	62.4	65.1	61.6	53.0	45.1	48.0	**66.4**
T21	131.7	75.3	55.6	54.6	59.7	62.4	58.9	54.3	42.4	45.3	**64.8**
T22	120.5	56.4	34.4	34.8	43.2	50.3	51.3	46.2	39.7	41.2	**51.8**
T23	120.5	56.4	34.4	34.8	43.2	50.3	51.3	46.2	39.7	41.2	**51.8**
T24	120.1	55.9	34.0	34.3	42.8	49.9	50.9	45.7	39.3	40.8	**51.4**
T25	119.9	56.8	45.8	42.3	43.6	45.2	44.9	40.1	35.4	29.6	**50.4**
T26	119.4	56.3	45.3	41.8	43.2	44.7	44.4	39.6	35.0	29.2	**49.9**
T27	118.4	53.2	29.8	28.3	33.8	37.0	33.3	23.8	14.5	16.6	**38.9**
T28	132.2	75.9	55.0	55.2	60.4	62.9	59.5	50.9	43.1	45.9	**64.1**
Mean B	**134.8**	**77.8**	**58.1**	**55.7**	**59.4**	**61.9**	**59.8**	**61.4**	**46.2**	**46.6**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.427		0.255		1.352						
CD5%	1.188		0.71		3.756						

C: Effect of various treatments and pore volume and their combination on the Sodium concentration at 15,30 and 45 DAI:

The post leaching soil analysis data after 45 days of incubation are presented in Table.33.and Fig.39. revealed that Na^+ was significantly lower as compared to initial. Among various treatments the mean lowest Na^+ (36.5 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found to be closely followed by the treatment T27 (Vermicompost + NG45% + Biomes) having Na^+ (38.9 Cmolc (+) kg^{-1}). The measured Na^+ of these treatments was significantly higher than the rest of the treatments under study, the most effective treatments from Na^+ reduction point of view are T18, the measured soil Na^+ was found less than 40 which is approximately 84.9% of the original soil Na^+. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil.

The soil SAR decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil Na^+. At 45 DAI the lowest mean soil Na^+ (46.6 Cmolc (+) kg^{-1}) was measured in the case of PV 5.0. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 44.32,67.87,76.00,77.02,75.49,74.44,75.31,74.63,80.92, 80.75 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatment combination with pore volume the data are presented in Table.33 and Fig.39., it is evident that the most effective treatment combination for the reclamation of Na^+ was T18PV5 (14,2 Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV5 (16.6 Cmolc (+) kg^{-1}).

Table.34. Effect of various treatments, pore volume and their combination on the leachate SAR at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	2.49	2.79	3.26	3.48	3.48	3.60	3.63	3.67	3.70	3.62	**3.37**
T2	2.02	2.81	3.23	3.40	3.40	3.52	3.55	3.60	3.61	3.55	**3.27**
T3	1.97	2.80	3.22	3.40	3.38	3.54	3.60	3.65	3.67	3.60	**3.23**
T4	2.05	2.78	3.13	3.29	3.27	3.45	3.53	3.61	3.65	3.59	**3.28**
T5	3.26	3.67	4.30	3.89	3.82	3.99	4.09	4.21	4.24	4.20	**3.97**
T6	4.19	4.36	5.32	4.86	4.76	4.81	4.73	4.71	4.66	4.70	**4.71**
T7	2.54	2.74	3.12	3.33	3.39	3.65	3.76	3.91	3.96	3.92	**3.43**
T8	2.52	2.73	3.10	3.32	3.38	3.61	3.72	3.83	3.89	3.85	**3.39**
T9	2.71	3.01	3.42	3.64	3.59	3.74	3.76	3.80	3.82	3.74	**3.52**
T10	4.82	5.92	6.41	6.78	6.97	7.49	7.75	7.94	8.06	8.10	**7.03**
T11	4.93	6.34	7.22	7.74	7.95	8.33	8.45	8.50	8.47	8.45	**7.64**
T12	5.41	6.71	7.64	8.33	8.58	9.09	9.20	9.23	9.05	9.10	**8.23**
T13	4.28	6.49	7.36	7.67	7.64	7.87	8.07	8.31	8.47	8.28	**7.44**
T14	4.25	6.00	7.11	7.87	8.04	8.55	8.61	8.58	8.54	8.59	**7.61**
T15	5.13	6.91	7.96	8.63	8.70	9.18	9.32	9.37	9.40	9.48	**8.41**
T16	7.58	7.95	8.50	9.06	9.26	9.91	10.13	10.22	10.24	10.30	**9.31**
T17	7.56	7.96	8.53	9.11	9.31	9.96	10.17	10.25	10.26	10.31	**9.34**
T18	8.00	8.43	9.54	10.40	10.77	11.75	11.95	11.90	11.89	11.93	**10.64**
T19	4.36	5.19	5.66	5.94	6.02	6.26	6.36	6.42	6.44	6.37	**5.90**
T20	4.27	4.99	5.41	5.64	5.75	5.95	6.05	6.17	6.19	6.19	**5.66**
T21	5.37	6.66	7.57	8.24	8.47	8.95	9.07	9.11	9.02	9.08	**8.15**
T22	4.98	6.67	7.74	8.42	8.54	9.04	9.15	9.20	9.25	9.63	**7.76**
T23	4.78	6.61	7.68	8.37	8.51	9.04	9.17	9.24	9.30	9.37	**8.21**
T24	4.82	6.63	7.71	8.40	8.49	8.99	9.15	9.22	9.27	9.35	**8.20**
T25	7.71	8.10	8.69	9.29	9.51	10.19	10.41	10.50	10.52	10.58	**9.55**
T26	7.68	8.04	8.60	9.17	9.38	10.04	10.26	10.34	10.36	10.41	**9.43**
T27	7.12	7.64	8.80	9.70	10.08	11.07	11.27	11.22	11.10	11.25	**9.92**
T28	4.35	4.47	4.57	4.77	4.85	4.89	4.80	4.78	4.70	4.75	**4.84**
Mean B	4.68	5.55	6.29	6.65	6.76	7.16	7.27	7.34	7.34	7.19	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.01		0.006		0.032						
CD5%	0.02		0.012		0.062						

Effect of various treatments, pore volume and their combination on the leachate SAR at 15,30 and 45 DAI:

Results revealed that the Sodium absorption ratio of the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in SAR of the leachate was found at par with 3.5 pore volume as the pore volume increases beyond 3 up to 5 pore volume.

A: Amendment treatment combination showed variable response and affected leachate SAR differently at 15 DAI represented in Table.34 and Fig.40.The maximum mean SAR in the leach was found in the treatment T18 (10.64 Cmolc (+) kg^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest soil SAR was found in the treatment T3 (3.23 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment T28, the SAR of the leached was 4.84 C molc (+) kg^{-1}. The conventional method was found statistically inferior to the treatments T10 (7.03 Cmolc (+) kg^{-1}), T11 (7.64 Cmolc (+) kg^{-1}) , T12 (8.23Cmolc (+) kg^{-1}), T13 (7.44 Cmolc (+) kg^{-1}), T14 (7.61 Cmolc (+) kg^{-1}), T15 (8.41 Cmolc (+) kg^{-1}), T16 (9.31 Cmolc (+) kg^{-1}), T17 (9.34 Cmolc (+) kg^{-1}), T18 (10.64 Cmolc (+) kg^{-1}) T19 (5.90 Cmolc (+) kg^{-1}),T20 (5.66 Cmolc (+) kg^{-1}), T21(8.15 Cmolc (+) kg^{-1}), T23 (8.21 Cmolc (+) kg^{-1}), T24 (8.20 Cmolc (+) kg^{-1}), (+) kg^{-1}), T25 (9.55 Cmolc (+) kg^{-1}) T26 (9.43 Cmolc (+) kg^{-1}), T27 (9.92 Cmolc (+) kg^{-1}) and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect SAR of leachate represented in Table.34. and Fig.40. It is evident from the data that SAR of the leachate was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most effective treatment combination was T18 which has leachate SAR 11.93 Cmolc (+) kg^{-1} when the soil column is subjected to leaching with PV 3.5. This treatment was found statistically at par with PV 4 (11.90 Cmolc (+) kg^{-1}), PV 4.5 (11.89 Cmolc (+) kg^{-1}) and PV5

(11.93 Cmolc (+) kg^{-1}) respectively, and superior to rest of the treatments. In case of T18 as we increase the pore volume the SAR value increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for leachate SAR was T3. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the salt removal from the soil increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 which removed 119.83 % more salts from the soil as compared to treatment T28 which comprised of addition of conventional gypsum as per gypsum requirement of the soil.

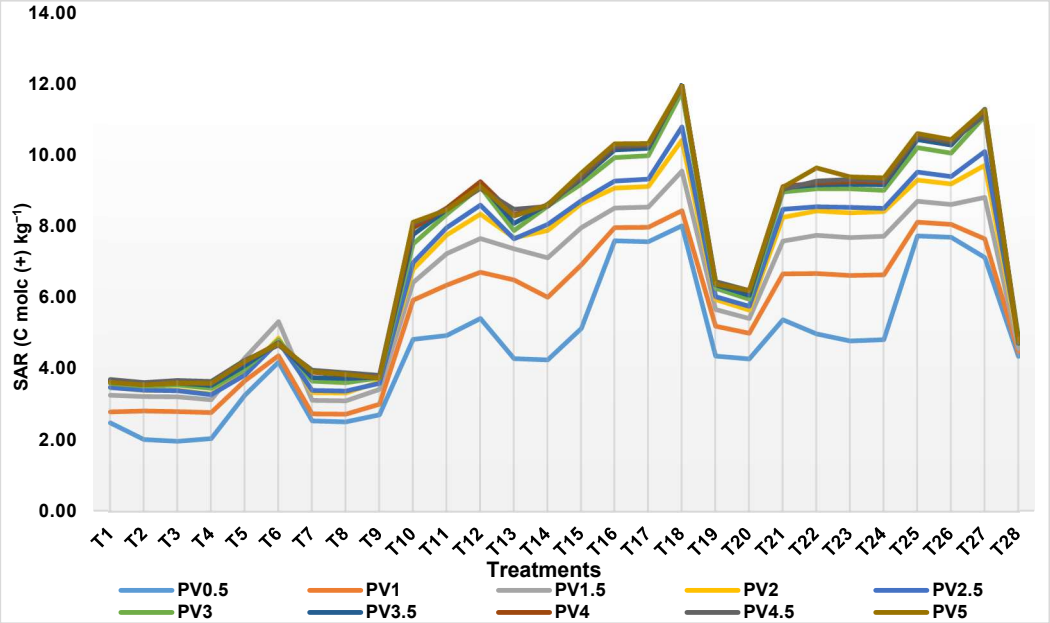


Fig.40: Interactive effect of various treatments on leachate SAR at 15 DAI

Table.35. Effect of various treatments, pore volume and their combination on the leachate SAR at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean A
T1	3.70	5.02	6.82	8.57	9.22	10.86	11.32	11.43	11.42	11.50	**8.99**
T2	3.17	4.51	6.30	6.53	8.07	9.30	10.27	10.81	10.86	11.00	**8.08**
T3	2.18	3.19	3.94	4.51	4.66	5.29	5.56	5.75	5.85	5.83	**4.68**
T4	2.68	3.69	4.54	5.24	5.49	6.19	6.44	6.59	6.65	6.68	**5.42**
T5	4.62	5.95	8.92	10.20	10.59	12.47	12.90	12.90	12.61	12.98	**10.41**
T6	6.21	7.58	11.49	13.37	14.00	16.07	17.11	17.19	17.30	17.76	**13.81**
T7	3.48	4.69	6.44	8.20	8.99	10.93	11.49	11.63	11.59	11.67	**8.91**
T8	3.47	4.70	6.43	8.21	8.95	10.80	11.40	11.60	11.58	11.68	**8.88**
T9	3.86	5.18	6.99	8.81	9.59	11.14	11.69	11.77	11.57	11.79	**9.24**
T10	5.83	7.81	10.30	12.74	13.86	16.50	17.33	17.06	16.93	17.09	**13.54**
T11	5.75	7.73	10.26	12.72	13.84	16.42	17.27	17.52	17.49	17.58	**13.66**
T12	6.26	9.03	12.12	15.00	16.19	18.81	19.47	19.57	19.20	19.53	**15.52**
T13	5.33	8.23	10.88	13.16	14.00	16.41	17.33	17.84	18.65	19.21	**14.10**
T14	6.18	8.97	10.79	12.17	12.67	14.68	15.93	17.67	19.03	17.91	**13.60**
T15	7.01	10.75	13.87	16.88	17.00	19.11	19.85	20.14	20.12	18.39	**16.31**
T16	6.61	9.52	12.59	15.45	16.64	19.45	20.40	20.76	20.77	20.85	**16.30**
T17	6.60	9.51	12.60	15.46	16.65	19.46	20.41	20.77	20.79	20.86	**16.31**
T18	8.71	11.58	15.02	17.66	18.83	21.79	22.84	22.96	22.90	22.93	**18.49**
T19	4.03	5.42	8.00	9.84	12.79	13.98	16.53	17.15	17.24	17.27	**12.22**
T20	3.99	5.38	7.97	9.80	12.77	13.91	16.46	17.16	17.26	17.27	**12.20**
T21	5.98	8.77	11.86	14.76	15.95	18.55	19.23	19.33	18.97	19.27	**15.27**
T22	6.53	10.24	13.29	15.68	16.47	18.63	19.32	19.61	19.65	19.58	**15.90**
T23	6.53	10.24	13.28	15.68	16.47	18.63	19.31	19.61	19.64	19.57	**15.90**
T24	6.61	10.36	13.49	16.48	16.62	18.74	19.48	19.79	19.77	18.07	**15.94**
T25	6.47	9.38	12.46	15.31	16.50	19.31	20.26	20.62	20.64	20.71	**16.17**
T26	6.52	9.43	12.52	15.37	16.56	19.38	20.33	20.69	20.70	20.78	**16.23**
T27	7.89	10.78	14.21	16.87	18.04	20.89	21.83	22.19	22.13	22.16	**17.70**
T28	6.26	7.62	11.50	13.38	14.02	16.87	17.57	17.21	17.32	17.76	**13.95**
Mean B	**5.45**	**7.69**	**10.32**	**12.43**	**13.41**	**15.52**	**16.72**	**16.69**	**16.74**	**16.70**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.014		0.009		0.045						
CD5%	0.04		0.024		0.125						

B: Effect of various treatments, pore volume and their combination on the leachate SAR at 30 DAI:

The mean lowest SAR was observed in treatment T3 and the highest in case of T18. (Table.35.Fig.41.) Amendment treatment combination showed variable response and affected mean SAR significantly. The maximum mean SAR in the leached was found in the treatment T18 (18.49 Cmolc (+) kg^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments. And the lowest soil SAR was found in the treatment T3 (4.68 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment T28, the SAR of the leached was 13.95 C molc (+) kg^{-1}. The conventional method was found statistically inferior to the treatments T12 (15.52 Cmolc (+) kg^{-1}) , T15 (16.31 Cmolc (+) kg^{-1}), T16 (16.30 Cmolc (+) kg^{-1}), T17 (16.31 Cmolc (+) kg^{-1}), T27(17.70 Cmolc (+) kg^{-1}), T18 (18.49 Cmolc (+) kg^{-1})T21 (15.27 Cmolc (+) kg^{-1}), T22 (15.90 Cmolc (+) kg^{-1}), T23 (15.90Cmolc (+) kg^{-1}), , T24 (15.94 Cmolc (+) kg^{-1}), T25 (16.17 Cmolc (+) kg^{-1}), T26 (16.23 Cmolc (+) kg^{-1}), , and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect SAR of leachate represented in Table.36.and Fig.41. It is evident from the data that SAR of the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most effective treatment combination was T18 which has leachate SAR 22.96 Cmolc (+) kg^{-1} when the soil column is subjected to leaching at PV 4. This treatment was found statistically at par with PV3.5(22.84 Cmolc (+) kg^{-1}), PV4.5(22.90 Cmolc (+) kg^{-1}) and PV 5 (22.93 Cmolc (+) kg^{-1}) respectively, and superior to rest of the treatments. In case of T18 as we increase the pore volume the SAR value increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for leachate SAR was T3. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the salt

removal from the soil increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 which removed 32.54 % more salts from the soil as compared to treatment T28 which comprised of addition of conventional gypsum as per gypsum requirement of the soil.

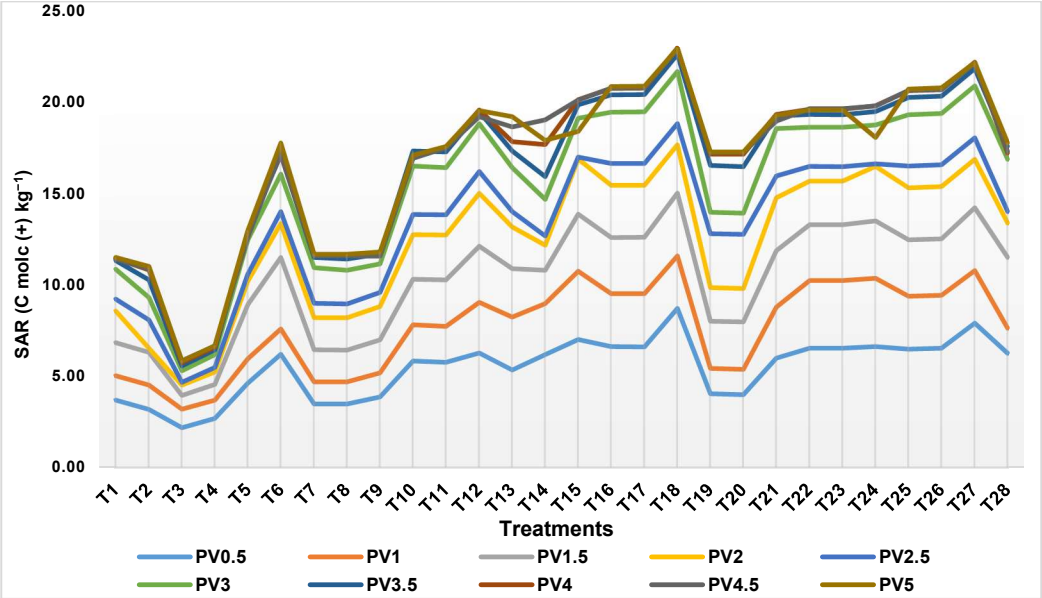


Fig.41: Interactive effect of various treatments on leachate SAR at 30 DAI

Table.36. Effect of various treatments, pore volume and their combination on the leachate SAR at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean A
T1	3.74	4.92	6.64	8.43	9.30	11.09	11.67	11.85	11.84	11.94	**9.14**
T2	3.22	4.40	6.10	6.52	8.05	9.51	10.43	11.00	11.19	11.22	**8.17**
T3	2.47	3.36	4.11	4.76	5.04	5.74	6.07	6.29	6.39	6.38	**5.06**
T4	4.54	6.57	8.32	9.21	9.55	10.47	10.88	11.15	11.27	11.22	**9.32**
T5	5.53	7.18	8.78	10.45	11.34	13.50	14.04	14.12	13.89	14.11	**11.29**
T6	6.26	9.37	13.17	14.49	15.13	17.28	17.91	18.23	18.11	18.22	**14.82**
T7	3.92	5.07	6.75	8.47	9.25	11.14	11.64	11.73	11.65	11.76	**9.14**
T8	3.92	5.08	6.75	8.47	9.23	10.99	11.55	11.70	11.66	11.78	**9.11**
T9	3.87	5.05	6.78	8.64	9.53	11.35	11.87	12.01	11.99	12.08	**9.32**
T10	12.62	13.75	15.33	16.94	17.75	19.96	21.01	21.63	21.86	21.82	**18.27**
T11	13.29	15.42	17.43	18.99	19.67	21.24	21.92	22.30	22.38	22.50	**19.51**
T12	13.72	17.59	20.00	21.42	21.87	22.96	23.55	24.08	24.08	24.13	**21.34**
T13	13.20	16.51	18.73	20.16	20.50	21.66	22.12	22.38	22.56	22.43	**20.02**
T14	12.53	16.17	18.00	18.81	18.87	19.51	19.99	20.47	20.83	20.50	**18.57**
T15	15.93	18.78	20.59	21.71	21.79	22.73	23.27	23.62	23.81	23.57	**21.58**
T16	15.20	17.77	20.17	22.23	22.88	24.85	25.56	25.83	25.97	26.17	**22.66**
T17	15.21	17.78	20.18	22.25	22.89	24.46	25.58	25.85	25.98	26.19	**22.64**
T18	17.19	20.62	23.72	25.27	25.70	26.78	27.72	27.98	27.97	28.10	**25.09**
T19	12.93	15.39	16.37	16.70	16.71	17.28	17.90	18.62	19.09	18.76	**16.97**
T20	15.32	17.75	18.75	18.97	19.03	19.46	20.09	20.87	21.28	21.02	**19.25**
T21	13.14	17.01	19.43	20.87	21.33	22.41	23.01	23.55	23.55	23.59	**20.79**
T22	15.47	18.29	20.02	21.07	21.31	22.30	22.76	23.14	23.34	23.18	**21.09**
T23	15.45	18.28	20.03	21.09	21.30	22.29	22.78	23.13	23.37	23.14	**21.09**
T24	15.58	18.43	20.26	21.37	21.46	22.40	22.94	23.30	23.50	23.25	**21.25**
T25	15.07	17.64	20.05	22.09	22.75	24.74	25.40	25.72	25.87	26.03	**22.53**
T26	15.12	17.69	20.10	22.16	22.81	24.38	25.50	25.77	25.90	26.11	**22.56**
T27	16.41	19.85	22.95	24.52	24.96	26.06	27.00	27.17	27.23	27.37	**24.35**
T28	6.30	9.40	13.19	14.37	15.16	17.30	17.93	18.26	18.14	18.24	**14.83**
Mean B	**3.74**	**4.92**	**6.64**	**8.43**	**9.30**	**11.09**	**11.67**	**11.85**	**11.84**	**11.94**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.016		0.01		0.051						
CD5%	0.044		0.027		0.14						

C: Effect of various treatments, pore volume and their combination on the leachate SAR at 45 DAI:

Results of the column study revealed that the Sodium absorption ratio of the leachate increased significantly with increased pore volume i.e., from 0.5 to 5 pore volume. This increasing trend was maintained up to 5 pore volume but the differences in SAR of the leachate was found at par PV4 (11.84 Cmolc (+) kg^{-1}) PV4.5 (11.85Cmolc (+) kg^{-1}) and PV 5(11.94 Cmolc (+) kg^{-1}) and all these were found statistically superior to the rest of the Pore volumes.

Amendment treatment combination showed variable response and affected mean SAR significantly (Table .36. Fig.42). The maximum mean SAR in the leached was found in the treatment T18 (25.09 Cmolc (+) kg^{-1}). This treatment was found most effective in the reclamation of saline soils under study as it is found statistically superior to the rest of the treatments, the lowest soil SAR was found in the treatment T3 (5.06 Cmolc (+) kg^{-1}). This treatment was found significantly inferior to the rest of the treatments. In case of conventional treatment T28, the SAR of the leached was 14.83 C molc (+) kg^{-1}. The conventional method was found statistically inferior to the treatments T10 (18.27Cmolc (+) kg^{-1}), T11 (19.51Cmolc (+) kg^{-1}),T12 (21.34Cmolc (+) kg^{-1}) , T13 (20.02 Cmolc (+) kg^{-1}) T14 (18.57 Cmolc (+) kg^{-1}) T15 (21.58Cmolc (+) kg^{-1}), T16 (22.66Cmolc (+) kg^{-1}), T17 (22.64Cmolc (+) kg^{-1}), T18 (25.09 Cmolc (+) kg^{-1}), T19 (16.97Cmolc (+) kg^{-1}) T20 (19.25 Cmolc (+) kg^{-1}), T21 (20.79 Cmolc (+) kg^{-1}), T22 (21.09 Cmolc (+) kg^{-1}), T23 (21.09Cmolc (+) kg^{-1}), T24 (21.25 Cmolc (+) kg^{-1}), T25 (22.53 Cmolc (+) kg^{-1}), T26 (22.56Cmolc (+) kg^{-1}), T27(24.35Cmolc (+) kg^{-1}), and statistically superior to rest of the treatments.

The data pertaining to various treatment combination effect SAR of leachate represented in Table.36.and Fig.42.It is evident from the data that SAR of the leached was affected significantly by different treatment combinations viz. amendment and pore volume combinations. The most effective treatment combination was T18 which has leachate SAR 28.10 Cmolc (+) kg^{-1} when the soil column is subjected to leaching with 5 pore volume. This treatment was found

statistically at par with, PV 4 (27.98 Cmolc (+) kg^{-1}) PV4.5(27.97 Cmolc (+) kg^{-1}) respectively, and superior to rest of the treatments. In case of T18 as we increase the pore volume the SAR value increases significantly in the leachate. This trend was maintained in almost all the treatments under study. The least effective treatment combination found for leachate SAR was T3. This treatment was found statistically inferior to rest of the treatment combination. Overall results suggest that as we treat the soil with different amendments the salt removal from the soil increases significantly with the increase in pore volume. This trend persisted in all the treatment combinations. The most effective treatment was T18 which removed 69.18 % more salts from the soil as compared to treatment T28 which comprised of addition of conventional gypsum as per gypsum requirement of the soil.

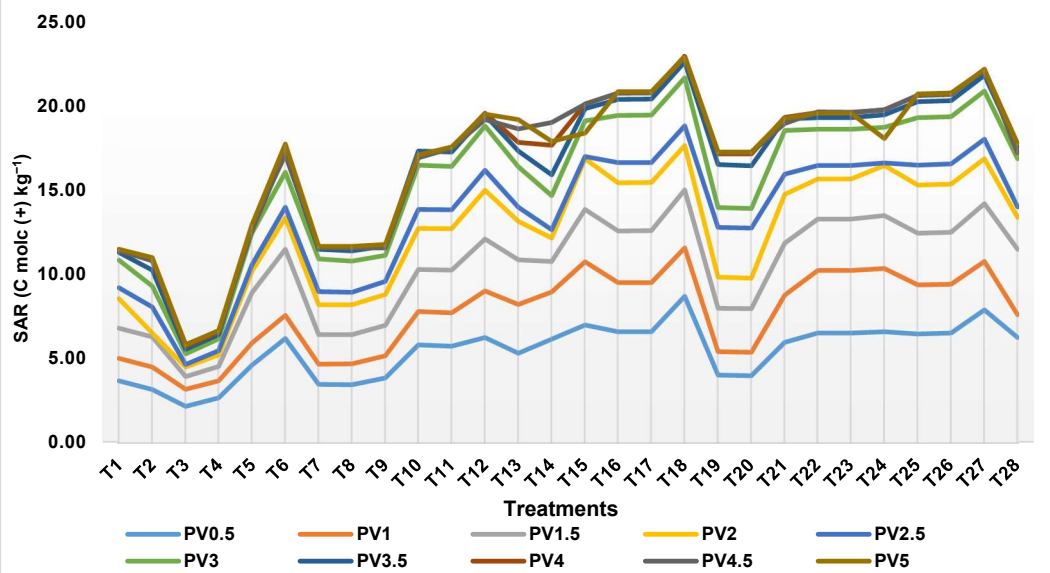


Fig.42: Interactive effect of various treatments on leachate SAR at 45 DAI

Table. 37. Effect of various treatments and pore volume and their combination on the Soil SAR at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	42.12	40.89	39.40	37.94	36.07	34.87	33.72	32.68	31.92	31.00	**36.06**
T2	42.07	40.83	39.31	37.81	35.98	34.78	33.61	32.58	31.81	30.91	**35.97**
T3	42.69	41.64	40.32	38.92	37.56	36.34	35.31	34.46	33.75	33.07	**37.41**
T4	32.78	28.67	27.62	27.67	27.61	26.76	25.03	22.86	21.25	21.72	**26.20**
T5	32.77	28.69	27.46	27.75	27.69	26.78	24.74	22.64	21.06	21.36	**26.10**
T6	32.74	28.56	27.23	27.33	27.15	26.20	24.42	22.22	20.63	21.03	**25.75**
T7	40.75	38.60	36.66	34.97	33.48	32.24	31.31	30.60	30.04	29.55	**33.82**
T8	40.74	38.58	36.66	34.96	33.49	32.29	31.33	30.61	30.04	29.54	**33.83**
T9	42.11	40.88	39.39	38.01	36.13	34.94	33.74	32.68	31.90	30.98	**36.08**
T10	36.43	33.44	31.12	29.74	28.82	28.02	27.01	26.13	25.47	25.29	**29.15**
T11	36.76	32.93	30.69	29.36	28.42	27.57	26.68	25.79	25.11	24.97	**28.83**
T12	36.78	32.95	30.73	29.39	28.45	27.60	26.71	25.81	25.15	25.00	**28.86**
T13	33.69	28.80	26.47	25.51	25.15	24.88	24.47	23.89	23.37	23.39	**25.97**
T14	32.85	28.83	26.52	25.57	25.17	24.89	24.49	23.91	23.38	23.36	**25.90**
T15	33.86	29.02	26.70	25.71	25.29	24.93	24.38	23.67	23.07	23.06	**25.97**
T16	32.75	27.37	24.70	23.49	22.92	22.48	21.91	21.19	20.55	20.40	**23.78**
T17	32.69	27.31	24.65	23.44	22.87	22.43	21.86	21.15	20.50	20.35	**23.73**
T18	32.25	26.76	24.06	22.93	22.44	22.09	21.61	20.91	20.36	20.20	**23.37**
T19	36.67	33.69	31.37	30.00	29.07	28.26	27.25	26.36	25.71	25.52	**29.39**
T20	36.96	32.97	30.74	29.41	28.46	27.62	26.73	25.83	25.15	24.75	**28.87**
T21	36.84	33.01	30.78	29.44	28.49	27.64	26.74	25.84	25.18	25.02	**28.90**
T22	33.68	28.79	26.46	25.50	25.14	24.88	24.46	23.88	23.36	23.38	**25.96**
T23	33.68	28.79	26.47	25.51	25.14	24.88	24.46	23.88	23.37	23.38	**25.96**
T24	33.80	28.96	26.64	25.65	25.23	24.86	24.31	23.60	23.00	22.99	**25.91**
T25	33.36	27.95	25.28	24.06	23.49	23.05	22.48	21.76	21.11	20.98	**24.36**
T26	33.37	27.96	25.28	24.07	23.50	23.06	22.49	21.77	21.12	20.88	**24.35**
T27	32.68	27.18	24.46	23.33	22.84	22.50	22.02	20.93	20.76	20.60	**23.78**
T28	33.15	28.96	27.63	27.72	27.54	26.59	24.81	22.62	21.02	21.42	**26.15**
Mean B	**35.75**	**31.90**	**29.82**	**28.76**	**27.99**	**27.27**	**26.36**	**25.39**	**24.62**	**24.44**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.042		0.025		0.134						
CD5%	0.118		0.07		0.373						

Effect of various treatments and pore volume and their combination on the SAR at 15,30 and 45 DAI:

The SAR of soil as influenced by various treatments under study was measured at 15, 30 and 45 Days after Incubation (DAI).

A: Post leaching soil analysis data after 15 days of incubation are presented in Table.38.and Fig.43., revealed that SAR was significantly lower as compared to initial. Among various treatments the mean lowest SAR (23.37 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found to be closely followed by the treatment T27 (Vermicompost + NG45% + biomes) having SAR (23.78 Cmolc (+) kg^{-1}). The measured SAR of these treatments was significantly higher than the rest of the treatments under study, the most effective treatments from SAR reduction point of view are T18 followed by T16(23.78 Cmolc (+) kg^{-1}), T17(23.73 Cmolc (+) kg^{-1}), T27(23.78 Cmolc (+) kg^{-1}), in all these treatments the measured soil SAR was found less than 21 which is approximately 50% of the original soil SAR. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil.

The soil SAR decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil SAR . At 15 DAI the lowest mean soil SAR (24.44 Cmolc (+) kg^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 18.26,27.08,31.83 ,34.25,36.01, 37.66 39.73, 41.96, 43.72, 44.14 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatment combination with pore volume the data are presented in Table.37 and Fig.43., it is evident that the most effective treatment combination for the reclamation of SAR was T18PV5 (20.20 Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV5 (20.60 Cmolc

(+) kg^{-1}) these two treatments were statistically at par with each other, similarly from 4 pore of same treatments also closely follow the SAR values obtained at PV5 i.e., T18 PV4 (20.91 Cmolc (+) kg^{-1}),T27 PV4 (20.93 Cmolc (+) kg^{-1}), T18PV4.5 (20.36 Cmolc (+) kg^{-1}), T27 PV4.5 (20.76 Cmolc (+) kg^{-1}).

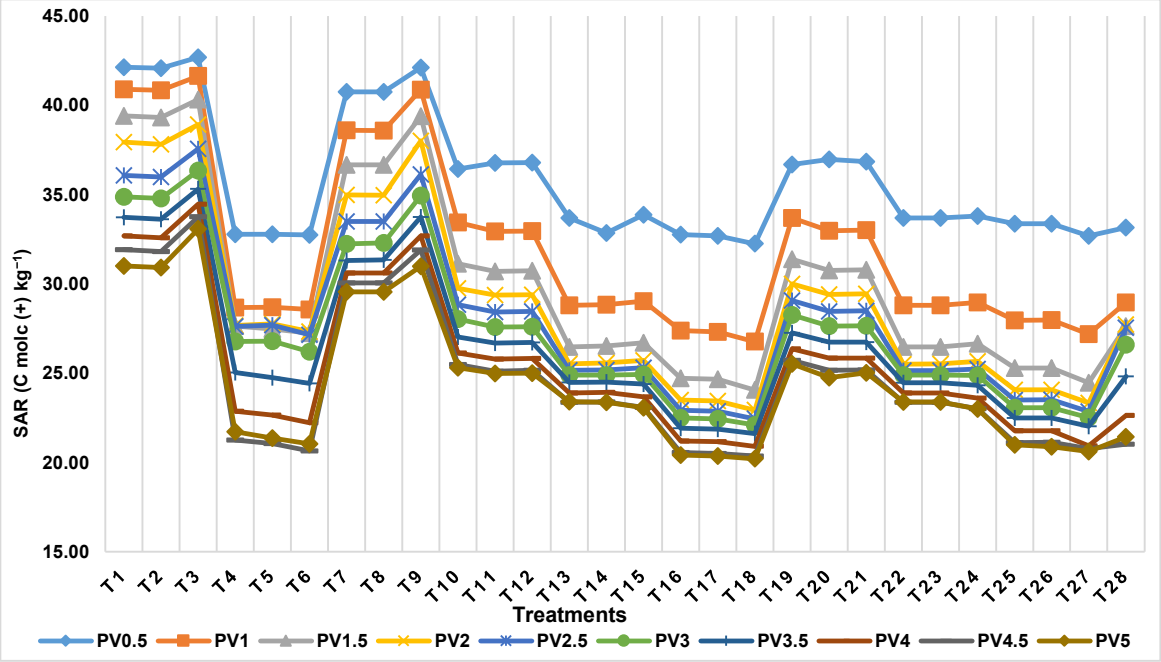


Fig.43: Interactive effect of various treatments on SAR 15 DAI

Table. 38. Effect of various treatments and pore volume and their combination on the SAR at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	40.00	38.10	37.05	36.25	35.31	34.08	32.59	31.12	30.17	30.44	**34.51**
T2	40.11	38.20	37.16	36.37	35.41	34.18	32.69	31.22	30.26	32.54	**34.82**
T3	40.51	38.82	37.88	37.19	36.40	35.36	34.10	32.83	31.98	32.23	**35.73**
T4	30.54	24.27	21.60	20.66	20.24	19.63	18.53	17.11	15.96	16.12	**20.47**
T5	30.14	23.83	21.00	20.26	19.89	19.31	18.24	16.83	15.73	15.86	**20.11**
T6	30.03	23.69	21.03	20.09	19.61	18.86	17.77	16.39	15.32	15.41	**19.82**
T7	36.79	31.94	28.61	26.39	24.79	23.53	22.51	21.61	20.90	20.59	**25.77**
T8	36.81	31.94	28.63	26.40	24.82	23.60	22.55	21.63	20.92	20.60	**25.79**
T9	39.11	36.90	35.80	35.03	34.17	33.00	31.55	30.07	29.07	29.29	**33.40**
T10	30.50	23.88	20.93	19.85	19.46	19.00	18.10	16.79	15.49	14.98	**19.90**
T11	30.52	23.89	20.94	19.86	19.47	19.01	18.09	16.79	15.49	14.98	**19.91**
T12	30.22	23.53	20.54	19.46	19.07	18.63	17.77	16.50	15.26	14.75	**19.58**
T13	28.25	21.07	18.15	17.39	17.47	17.53	17.15	16.31	15.43	15.31	**18.41**
T14	28.21	21.04	18.13	17.37	17.45	17.51	17.13	16.29	15.42	15.29	**18.39**
T15	28.23	21.07	18.15	17.39	17.48	17.55	17.16	16.33	15.46	15.33	**18.42**
T16	27.52	20.16	17.23	16.51	16.61	16.64	16.19	15.28	14.41	14.49	**17.51**
T17	27.53	20.15	17.23	16.51	16.61	16.64	16.18	15.27	14.40	14.48	**17.50**
T18	27.13	19.76	16.82	16.16	16.28	16.33	15.90	14.93	14.12	14.16	**17.17**
T19	30.40	23.80	20.84	19.76	19.37	18.90	17.99	16.68	15.37	14.86	**19.80**
T20	30.72	23.95	21.00	19.92	19.54	19.06	18.15	16.83	15.53	14.76	**19.95**
T21	30.29	23.58	20.59	19.50	19.11	18.67	17.80	16.53	15.29	14.78	**19.62**
T22	28.35	21.17	18.25	17.49	17.57	17.63	17.24	16.40	15.52	15.39	**18.50**
T23	28.35	21.17	18.25	17.48	17.56	17.62	17.23	16.39	15.51	15.39	**18.50**
T24	27.80	20.64	17.72	16.95	17.04	17.11	16.72	15.89	15.02	14.89	**17.98**
T25	27.92	20.47	17.52	16.80	16.90	16.93	16.47	15.55	14.67	14.77	**17.80**
T26	27.87	20.45	17.50	16.78	16.88	16.91	16.45	15.54	14.66	14.65	**17.77**
T27	27.19	19.80	16.86	16.19	16.31	16.37	15.93	14.97	14.15	14.19	**17.21**
T28	29.99	23.65	21.01	20.07	19.59	18.84	17.75	16.37	15.30	15.39	**19.80**
Mean B	**31.11**	**25.04**	**22.38**	**21.44**	**21.09**	**20.66**	**19.86**	**18.74**	**17.75**	**17.72**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.042**		**0.025**		**0.134**						
CD5%	**0.118**		**0.07**		**0.373**						

B: Effect of various treatments and pore volume and their combination on the SAR at 30 DAI:

Post leaching soil analysis after 30 days of incubation are presented in Table.38.and Fig.44. revealed that SAR was significantly lower as compared to initial. Among various treatments the mean lowest SAR (17.17 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% +Biomes) which was found to be closely followed by the treatment T27 (Vermicompost + NG 45% +Biomes) having SAR (17.21 Cmolc (+) kg^{-1}). The measured SAR of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from SAR reduction point of view are T18 in these treatments the measured soil SAR was found less than 18 which is approximately 60.75% of the original soil SAR. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with of 45%gypsum requirement through NG + Biomes have been found effective in reclaiming the soil.

The soil SAR decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil SAR continuously. At 30 DAI the lowest mean soil SAR (17.72 Cmolc (+) kg^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 28.87,42.76,48.85, 50.99, 51.79, 52.76, 54.60, 57.16, 59.43, 59.50, for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume the data are presented in Table.38.Fig.44.at 30 DAI, it is evident that the most effective treatment for the reclamation of SAR was T18PV5 (14.16 Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV5 (14.19 Cmolc (+) kg^{-1}) these two treatments were statistically at par with each other, similarly from 4 pore of same treatments also closely follow the SAR values obtained at PV5 i.e., T18 PV4 (14.93 Cmolc (+) kg^{-1}),T27 PV4 (14.97 Cmolc (+) kg^{-1}), T18PV4.5 (14.12 Cmolc (+) kg^{-1}), T27 PV4.5 (14.15 Cmolc (+) kg^{-1}).

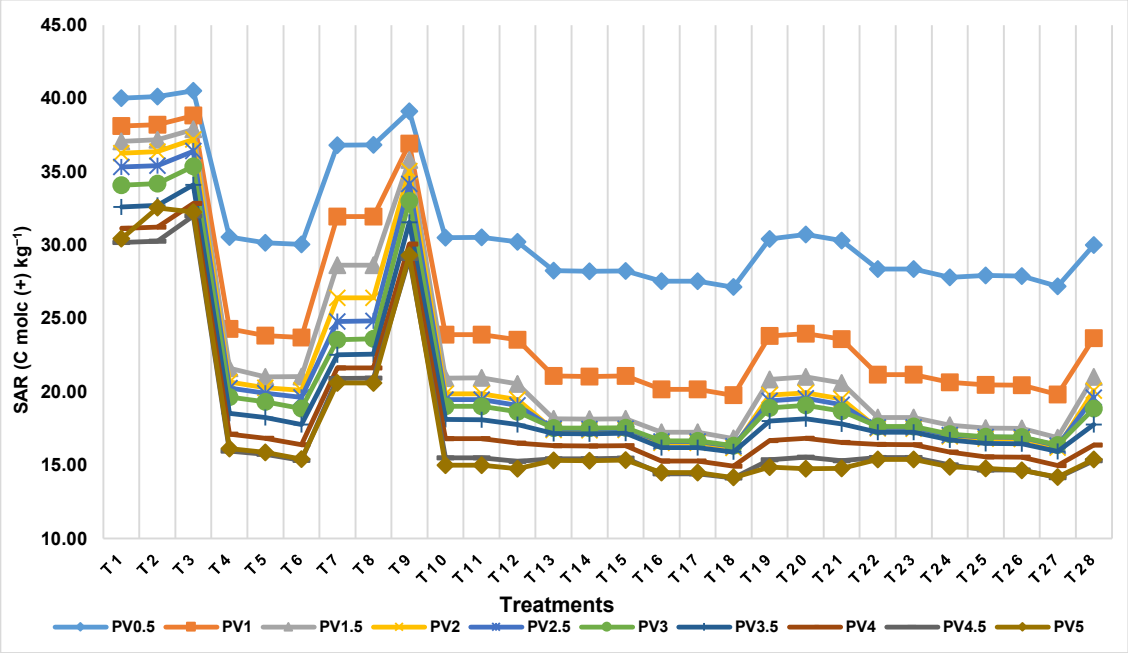


Fig.44: Interactive effect of various treatments on SAR 30 DAI

Table. 39. Effect of various treatments and pore volume and their combination on the SAR at 45 DAI											
Pore Volume / Treatment	**PV0.5**	**PV1**	**PV1.5**	**PV2**	**PV2.5**	**PV3**	**PV3.5**	**PV4**	**PV4.5**	**PV5**	**Mean**
T1	30.33	23.30	20.07	18.87	18.42	17.92	16.94	15.55	14.22	13.89	18.95
T2	30.20	23.20	19.98	18.80	18.34	17.84	16.86	15.47	14.10	13.96	19.83
T3	30.92	23.97	20.77	19.61	19.25	18.84	17.97	16.65	15.33	14.95	20.68
T4	21.69	11.97	8.67	8.54	9.39	9.85	9.30	7.89	6.59	7.07	10.10
T5	21.38	11.72	8.30	8.33	9.18	9.60	9.04	7.65	6.39	6.82	9.84
T6	20.39	10.91	7.62	7.65	8.47	8.87	8.32	6.97	5.75	6.18	9.11
T7	27.79	19.15	15.02	13.51	13.06	12.81	12.27	11.39	10.52	10.51	14.60
T8	27.83	19.18	15.05	13.54	13.10	12.89	12.33	11.42	10.55	10.53	14.64
T9	27.43	18.81	14.69	13.18	12.75	12.54	11.98	11.08	10.21	10.19	14.29
T10	22.02	12.20	8.85	8.68	9.50	9.92	9.32	7.88	6.55	7.04	10.20
T11	21.98	12.19	8.84	8.67	9.50	9.91	9.29	6.02	6.54	7.01	11.00
T12	21.10	11.44	8.19	8.02	8.82	9.23	8.66	9.14	6.02	6.46	9.71
T13	19.00	8.32	4.86	4.91	6.22	7.32	7.45	6.62	5.60	5.84	7.61
T14	18.97	8.28	4.82	4.87	6.18	7.28	7.42	6.59	5.57	5.82	7.58
T15	19.27	8.59	5.12	5.17	6.49	7.59	7.72	6.89	5.87	6.12	7.88
T16	18.29	7.35	6.41	5.65	5.43	5.34	5.26	4.57	4.01	2.58	6.49
T17	18.32	7.37	6.44	5.68	5.45	5.36	5.28	4.60	4.03	2.60	6.51
T18	17.71	7.05	4.09	4.58	3.46	4.02	3.23	2.58	1.18	1.50	4.94
T19	21.66	11.62	7.99	7.66	8.56	9.31	9.24	8.36	7.38	7.68	9.95
T20	22.25	12.29	8.93	8.77	9.59	10.00	9.40	7.95	6.62	6.83	10.26
T21	21.16	11.47	8.21	8.04	8.84	9.25	8.67	4.70	6.03	6.48	10.29
T22	18.91	8.17	4.70	4.75	6.07	7.17	7.30	6.47	5.45	5.69	7.47
T23	19.06	8.33	4.85	4.91	6.22	7.32	7.45	6.62	5.60	5.84	7.62
T24	18.38	7.69	4.23	4.27	5.60	6.70	6.83	6.00	4.98	5.23	6.99
T25	18.84	7.79	6.85	6.08	5.86	5.77	5.69	5.00	4.43	3.01	6.93
T26	18.74	7.72	6.78	6.02	5.79	5.70	5.62	4.93	4.36	2.84	6.85
T27	17.97	7.28	4.31	4.80	4.25	3.68	3.46	2.80	1.39	1.71	5.17
T28	20.69	11.20	7.90	7.94	8.76	9.16	8.61	7.25	6.03	6.47	9.40
Mean B	21.87	12.09	9.04	9.39	9.02	9.25	8.97	8.53	6.83	7.46	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.141		0.084		0.445						
CD5%	0.391		0.234		1.238						

C: Effect of various treatments and pore volume and their combination on the SAR at 45 DAI:

Post leaching soil analysis at 45 days of incubation are presented in Table.39. and Fig.45., revealed that SAR was significantly lower as compared to initial. Among various treatments the mean lowest SAR (4.95 Cmolc (+) kg^{-1}) was recorded in case of T18 (Biochar + NG45% + Biomes) which was found to be closely followed by the treatment T27 (Vermicompost + NG45% + Biomes) having SAR (5.17 Cmolc (+) kg^{-1}). The measured SAR of these two treatments was significantly higher than the rest of the treatments under study, the most effective treatments from SAR reduction point of view are T18 which was found less than 21 which is approximately 88.68% of the original soil SAR. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil. The soil SAR decreased continuously as soil leaching was perform in10 steps with different amount of water based on pore volumes (PV) and time duration. The increase in pore volume from 0.5 to 5 decreased the soil pH continuously. At 45 DAI the lowest mean soil SAR (7.46 Cmolc (+) kg^{-1}) was measured in the case of 5.0 pore volume. The percentage reduction of soil pH in comparison to original soil for mean values of various treatments at different pore volumes was 50.01, 72.36,79.32 78.54, 79.38, 78.85, 79.48, 80.50, 84.38, 82.95 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume the data are presented in Table.39. and Fig.45., it is evident that the most effective treatment for the reclamation of SAR was T18 PV4.5 (1.18 Cmolc (+) kg^{-1}) which was closely followed by the treatment T27 PV4.5 (1.39 Cmolc (+) kg^{-1}) these two treatments were statistically at par with each other, similarly from 5 pore of same treatments also closely follow the SAR values obtained at PV4.5 i.e.T18PV5 (1.50 Cmolc (+) kg^{-1}), T27 PV 5 (1.71 Cmolc (+) kg^{-1}).

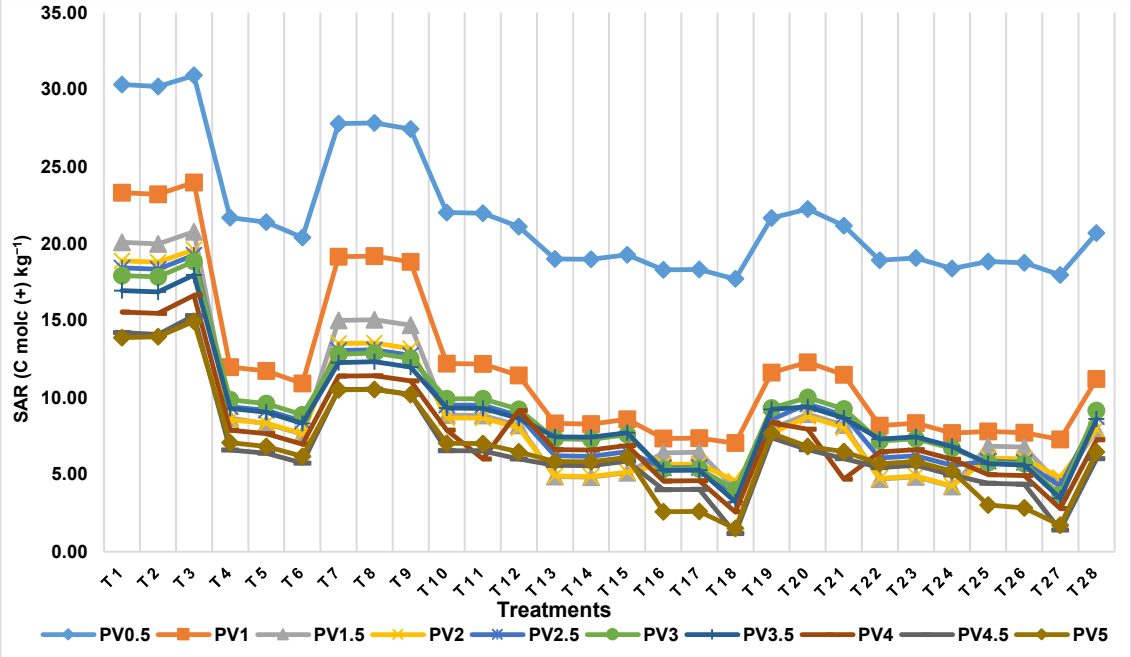


Fig.45: Interactive effect of various treatments on SAR 45 DAI

Table. 40. Effect of various treatments and pore volume and their combination on the CEC at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	24.12	24.69	25.14	25.50	25.77	25.97	26.11	26.22	26.30	26.37	**25.62**
T2	23.58	23.83	24.14	24.49	24.84	25.17	25.45	25.64	25.73	25.67	**24.85**
T3	23.76	24.06	24.34	24.58	24.79	24.97	25.11	25.21	25.26	25.27	**24.73**
T4	27.23	29.77	31.28	31.98	32.11	31.87	31.51	31.23	31.28	31.87	**31.01**
T5	28.34	31.46	33.14	33.73	33.56	32.97	32.30	31.90	32.11	33.26	**32.27**
T6	30.08	34.19	36.26	36.79	36.26	35.16	33.99	33.23	33.38	34.93	**34.42**
T7	24.54	25.40	26.04	26.49	26.78	26.97	27.07	27.13	27.19	27.26	**26.48**
T8	24.38	25.09	25.60	25.95	26.16	26.27	26.31	26.32	26.33	26.37	**25.88**
T9	25.58	26.98	27.78	28.12	28.14	27.97	27.76	27.65	27.77	28.27	**27.60**
T10	26.33	28.16	29.13	29.45	29.33	28.97	28.59	28.39	28.58	29.37	**28.63**
T11	26.58	28.63	29.79	30.26	30.25	29.97	29.61	29.39	29.51	30.17	**29.41**
T12	28.23	31.31	33.00	33.63	33.51	32.97	32.33	31.92	32.06	33.07	**32.20**
T13	28.43	31.57	33.22	33.73	33.46	32.77	32.02	32.27	32.57	32.67	**32.27**
T14	29.49	33.27	35.23	35.85	35.61	34.97	34.41	34.41	35.44	35.47	**34.41**
T15	30.07	34.14	36.16	36.63	36.07	34.97	35.17	35.27	35.37	35.37	**34.92**
T16	30.38	34.69	36.89	37.49	37.02	37.27	37.37	37.47	37.47	37.53	**36.36**
T17	29.26	32.88	34.73	35.23	34.83	34.92	35.17	35.37	35.42	35.42	**36.02**
T18	32.24	37.68	39.11	39.29	41.17	41.47	41.62	41.67	41.76	41.77	**40.09**
T19	23.91	24.38	24.84	25.26	25.64	25.97	26.23	26.41	26.49	26.50	**25.56**
T20	23.72	23.92	24.03	24.06	23.98	24.27	24.57	24.87	24.98	25.00	**24.34**
T21	24.24	24.85	25.31	25.63	25.86	26.01	26.11	26.20	26.31	26.47	**25.70**
T22	26.80	28.94	30.08	30.48	30.36	30.47	30.57	30.67	30.69	30.69	**29.97**
T23	25.63	27.05	27.85	28.17	28.16	27.97	27.75	27.64	27.80	28.37	**27.64**
T24	27.28	29.73	31.05	31.52	31.41	30.97	30.49	30.57	30.67	30.67	**30.43**
T25	28.73	32.02	33.70	34.16	33.78	32.97	33.27	33.37	33.47	33.47	**32.89**
T26	29.37	33.04	34.57	34.97	35.27	35.57	35.67	35.77	35.83	35.83	**35.73**
T27	30.21	34.46	34.97	35.67	36.27	36.67	36.87	36.97	37.07	37.07	**35.79**
T28	28.35	31.46	33.13	33.70	33.87	34.47	34.57	34.77	34.87	34.87	**33.40**
Mean B	27.17	29.56	30.78	31.23	31.22	31.10	31.00	30.99	31.13	31.39	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.228		0.136		0.722						
CD5%	0.634		0.379		2.006						

Effect of various treatments and pore volume and their combination on the Cation exchange capacity of soil at 15, 30 and 45 DAI:

The CEC of soil as influenced by various treatments under study which was measured at 15, 30 and 45 Days after Incubation (DAI),

A: The findings of 15 days of incubation are presented in Table.40. and Fig.46. Among various treatments the mean highest CEC (40.09 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes). Followed by T16(36.36 cmol(+)/kg) which was found significantly at par with T15(36.02 cmol(+)/kg), T26(35.73cmol (+)/kg), T27(35.09 cmol(+)/kg), in all these treatments the measured soil CEC was found more than 35 cmol(+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil, as it increases from 24.36 to > 35.10 cmol (+)/kg.

The CEC in soil increased continuously till certain pore volumes, as soil leaching was performed in 10 steps with different amount of water based on pore volumes (PV) and time duration. The CEC was found at par for pore volume 3.5,4, 4.5 and 5 and significant increase in concentration was observed with increase in pore volume. The percentage increase CEC of various treatment combination at different pore volumes in comparison to original soil for mean values was 15.81 25.98 31.18 33.13 33.08 32.57 32.13 32.11 32.69 33.81for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 15 DAI are presented in Table.40. and Fig.46. It is evident that the most effective treatment for the reclamation of soil pH was T18 which, the CEC in T18 PV2.5 to 5 were at par with each other.

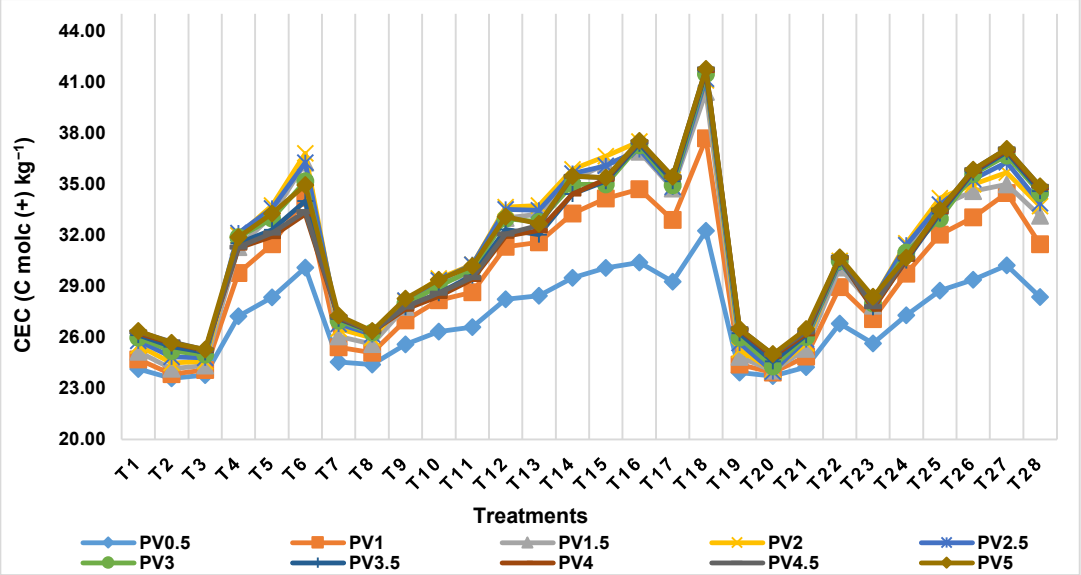


Fig.46: Interactive effect of various treatments on Soil CEC at 15 DAI

Table.19. Effect of various treatments and pore volume and their combination on the CEC of soil at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	25.93	26.59	27.27	27.93	28.54	29.07	29.47	29.71	29.75	29.77	**28.40**
T2	25.40	25.73	26.23	26.84	27.48	28.07	28.54	28.81	28.82	28.87	**27.48**
T3	25.57	25.96	26.46	27.01	27.56	28.07	28.48	28.76	28.83	28.67	**27.53**
T4	29.37	32.03	33.56	34.24	34.32	34.07	33.76	33.64	33.99	34.07	**33.30**
T5	30.14	33.36	35.27	36.17	36.34	36.07	35.65	35.37	35.51	35.67	**34.95**
T6	32.02	36.36	36.57	37.07	37.47	37.77	37.97	38.02	38.07	38.17	**36.95**
T7	26.36	27.30	28.14	28.89	29.53	30.07	30.49	30.80	30.99	31.06	**29.36**
T8	26.21	26.99	27.66	28.23	28.70	29.07	29.35	29.54	29.64	29.67	**28.50**
T9	27.39	28.88	29.90	30.55	30.91	31.07	31.13	31.17	31.28	31.57	**30.38**
T10	28.14	30.06	31.26	31.89	32.10	32.07	31.94	31.88	32.04	32.57	**31.39**
T11	28.39	30.53	31.91	32.69	33.02	33.07	32.99	32.94	33.08	33.57	**32.22**
T12	30.04	33.21	35.12	36.05	36.27	36.07	35.72	35.50	35.69	36.57	**35.02**
T13	30.54	33.92	35.82	36.58	36.55	36.07	35.50	35.57	35.67	36.68	**35.29**
T14	31.26	35.17	37.43	38.42	38.51	38.07	38.06	38.27	38.32	38.37	**37.19**
T15	31.87	36.04	37.47	38.37	38.67	39.37	39.57	39.67	39.77	39.77	**38.05**
T16	32.19	36.59	37.67	38.67	38.97	39.07	39.37	39.47	39.47	39.52	**38.10**
T17	31.07	34.78	36.86	37.68	37.62	37.97	38.37	38.67	38.77	38.79	**37.06**
T18	34.05	39.58	42.54	43.54	43.57	43.87	44.07	44.27	44.32	44.37	**42.42**
T19	25.72	26.28	26.95	27.68	28.40	29.07	29.63	30.02	30.18	30.27	**28.42**
T20	25.54	25.57	25.38	24.93	24.19	23.10	23.57	23.87	23.97	23.97	**24.41**
T21	26.04	26.75	27.43	28.05	28.61	29.07	29.42	29.63	29.69	29.70	**28.44**
T22	28.60	30.84	32.22	32.93	33.15	33.07	32.87	32.73	32.84	33.38	**32.26**
T23	27.43	28.95	29.97	30.60	30.94	31.07	31.10	31.13	31.26	31.57	**30.40**
T24	29.08	31.63	33.18	33.67	34.07	34.07	34.57	34.67	34.77	34.77	**33.45**
T25	30.54	33.92	34.67	34.87	35.57	36.07	36.57	36.77	36.97	36.92	**35.28**
T26	31.18	34.94	35.47	35.87	35.97	36.57	36.87	36.97	37.07	37.07	**35.80**
T27	32.03	32.07	35.07	36.07	37.07	38.07	39.07	39.57	40.07	40.27	**36.93**
T28	30.14	33.36	35.27	35.67	35.87	36.07	36.37	36.77	36.97	37.02	**35.35**
Mean B	**29.01**	**31.33**	**32.60**	**33.25**	**33.57**	**33.75**	**33.94**	**34.08**	**34.20**	**34.38**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.184		0.11		0.583						
CD5%	0.512		0.306		1.62						

Effect of various treatments and pore volume and their combination on the Cation exchange capacity of soil at 30 DAI:

The findings of 30 days of incubation are presented in Table.41. and Fig.47. Among various treatments the mean highest CEC (42.42 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes). Followed by T16(38.10 cmol(+)/kg) which was found significantly at par with T15(37.31 cmol(+)/kg), T26(37.80cmol (+)/kg), T27(37.93 cmol(+)/kg), in all these treatments the measured soil CEC was found more than 37 cmol(+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil, as it increases from 24.36 to > 37 cmol (+)/kg.

The CEC in soil increased continuously till certain pore volumes, as soil leaching was performed in 10 steps with different amount of water based on pore volumes (PV) and time duration. The CEC was found at par for pore volume 3.5,4, 4.5 and 5 and significant increase in concentration was observed with increase in pore volume. The percentage increase CEC of various treatment combination at different pore volumes in comparison to original soil for mean values was 15.81, 25.98 19.07, 28.62, 33.81, 36.50, 37.80, 38.56, 39.33, 39.88, 40.41, 41.12 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 30 DAI are presented in Table.41. and Fig.47. It is evident that the most effective treatment for the reclamation of soil pH was T18 which, the CEC in T18 PV2.5 to 5 were at par with each other.

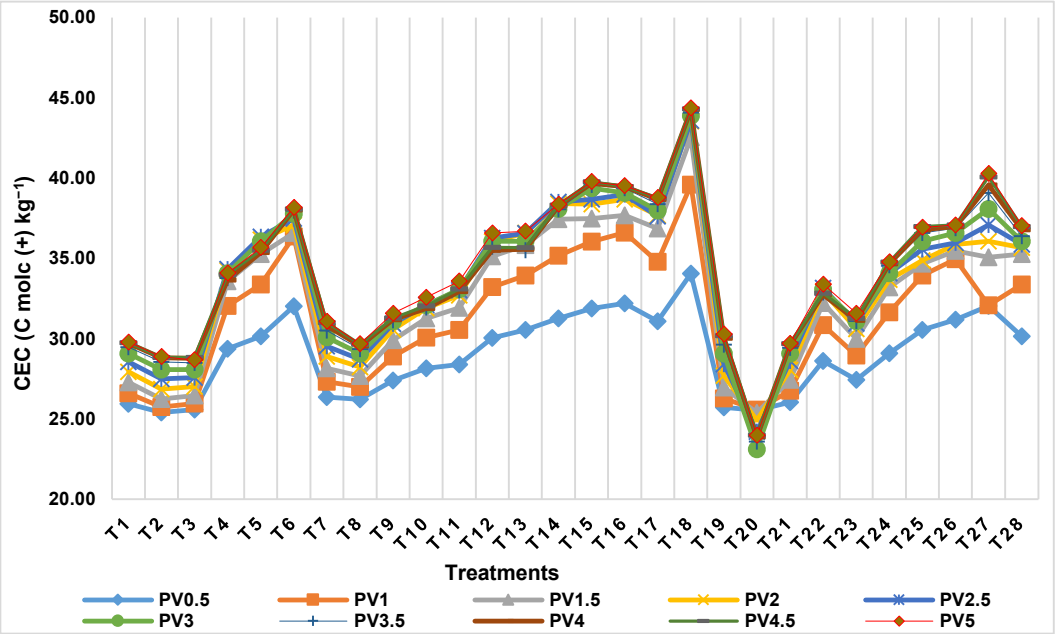


Fig.47: Interactive effect of various treatments on Soil CEC at 30 DAI

Table. 42. Effect of various treatments and pore volume and their combination on the CEC at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	28.41	29.15	30.02	30.96	31.89	32.73	33.41	33.85	33.99	33.93	31.84
T2	27.89	28.29	28.99	29.87	30.82	31.73	32.49	32.98	33.10	33.03	30.92
T3	28.04	28.52	29.23	30.06	30.93	31.73	32.37	32.74	32.76	32.88	30.93
T4	31.84	34.59	36.35	37.32	37.71	37.73	38.03	38.33	38.43	38.48	36.88
T5	32.64	35.92	38.00	39.14	39.63	39.73	39.93	40.03	40.13	40.17	38.54
T6	34.49	38.92	41.56	42.81	43.07	44.15	44.33	44.53	44.63	44.73	42.33
T7	28.83	29.86	30.93	31.97	32.93	33.73	34.33	34.65	34.64	34.73	32.66
T8	28.69	29.55	30.43	31.28	32.07	32.73	33.24	33.53	33.58	33.63	31.88
T9	29.86	31.44	32.68	33.61	34.28	34.73	35.00	35.12	35.15	35.23	33.71
T10	30.61	32.62	34.03	34.95	35.48	35.73	35.81	35.84	35.90	36.13	34.71
T11	30.86	33.09	34.68	35.75	36.39	36.73	36.86	36.90	36.95	37.13	35.54
T12	32.52	35.77	37.88	39.08	39.62	39.73	39.66	39.64	39.92	40.73	38.46
T13	33.02	36.48	38.57	39.43	39.73	39.93	40.03	40.13	40.18	40.23	38.78
T14	33.74	37.73	40.19	40.63	41.03	41.33	41.42	41.60	41.63	41.73	37.41
T15	34.35	38.60	39.33	39.73	40.73	41.73	42.33	42.53	42.73	42.78	40.49
T16	34.66	39.15	39.73	40.73	41.73	42.73	43.03	43.33	43.53	43.63	41.23
T17	33.55	37.34	38.33	39.23	39.73	40.73	41.23	41.53	41.63	41.73	40.51
T18	36.53	42.14	44.29	45.33	46.51	46.63	46.93	47.03	47.13	47.23	45.18
T19	28.21	28.84	29.69	30.68	31.72	32.73	33.62	34.31	34.70	34.73	31.93
T20	28.16	28.68	29.37	30.16	30.97	31.73	32.36	32.78	32.93	33.03	31.02
T21	28.53	29.31	30.18	31.08	31.95	32.73	33.36	33.77	33.92	33.93	31.88
T22	31.09	33.40	34.97	35.95	36.49	36.73	36.83	36.93	37.18	37.73	35.73
T23	29.92	31.51	32.73	33.63	34.28	34.73	35.04	35.27	35.48	35.73	33.84
T24	31.57	34.19	35.94	36.99	37.53	37.73	37.77	37.83	38.09	38.73	36.64
T25	33.02	36.48	38.57	39.61	39.89	39.93	40.03	40.33	40.43	40.43	38.88
T26	33.66	37.50	38.03	38.73	39.73	40.73	40.73	41.23	41.43	41.43	40.32
T27	34.50	36.73	38.73	40.73	41.73	42.73	43.33	43.73	44.03	44.03	42.03
T28	32.63	35.92	38.02	39.19	39.68	39.73	40.03	40.23	40.63	40.73	38.68
Mean B	**31.50**	**33.99**	**35.45**	**36.42**	**37.08**	**37.64**	**37.99**	**38.24**	**38.43**	**38.53**	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	**0.259**		**0.155**		**0.819**						
CD5%	**0.72**		**0.43**		**2.276**						

C: Effect of various treatments and pore volume and their combination on the Cation exchange capacity of soil at 45 DAI:

The findings of 45 days of incubation are presented in Table.42. and Fig.48. Among various treatments the mean highest CEC (45.18 cmol(+)/kg) was recorded in case of T18 (Biochar + NG45% + Biomes). Followed by T16 (41.23 cmol(+)/kg) which was found significantly at par with T17 (40.51 cmol(+)/kg), T26(40.32 cmol (+)/kg), T27(42.03 cmol(+)/kg), in all these treatments the measured soil CEC was found more than 40 cmol(+)/kg. It emphasized that the treatments comprising Biochar/ Vermicompost application in combination with 30-45% of gypsum requirement through NG + Biomes have been found effective in reclaiming the soil, as it increases from 24.36 to > 40 cmol (+)/kg.

The CEC in soil increased continuously till certain pore volumes, as soil leaching was performed in 10 steps with different amount of water based on pore volumes (PV) and time duration. The CEC was found at par for pore volume 3.5,4, 4.5 and 5 and significant increase in concentration was observed with increase in pore volume. The percentage increase CEC of various treatment combination at different pore volumes in comparison to original soil for mean values was 29.30 39.54 45.52 49.50 52.23 54.51 55.94 56.99 57.74 58.15 for PV1, PV2, PV2.5, PV3, PV3.5, PV4, PV4.5 and PV5 respectively.

To examine the interactive effect of amendment treatments with pore volume at 15 DAI are presented in Table.41. and Fig.48. It is evident that the most effective treatment for the reclamation of soil pH was T18 which, the CEC in T18 PV2.5 to 5 were at par with each other.

Table. 43. Effect of various treatments and pore volume and their combination on the ESP at 15 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	57.48	57.54	56.79	55.57	54.12	52.71	51.41	50.28	49.33	48.49	53.37
T2	56.13	55.46	54.47	53.32	52.12	51.04	50.05	49.14	48.23	47.17	51.71
T3	56.55	56.01	54.92	53.53	52.06	50.64	49.39	48.30	47.36	46.44	51.52
T4	52.79	51.98	53.13	54.45	54.35	52.16	48.19	43.70	40.78	42.41	49.39
T5	54.97	54.96	55.97	57.45	56.85	53.97	49.43	44.65	41.92	44.27	51.44
T6	58.36	59.75	61.26	62.68	61.44	57.56	52.00	46.49	43.54	46.47	54.95
T7	57.60	57.44	56.25	54.59	52.80	51.18	49.96	49.10	48.43	47.74	52.51
T8	57.22	56.73	55.32	53.48	51.59	49.92	48.60	47.63	46.90	46.16	51.36
T9	60.93	62.89	62.78	61.27	59.07	56.73	54.60	52.98	52.06	51.97	57.53
T10	54.88	53.29	51.93	50.70	49.35	47.78	46.12	44.71	44.11	45.13	48.80
T11	55.42	54.21	53.13	52.12	50.93	49.46	47.81	46.32	45.58	46.37	50.14
T12	58.90	59.34	58.93	57.98	56.48	54.47	52.25	50.34	49.58	50.88	54.92
T13	56.57	55.31	54.11	53.02	51.69	49.90	47.84	47.08	46.55	46.70	50.88
T14	58.71	58.32	57.42	56.39	55.04	53.28	51.45	50.23	50.69	50.74	54.23
T15	59.99	60.00	59.07	57.74	55.89	53.43	52.73	51.63	50.74	50.74	55.20
T16	59.35	58.54	56.94	55.24	53.25	52.69	51.73	50.50	49.22	48.91	53.64
T17	57.11	55.41	53.52	51.82	50.03	49.29	48.61	47.59	46.45	46.09	50.59
T18	63.02	63.60	62.26	60.49	59.21	58.61	57.59	56.13	54.84	54.44	59.02
T19	50.10	46.39	44.53	43.75	43.44	43.14	42.65	41.93	41.23	41.04	43.82
T20	49.61	45.21	42.77	41.34	40.28	39.98	39.61	39.14	38.53	37.97	41.44
T21	50.45	46.94	45.02	44.02	43.41	42.82	42.05	41.19	40.56	40.58	43.70
T22	53.29	50.65	48.95	47.85	46.84	46.36	45.65	44.72	43.83	43.84	47.20
T23	50.93	47.31	45.27	44.19	43.42	42.52	41.39	40.26	39.67	40.50	43.54
T24	54.19	51.98	50.46	49.42	48.40	47.07	45.45	44.49	43.74	43.74	47.89
T25	57.10	55.11	53.15	51.47	49.74	47.71	47.17	46.09	45.09	44.79	49.74
T26	58.42	56.92	54.57	52.75	51.99	51.55	50.65	49.48	48.34	47.76	52.24
T27	59.74	58.97	54.67	53.33	52.99	52.67	51.88	50.66	49.55	49.18	53.36
T28	55.66	55.70	56.73	58.19	58.19	57.28	53.77	49.54	46.38	47.27	53.87
Mean B	56.27	55.21	54.08	53.15	51.96	50.57	48.93	47.30	46.19	46.35	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.178		0.106		0.563						
CD5%	0.495		0.296		1.564						

Effect of various treatments and pore volume and their combination on the Exchangeable Sodium Percentage of soil at 15, 30 and 45 DAI:

The Exchangeable Sodium Percentage (ESP) of soil as influenced by various treatments under study which was measured at 15, 30 and 45 Days after Incubation (DAI),

A: The findings of 15 days of incubation are presented in Table.43. and Fig.49. Among various treatments the mean highest ESP (40.09) was recorded in case of T18 (Biochar + NG45% + Biomes).

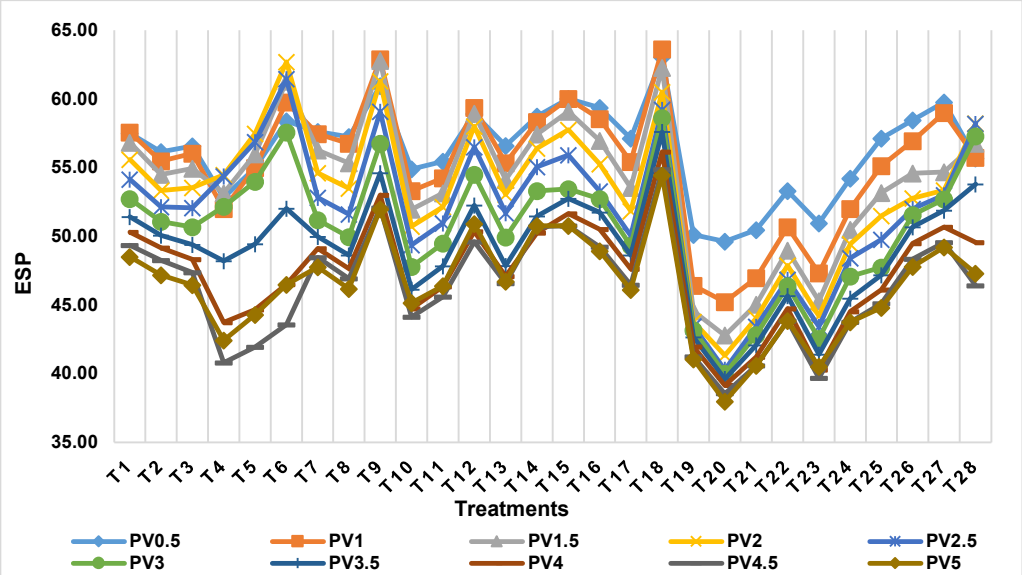


Fig.49: Interactive effect of various treatments on Soil ESP at 15 DAI

Table. 44. Effect of various treatments and pore volume and their combination on the ESP at 30 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	59.58	58.46	58.35	58.40	58.05	57.07	55.36	53.39	51.90	52.34	56.29
T2	58.29	56.52	56.11	56.11	55.86	55.08	53.58	51.76	50.26	54.05	54.76
T3	58.68	57.02	56.60	56.46	56.06	55.09	53.48	51.66	50.27	50.37	54.57
T4	53.92	47.97	45.08	43.92	42.99	41.22	38.60	35.59	33.67	33.99	41.70
T5	55.35	49.95	46.99	46.40	45.52	43.68	40.74	37.42	35.22	35.58	43.69
T6	58.74	54.41	48.64	47.49	46.90	45.67	43.36	40.19	37.69	38.01	46.11
T7	54.40	49.07	45.78	43.87	42.55	41.39	40.24	39.04	37.92	37.50	43.18
T8	54.10	48.52	45.02	42.84	41.37	40.11	38.81	37.46	36.32	35.82	42.04
T9	62.82	63.42	63.91	63.77	62.76	60.86	58.38	55.92	54.48	55.39	60.17
T10	50.95	43.56	40.05	38.89	38.41	37.49	35.70	33.21	30.98	30.42	37.97
T11	51.38	44.26	40.90	39.84	39.50	38.68	36.89	34.34	31.98	31.39	38.92
T12	54.36	48.13	45.01	43.91	43.37	42.19	39.92	37.00	34.50	34.16	42.26
T13	53.14	45.74	42.21	41.33	41.38	40.98	39.57	37.98	36.24	36.96	41.55
T14	54.38	47.42	44.09	43.40	43.60	43.22	42.40	40.81	38.92	38.61	43.69
T15	55.57	48.72	44.25	43.49	43.91	44.89	44.27	42.49	40.59	40.20	44.84
T16	54.79	47.51	42.50	41.92	42.42	42.60	41.80	39.77	37.60	37.80	42.87
T17	52.84	45.12	41.51	40.81	40.92	41.33	40.70	38.89	36.90	37.06	41.61
T18	57.92	51.33	47.80	47.11	47.36	47.72	46.69	44.49	42.19	42.39	47.50
T19	46.29	37.83	34.25	33.44	33.66	33.68	32.82	31.00	28.88	27.97	33.98
T20	46.50	37.14	32.61	30.43	28.96	27.05	26.40	24.93	23.22	22.04	29.93
T21	47.14	38.75	35.14	34.18	34.20	33.94	32.84	30.83	28.70	27.74	34.35
T22	49.76	41.61	37.92	37.21	37.52	37.56	36.61	34.92	33.37	33.61	38.01
T23	47.76	39.04	35.33	34.59	35.04	35.29	34.71	33.23	31.78	31.82	35.86
T24	49.79	41.78	38.13	37.08	37.63	37.77	37.60	36.02	34.38	34.07	38.43
T25	52.31	44.40	39.49	38.20	39.11	39.70	39.23	37.42	35.63	35.78	40.13
T26	53.45	45.78	40.40	39.31	39.60	40.30	39.61	37.67	35.78	35.68	40.76
T27	54.49	41.61	39.39	39.04	40.29	41.42	41.40	39.78	38.10	38.48	41.40
T28	55.28	49.91	46.94	45.71	44.88	43.64	41.53	38.86	36.60	36.90	44.03
Mean B	53.71	47.32	44.09	43.18	42.99	42.49	41.19	39.15	37.29	37.36	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.286		0.171		0.906						
CD5%	0.796		0.476		2.517						

Effect of various treatments and pore volume and their combination on the Exchangeable Sodium Percentage of soil at 30 DAI:

The findings of 30 days of incubation are presented in Table.43. and Fig.49. Among various treatments the mean highest ESP (…….) was recorded in case of T18 (Biochar + NG45% + Biomes).

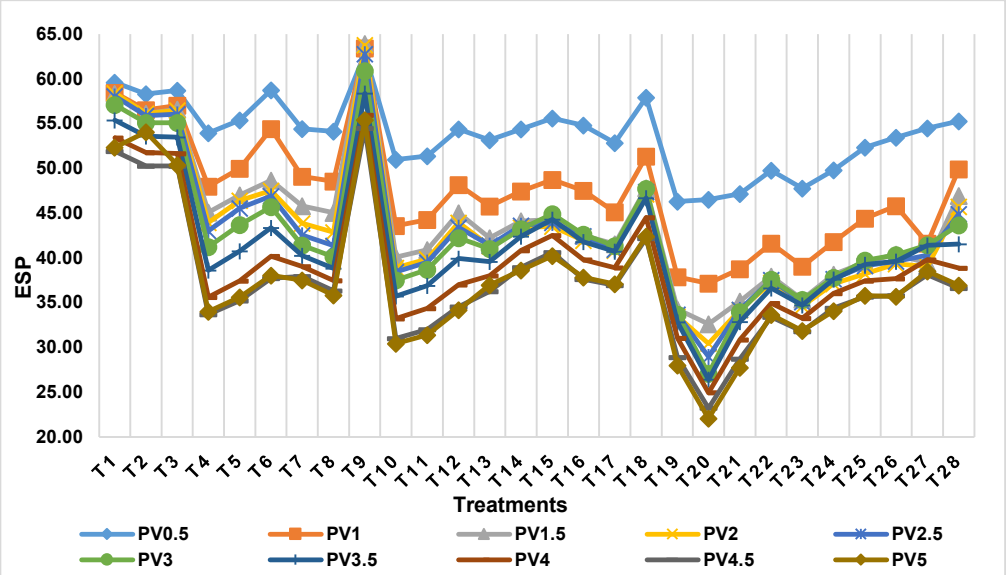


Fig.50: Interactive effect of various treatments on Soil ESP at 30 DAI

Table. 45. Effect of various treatments and pore volume and their combination on the ESP at 45 DAI

Pore Volume / Treatment	PV0.5	PV1	PV1.5	PV2	PV2.5	PV3	PV3.5	PV4	PV4.5	PV5	Mean
T1	49.79	39.60	35.29	34.27	34.49	34.50	33.40	31.20	28.75	28.02	34.93
T2	48.76	38.33	33.98	32.99	33.24	33.36	32.39	30.31	27.82	61.89	37.31
T3	49.62	39.24	34.87	33.83	34.05	34.03	32.96	30.79	28.34	27.77	34.55
T4	42.11	26.26	20.41	20.62	22.74	23.74	22.61	19.51	16.50	17.65	23.22
T5	43.19	27.29	20.92	21.63	23.95	25.01	23.76	20.39	17.31	18.41	24.19
T6	44.91	28.74	22.02	22.76	25.12	26.87	25.45	21.75	18.31	19.60	25.55
T7	46.27	33.41	27.30	25.37	25.31	25.46	24.95	23.49	21.79	21.82	27.52
T8	46.07	33.06	26.88	24.83	24.70	24.83	24.24	22.77	21.15	21.15	26.97
T9	47.42	34.61	28.28	26.08	25.79	25.72	24.90	23.23	21.52	21.52	27.91
T10	40.49	24.77	19.11	19.31	21.39	22.48	21.29	18.24	15.42	16.58	21.91
T11	40.83	25.14	19.48	19.76	21.95	23.13	21.93	60.13	15.88	17.04	26.53
T12	42.57	26.66	20.75	21.05	23.34	24.45	23.03	24.38	16.61	18.11	24.10
T13	39.82	20.59	13.30	13.74	17.20	20.11	20.56	18.55	15.96	16.61	19.65
T14	40.61	21.20	13.76	14.06	17.67	20.72	21.18	19.13	15.79	17.14	19.13
T15	42.06	22.48	14.26	14.54	18.37	21.79	22.51	20.43	17.76	18.46	21.27
T16	39.77	19.00	17.11	15.51	15.21	15.26	15.15	13.35	11.83	7.70	16.99
T17	38.60	18.24	16.64	15.07	14.61	14.68	14.66	12.93	11.45	7.63	16.45
T18	42.24	20.38	19.43	17.56	16.87	16.57	16.44	14.41	12.73	8.39	18.50
T19	37.08	21.15	15.30	15.20	17.43	19.49	19.91	18.54	16.73	17.37	19.82
T20	37.62	21.91	16.63	16.80	18.81	20.12	19.40	16.83	14.29	14.77	19.72
T21	37.32	21.84	16.52	16.72	18.81	20.13	19.35	54.53	14.09	15.07	23.44
T22	37.13	18.45	11.65	12.10	15.36	18.07	18.47	16.63	14.33	15.13	17.73
T23	36.04	17.74	11.24	11.67	14.79	17.45	17.94	16.25	14.04	14.70	17.19
T24	36.76	17.87	10.88	11.32	14.69	17.44	17.82	15.91	13.55	14.39	17.06
T25	38.68	18.58	17.54	16.03	15.49	15.22	15.06	13.39	11.96	8.10	17.00
T26	39.29	18.94	17.14	15.57	15.67	16.35	15.72	13.39	11.16	8.82	17.21
T27	40.39	19.03	14.87	15.02	16.69	17.88	17.01	13.75	10.57	9.79	17.50
T28	43.11	27.22	20.87	21.60	23.91	24.95	23.76	20.42	17.44	18.63	24.19
Mean B	41.73	25.06	19.87	19.47	20.99	22.14	21.64	22.31	16.54	17.94	
	Treatment (A)		**Pore Volume (B)**		**Interaction (A*B)**						
S.Em. ±	0.32		0.191		1.013						
CD5%	0.89		0.532		2.814						

Effect of various treatments and pore volume and their combination on the Exchangeable Sodium Percentage of soil at 45 DAI:

The findings of 45 days of incubation are presented in Table.43. and Fig.49. Among various treatments the mean highest ESP (…….) was recorded in case of T18 (Biochar + NG45% + Biomes).

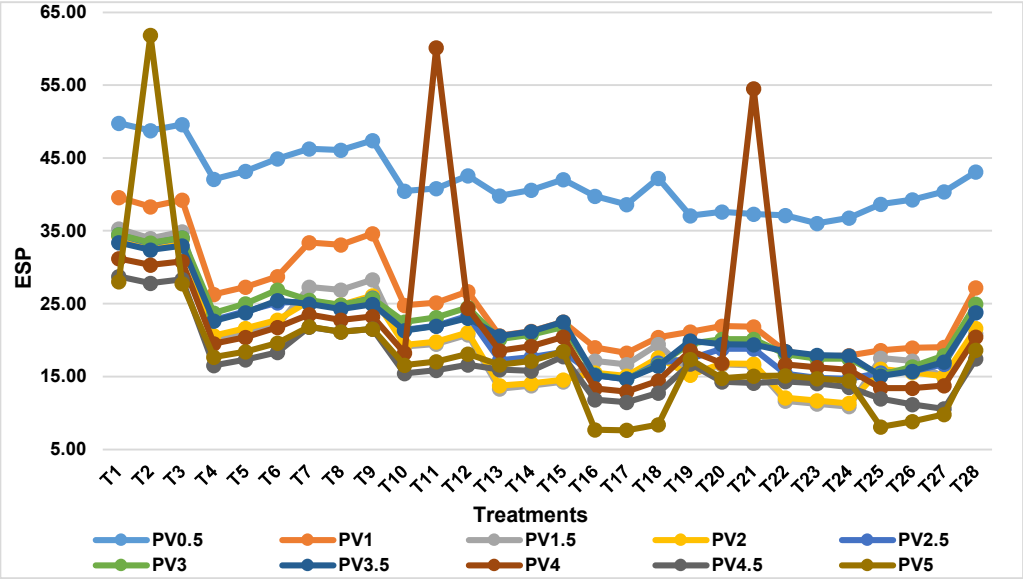


Fig.51: Interactive effect of various treatments on Soil ESP at 45 DAI

For official use only

All India Coordinated Research Project on Chickpea

भाकृअनुप
ICAR

Annual Progress Report
2022-23



RajmataVijayaraje Scindia Krishi Vishwa Vidyalaya
Campus: College of Agriculture,
Indore-452 001 (M.P.)

ALL INDIA COORDINATED RESEARCH PROJECT ON CHICKPEA

Annual Progress Report: 2022-23

1.	Project title	All India Coordinated Research Project on Chickpea College of Agriculture, Indore, (M.P.)
2.	Budget Head	Administrative approval of Department of Agriculture Research and Education, Ministry of Agriculture, Govt. of India, New Delhi *vide* letter No. CS/6/3/2014 – IA-III dated 11.11.2014 for opening of New Centre at College of Agriculture, Indore of AICRP on Chickpea during XII Five year Plan (2012-17) *w.e.f.,* 01.04.2015.
3.	Report No.	07
4.	Report Period	2022-23
5.	Date of start of Project	XII Five year Plan (2012-17) *w.e.f.,* 01.04.2015.
6.	Date of Termination	NA
(a)	Name of the Institute	College of Agriculture, Indore, (M.P.)
(b)	Department/Section	Department of Genetics & Plant Breeding

7. Introduction (Technological status and constraints)

Chickpea (*Cicer arietinum* Linn.) is the most important pulse grown in the Indian subcontinent. Among the pulses, chickpea occupies 30% of area with 38% of annual production in India. India contributes a major share of approximately 70% in the total world production. India produces mostly the *Desi* type chickpea and not the *Kabuli* type. Most of the people in the country satisfy their appetite requirements by consuming pulses and Chickpea is the most dominating pulse in this list. Major chickpea producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Andhra Pradesh. Chickpea is the pre dominant pulse crop in Madhya Pradesh which produces the major share of around 40% in the Indian production; Uttar Pradesh and Rajasthan follow Madhya Pradesh contributing to 16% and 14% of production respectively. In *Malwa* region, the area under *Kabuli* type chickpea has been increasing as availability of water improved due to adoption of rainwater harvesting technique and *Kabuli* type chickpea fetches higher premium.

In Madhya Pradesh, three types of chickpea *i.e., Desi*, *Gulabi* and *Kabuli* are grown with predominance of *Desi* type chickpea. These are characterized as;

Desi type: Seeds-Small to bold, angular, shades of brown colour with high percentage of fibre

Green seeded: Seeds-Small to bold, angular, green colour with high percentage of fibre

Black seeded: Seeds-Small to bold, angular, black colour with high percentage of fibre

Gulabi type: Seeds- Small, pea shaped, pink colour and suitable for parching

Kabuli type: Seeds- large, ram shaped, whitish colour with low percentage of fibre.

Desi type accounts for nearly 80-90% and *Kabuli* type covers around 10 – 20 % area. Nearly 80-90% of the crop is cultivated under rainfed conditions mostly on depleting soil moisture and on marginal lands. However, in Madhya Pradesh due availability of extra bold seeded kabuli type which is liked by farmers *i.e., Dollar* and double *dollar* types of *Kabuli* chickpea having more than 55g seed index and fetching premium prices in the market so, farmers have started growing *Kabuli* types replacing a significant area under *Desi* chickpea. This is quite significant in *Malwa* region and its adjacent regions.

The domestic demand of chickpea is so large that after India being the largest producer of chickpea, but it is also the largest importer of chickpea in the world. Over 4/5th of the chickpea produced in the country is used to produce *'Chana Dal'* and over 4/5th of this '*Dal*' is ground to make flour termed as '*Besan*'. The India imports around 30% of the total world imports. Major trading centers of chickpea in Madhya Pradesh are; Indore, Bhopal and Vidisha.

Table G-1: Area, Production and Yield of Chickpea in India and Madhya Pradesh

Year	India			Madhya Pradesh			Production Share of M.P. (%)
	Area ('000 ha)	Production ('000 t)	Yield (kg/ha)	Area ('000 ha)	Production ('000 t)	Yield (kg/ha)	
2009-10	8170	7480	915	3086	3304	1072	45.0
2010-11	9190	8220	895	3110	2690	863	32.7
2011-12	8300	7700	912	3040	3290	1081	42.7
2012-13	9510	8830	929	3130	3550	1135	40.2
2013-14	9930	9530	960	3160	3300	1044	34.6
2014-15	8250	7330	889	2853	2964	1039	40.4
2015-16	8390	7060	840	3017	3364	1115	47.7
2016-17	9630	9380	974	3222	3544	1100	37.8
2017-18	10560	11370	1077	3590	4595	1280	40.4
2018-19	9550	9940	1041	3103	3997	1288	40.2
2019-2020	9680	11080	1142	1926	2729	1417	25.2
2020-2021*		1261					

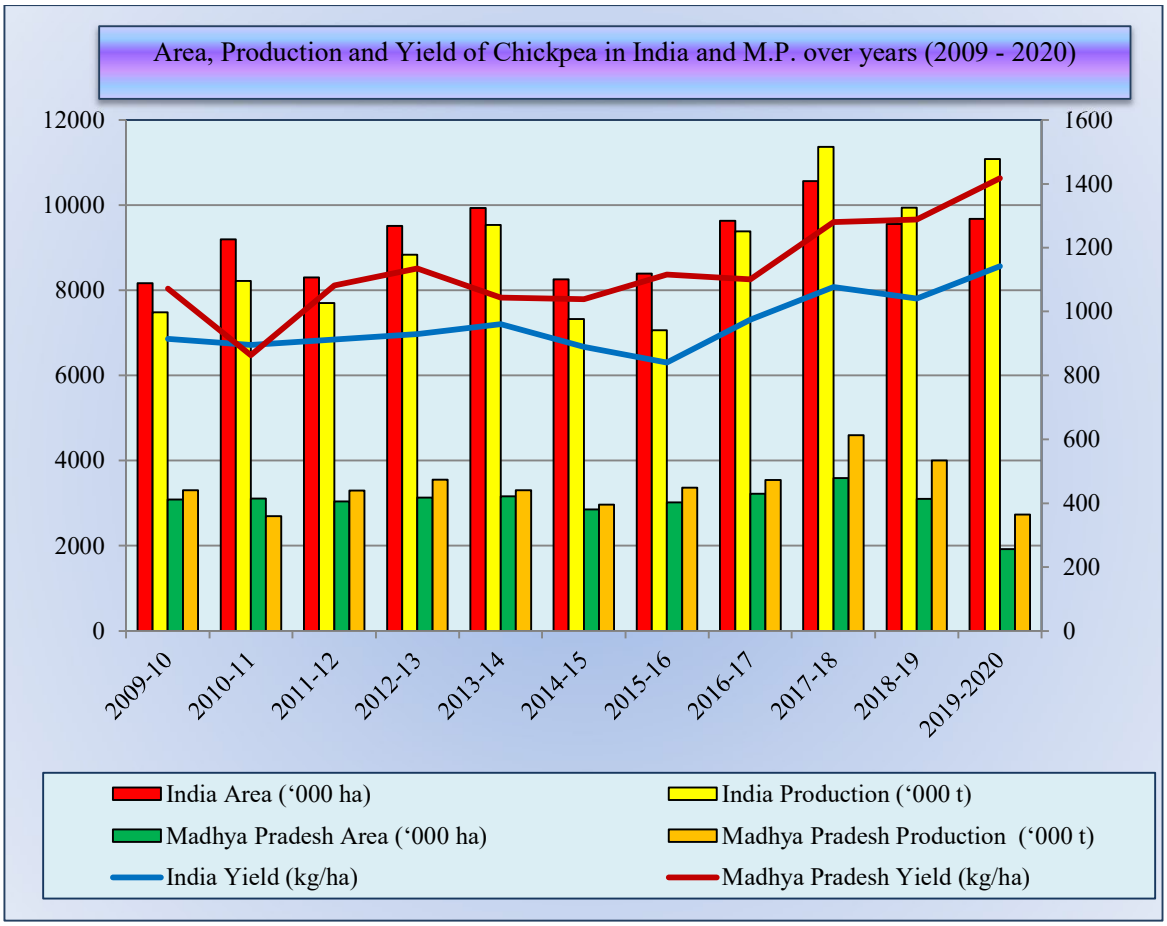
**3rd Advance estimates*

Source:-

- *Agricultural Statistics Division, Directorate of Economics & Statistics, Department of Agriculture & Cooperation.*

- *Project Coordinator's Report 2020-21. AICRP on Chickpea, ICAR – IIPR, Kanpur*

Figure G-1: Area, Production (on Y – I axis) and Yield (on Y-II axis) and during Period i.e., Year (on X axis) of Chickpea in India and M.P. over years.



Source:

- *Agricultural Statistics Division, Directorate of Economics & Statistics, Department of Agriculture & Cooperation.*
- *Project Coordinator's Report 2019-2020. AICRP on Chickpea, ICAR – IIPR, Kanpur*

Constraints:

Madhya Pradesh, being a leading state, any major increase or decrease in chickpea production of the state directly reflects in the Indian chickpea scenario. Thus, increase in chickpea production is the main focus of a chickpea breeder. Pulses can be grown on wide range of soil and climatic conditions and play important role in crop rotation, mixed and inter-cropping, maintaining soil fertility through atmospheric nitrogen fixation, release of soil-bound phosphorus, and thus contribute significantly to soil fertility and sustainability of the farming systems.

Production constraints:

- Production of major pulses is constrained by both biotic and a-biotic stresses. For example, pod borers (*Helicoverpa armigera*), *Fusarium* wilt, dry root rots, are some of the major biotic constraints to increasing the productivity of chickpea.

- Mostly chickpea is grown in low fertility, problematic soils and unpredictable environmental conditions.
- More than 87% of the area under pulses is rainfed. Drought (low soil moisture) and heat stress (high and low temperature) may reduce seed yields by 50%, especially semi-arid regions of M.P.
- Another major problem is salinity and alkalinity of soils which is high both in semi-arid tropics.
- With recent changes in the global temperatures the grain yield is likely to be drastically affected by temperature extremities.

Socio-economic constraints

- Even though India is the largest producer in the world, it imports large amount of chickpea from rest of the world.
- Farmers in India treat pulses as secondary crops.
- Until recently the government also gave less importance to pulses compared to the staple cereals. In general farmers' access to inputs is limited, both because of low purchasing power and accessibility to markets to sell the excess produce of pulses. Because of this situation, the farmers give first priority to staple cereals and cash crops for allocating inputs and the second priority to pulses. As a result, pulses continue to be grown on poor soils with low inputs.
- In addition, there is lack of policy support and post-harvest innovations related to pulse crops. Availability of quality seed of improved varieties and other inputs is one of the major constraints in increasing the production of grain legumes.

Both biotic and a-biotic factors affect the production and productivity of the crops. A close scrutiny of facts reveals that besides the a-biotic factors, seeds contribute to the great extent in the production. The changes of seeds and or varieties increase production to the tune of 40% (gross estimated factor productivity of seed).

The constraints to harness higher productivity could be removed with two pronged approaches *that are;*

a. By involving pulse growers in the research process at every step to ensure the easy up take of new and emergent knowledge based technologies by the farmers
b. Evolver, marketable input based technologies by involving both farmers and input agencies for making such technologies economically viable and acceptable by the pulse growers in the state.

8.a. Objectives of the project:

1. **Breeding for higher yield:** Chickpea has low harvest index values due to its indeterminate growth habit, photo-sensitive, thermo-sensitive and is characterized by poor partitioning of the photosynthetic materials. Yield potentiality can be increase by breeding cultivars responsive to fertilizer and irrigation.
2. **Breeding for extended adaptation of chickpea in space and time:** This objective schedules for breeding cultivars suited for double cropping in the irrigated areas *i.e.,* for sowing late in the season.
3. **Breeding for resistance to biotic stress:** Breeding for resistance / tolerance to biotic stresses will help to stabilize chickpea production. There are various biotic stresses faces by Chickpea which deprives the yield and production. Some of them are *Fusarium* wilt, color rot and dry root rot (diseases), gram pod borer and leaf minor (pests), cyst, root knot root lesion nematodes (soil microorganisms) *etc.*
4. **Breeding for resistance to a-biotic stress:** Breeding for resistance or tolerance to a-biotic stress is an important objective because these result in high yield instability. The major a-biotic stresses are drought, salinity, cold and frost.

8.b. Technical Programme approved for the year:

A – PLANT BREEDING

I - Evaluation of elite entries under varietal multi-locational trials

Table G-4: Technical Programme for *Rabi* 2022-23

S. N.	Trials	Details	Check entries	Date of Dry Sowing	Date of Come – up irrigation
	A - Coordinated Varietal Trials				
1	IVT *Desi Timely Sown*	Design: RBD Entries: 56 Replications: 03	CVRRN-1910	12.11.2022	19.11.2022
2	IVT *Rainfed*	Design: RBD Entries: 45 Replications: 03	IG 15-15	03.11.2022	20.11.2022
3.	IVT Mechanical Harvest	Design: RBD Entries: 49 Replications: 03	IG 2020-05 JG-6 X BGD-1085	03.11.2022	06.11.2022
4.	AVT-2 & 1 Rainfed	Design: RBD Entries: 10 Replications: 04	IG 2020-115 IG 21-06	28.11.2022	30.11.2022
5.	IVT *Kabuli + ELSK*	Design: RBD Entries: 36 Replications: 03	IGK2021-01 IGK 2021-05	28.11.2022	25.11.2022

6.	AVT -1& 2 *Kabuli* + *ELSK*	Design: RBD Entries: 11 Replications: 04	IKG 2020-01	25.11.2022	22.11.2022
	B- ICAR-ICRISAT Collaborated Chickpea Breeding Experiments				
1.	ICVT – *Desi*	Design: RBD Entries: 18+02 Replications: 02	Phule-Vikram GP 294	30.11.2022	03.12.2022
2.	ICVT –Extra Early	Design: RBD Entries: 08+02 Replications: 02	Phule-Vikram IG 2020-015	30.11.2022	03.12.2022
3.	ICVT – *Kabuli Large seed*	Design: RBD Entries: 18+02 Replications: 02	NBeG 119 IGK 2021-01	30.11.2022	03.12.2022

	C- State & Station Varietal Evaluation Trials				
1	Sehore Varietal Evaluation Trial – *Desi* (SVET- *Desi*)	Design: RBD Entries: (15+2) 17 Replications: 02	IG 2020-03	26.11.2021	28.11.2021
2	Sehore Varietal Evaluation Trial –*Pea-shaped* (SVET- *Pea-shaped*)	Design: RBD Entries: 16 (13+3) Replications: 02	RVG 210 RVG 204 IG 21-07	26.11.2021	29.11.2021
3.	Sehore Varietal Evaluation Trial – *Kabuli* (SVET- *Kabuli*	Design: RBD Entries: (8+2) =10 Replications: 02	IKG 2021-01 IGK 2021-115	27.11.2021	29.11.2021

BREEDING PROGRAMME ON CHICKPEA AT INDORE
Rabi 2022-23

I- Varietal evaluation Programme:

Under this programme following programme were undertaken:

1. Varietal Evaluation trial – *Desi*: Fifteen entries were evaluated in RBD with two replications.
2. Varietal Evaluation trial – *Pea-shaped*: Sixteen entries were evaluated in RBD with two replications.
3. Varietal Evaluation trial – *Kabuli*: Eleven entries were evaluated in RBD with two replications.
4. Station Varietal Evaluation trial – *Desi*: Thirty four entries were evaluated in RBD with two replications.
5. Station Varietal Evaluation trial – *Kabuli*: Fourteen entries were evaluated in RBD with two replications
6. State varietal Evaluation trial – *Desi*: Fourteen entries were evaluated in RBD with three replications.

II- Evaluation and maintenance of germplasm: 250 accessions were evaluate alternate years and evaluate for various quantitative traits *i.e.,*

- Earliness: Short duration (85-90 days)
  Medium duration (90-100 days)
  Late duration (More than 100 days)
- Growth habit: Determinate growth habit, Indeterminate growth habit
- Plant type: Erect, Semi-spreading, Spreading
- Plant height: Tall, Mid-tall, Dwarf
- Branching: Erect, Semi-spreading, Spreading
- Podding: Sparse, Mid-sparse and Profuse
- Seed colour: Brown all shade, Green and Creamy
- Seed size: Small, Medium, Bold

III- Evaluation of segregating generations:

Evaluation of F1 – F2 generation along-with Parents:

S.N.	Cross	S.N.	Cross
1	ICCV-10305	12	SPP-15 X JG-6
2	KARPA X RVSSG-37	13	JG-3 X KAK-2
3	ICC-10305 X RVSSG-37	14	JG-474 X ICCV-10314
4	KRIPA X RVSSG-37	15	SPP -38 X C-1743
5	ICCV-00305	16	Hyd X Indore
6	SAGL-152223 X RVSSG-10401	17	JG-33 X KAK-2
7	JGK-3 X RVSSG-37	18	JSC-37 X IPC-1239
8	ICCV-15223 X ICCV-10305	19	KAK-2 X RVSSG-37
9	ICCV-00305	20	JG-6 X JG-315
10	JG-14 X JG-15	21	ICCV-03403
11	IG-593 X JG-474		

Evaluation and selection in F5-F6 generations:

225 progenies were evaluated and line selections were made. All these selected progenies were also screened for *Fusarium* wilt under wilt sick plot. The selections were made on the basis of yield contributing quantitative traits and disease reaction.

IV- Hybridization programme:

- **National crossing programme:**

Four fresh crosses of *Kabuli* x *Kabuli* were made by using KAK-2, Kripa, JGK-3 and IGK-1 as parents and one pollinator RVSSG-37 (donor for wilt resistance and bold seed size).

i. KAK-2 X RVSSG-37
ii. Kripa X RVSSG-37
iii. JGK-3 X RVSSG-37
iv. IGK-1 X RVSSG-37

- **Station crossing programme**:

Following twenty-two crosses were attempted to combination breeding to developed disease (*Fusarium* wilt) resistance/tolerance with high seed yield potential, bold seeded and plant growth traits which can address the climate change on sustainable basis:

Table: List of crosses made at Indore during 2019-20 *rabi*

S.N.	Cross	S.N.	Cross
1.	SGLA-152223 x ICCV-10401	2.	ICCV-10401 x SGLA-152223
3.	JG-6 x JAKI-9218	4.	JG-130 x JG-14
5.	JG-6 x JG-315	6.	JG-474 x ICCV-10315
7.	JG-474 x ICCV-10315	8.	JG 474 x RVSSG-37
9.	JG-474 x ICCV-10401	10.	JG-315 x JG-6
11.	JSC-37 x IPC-1239	12.	ICCV-1034 x ICCV-10305
13.	ICCV-1034 x KAK-2	14.	RVKG-101 x KAK-2
15.	ICCV-10305 x RVSSG-37	16.	ICCV-06301 x BDG-1185
17.	JG-33 x KAK-2	18.	ICCV-10401 x JG-474
19.	JG-14 x JG-474	20.	JG-14 x ICCV-152223
21.	RVSG-201 x RG 2015-07*	22.	RG 2015-07* x RVSG-201

*Note: *C-1743: IVT- Desi (2017-18 Rabi)*

PLANT PATHOLOGY

1.	Evaluation of IVT, AVT-1 and AVT-2 (*Desi*, *Kabuli*, *Rainfed, Late sown etc.*) entries against Wilt disease of chickpea.
2.	Confirmation of resistance against wilt disease of chickpea.
3.	Chickpea national nurseries of elite lines and donors against wilt.
5.	Evaluation of advanced breeding materials against wilt disease of chickpea.
6.	Evaluation of chickpea germplasm against wilt disease of chickpea.

Exp. No.1: Evaluation of IVT, AVT 1 and AVT 2 (*Desi, Kabuli, Rainfed, Late Sown, MH, DTIL, WRIL etc.*) entries against wilt.

* Artificially inoculated conditions
Design: Susceptible check after every two test entries.

1. Susceptible check
   i. Wilt : JG 62, K 850
2. Resistant check*
   a) Wilt : JG 315/WR 315

*Resistant check should be used in the beginning and at the end of the trial.

Exp. No. 2: Initial Plant Pathological Screening Nursery (IPPSN) against wilt

- Source of seed: Own respective centers
- All other details as per experiment No. 1.

Exp. No. 3: Elite Plant Pathological Screening nursery for individual and multiple disease resistance (EPPSN) against wilt
Wilt:

Source of seed: The Project Coordinator (Chickpea), IIPR, Kanpur

Sowing to be done in wilt sick plot.

Plot size: 2 rows of each entry alternated with one row of susceptible check. Use resistant check as in Experiment No. 1.

Note:

1. Above entries to be contributed by the breeders.
2. Entries selected based on performance in different trials during 2018-19.
3. Only one entry from a cross will be accepted in EPPSN hence breeders are requested to send the pedigree
4. 700g seed of each entry should be sent to Project Coordinator (Chickpea), IIPR, Kanpur

Exp. No. 4: identification of races of *Fusarium oxysporum*f. sp. *ciceri* in wilt sick plot using new set of differentials.

Replications: Four (Two row/replication)

Differentials: C 104, JG 74, CPS 1, BG 212, WR 315, KWR 108, GPF 2, DCP 92-3, Chaffa, JG 62, Annegiri, L550 and K 850 (13)

Source of Isolate: Wilt sick plot JG 62 (Ten plant samples from different places of sick plot)

Observations: Total number of plants per entry, total number of wilted plants, per cent wilt. Each plant should be examined critically for wilt symptoms.

Note:

1. Centers in different zones have to supply fresh wilted ten JG 62 plants only to respective centers of zone as soon as the wilt appears in JG 62. The diseased plants should be blot dried and dispatched by speed post in brown envelops to the center of the respective zone taking up the studies and ICRISAT.

Exp. No. 5: International nurseries

A. ICAR-ICRISAT Collaborative Programme

- International Chickpea Wilt and Root Rot Nursery
- International Ascochyta blight Nursery
- International Botrytis grey mould Nursery
- Source of seed: ICRISAT

7. (c). Technical Personnel employed:

Post with Pay-scale (Rs)	Posts			Person Posted	Present Pay-scale
	Sanctioned	Filled	Vacant		
Scientist (Plant Breeder) PB 3 / 4 Rs. 37400-67000 + GP 8000/9000	01	01	-	Dr.(Ms.) Indu Swarup	Basic Rs.2,18,200 at 14 level
Scientist (Plant Pathology) PB-3 Rs.15600-39100 + 8000 (GP)	01	01	-	Dr. R.K. Singh	Basic Rs.1,10,400
Technical Assistant (T-3) PB-1	01	-	01		

8. (a) Budget 2022-23: Budget Head: ICAR – AICRP on Chickpea, Indore

1. Name of the scheme: AICRP on Chickpea, Indore
2. Whether recurring or non-recurring: Recurring
3. Grants position at the beginning of financial year 2022-23
   - i. Cash in hand / Bank: (-) 36,29,528
   - ii. Unadjusted Adv. balance: 00 = 00
   - iii. Total: (-) 36,29,528

4. Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent balances of the grants received years [Figure as at S.No.3 (iii)	Interest earned there on	Interest deposited back to the Government	Grant received during the year 2022-23			Total available funds (1+2-3+4)	Expend-iture incurred (75%)	Closing Balances (5-6)
1	2	3	4			5	6	7
			Sanction No. (i)	Date (ii)	Amount (iii)			
(-) 36,29,528	-	-	Compt./2023-24 /257	03.05. 2023	71,57,000	35,27,472	60,09,313	(-) 24,81,841

Component wise utilization of grants:

Grant –in – aid- General	Grant –in – aid- Salary	Grant –in – aid- Creation of capital assets	Total
1	2	3	4 (1+2)
96,794	59,12,519	-	60,09,313

Details of grant position at the end of the year 2022-23

i. Cash in hand / Bank: (-) 24,81,841

ii. Unspent balance: -

iii. Total: (-) 24,81,841

7 (b) Budget 2022-23: Budget Head: ICAR – AICRP on Chickpea, Indore, FLDs Chickpea

1 Name of the scheme: AICRP on Chickpea, Indore, FLDs Chickpea

2 Whether recurring or non-recurring: Recurring

3 Grants position at the beginning of financial year 2021-22

- Cash in hand / Bank: 1,11,795 = 00
- Unspent balance: 65,205 = 00
- Total: 1,77,000 = 00

Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent balances of the grants received years	Interest earned there on	Interest deposited back to the Government	Grant received during the year 2021-22			Total available funds (1+2-3+4)	Expend-iture incurred (75%)	Closing Balances (5-6)
1	2	3	4			5	6	7
			Sanction No. (i)	Date (ii)	Amount (iii)			
65,205	-	-	L.No.4 (A&A) / FLDs-Chickpea/ 2021-22/ 455 – 59 & L No. DON – 13-1/PC/ 2021-22	24.11. 2022	1,11,795	1,77,000	1,42,679	(+) 34,321

Component wise utilization of grants:

Grant –in – aid- General	Grant –in – aid- Salary	Grant –in – aid- Creation of capital assets	Total
1	2	3	4 (1+2)
1,42,679	-	-	1,42,679

Details of grant position at the end of the year 2021-22

- Cash in hand / Bank: (+) 34,321
- Unspent balance: -
- Total (+) 34,321

7 (c) Budget 2021-2022: Budget Head: ICAR – AICRP on Chickpea, Indore, TSP Chickpea

1 Name of the scheme: AICRP on Chickpea, Indore, TSP Chickpea

2 Whether recurring or non-recurring: Recurring

3 Grants position at the beginning of financial year 2021-22

- Cash in hand / Bank: 0 = 00
- Unspent balance: 8,73,924 = 00
- Total: 8,73,924 = 00

Details of grants received, expenditure incurred and closing balances: (Actuals)

Unspent balances of the grants received years	Interest earned there on	Interest deposited back to the Government	Grant received during the year 2021-22			Total available funds (1+2-3+4)	Expend-iture incurred (75%)	Closing Balances (5-6)
1	2	3	4			5	6	7
			Sanction No. (i)	Date (ii)	Amount (iii)			
8,73,924	-	-	DO No 13–1-1/PC/ 2021-22	21.12. 2022	0	8,73,924	2,50,225	(+) 6,23,699

Component wise utilization of grants:

Grant –in – aid- General	Grant –in – aid- Salary	Grant –in – aid- Creation of capital assets	Total
1	2	3	4 (1+2)
2,50,225	-	-	2,50,225

Details of grant position at the end of the year 2021-22

- Cash in hand / Bank: (+) 6,23,699
- Unspent balance: -
- Total (+) 6,23,699

8. Executive Summary (in English):

The state Madhya Pradesh is the leading state of the country in terms of area, production and productivity of chickpea is concerned. But its production fluctuates over years due to various constraints mainly related to climatic factors like; soil moisture availability, high / low temperature prevailed during crop growth period *etc*. To address these constraints, the ICAR has sanctioned a new centre of project, AICRP on Chickpea which commence from 01.04.2015 at the College of Agriculture, Indore. During the year 2022-23 *rabi*; total 06 coordinated trials on *Desi and Kabuli and* for Mechanical Harvest. 03 international varietal yield evaluation trials under ICAR–ICRISAT collaborative programme, 03 state varietal evaluation trials were conducted at Indore centre during 2022-23. Various crosses were attempted under national and station crossing programme. The project is also maintaining breeding materials developed at the centre and evaluate the F5 segregating generation of 25 crosses received from the Project Coordinator, Kanpur. 250 accession of chickpea germplasm were also evaluating, characterization and maintaining at the centre. Then, extension activity *viz.,* Demonstrations on chickpea under TSP and Front Line Demonstrations on chickpea were conducted on farmer's fields at different villages of Alirajpur district of the *Malwa* region. Apart from this the students of post-graduate also perform the field experiments for master's research (GP 599). The outcome of the project has been presented in the forgoing pages.

कार्यकारी सारांश (हिंदी में):

चने के क्षेत्रफल, उत्पादन और उत्पादकता की दृष्टि से मध्य प्रदेश देश का अग्रणी राज्य है। लेकिन इसके उत्पादन में मुख्य रूप से जलवायु कारकों से संबंधित विभिन्न बाधाओं के कारण वर्षों में उतार-चढ़ाव होता है; मिट्टी की नमी की उपलब्धता, फसल के विकास की अवधि के दौरान उच्च / निम्न तापमान आदि। इन बाधाओं को दूर करने के लिए, आईसीएआर ने परियोजना का एक नया केंद्र, चना पर एआईसीआरपी को मंजूरी दी है, जो 01.04.2015 से कृषि महाविद्यालय, इंदौर में शुरू होगा। वर्ष 2022-23 के दौरान रबी; देसी और काबुली और मैकेनिकल हार्वेस्ट पर कुल 06 समन्वित परीक्षण। आईसीएआर-आईसीआरआईएसएटी सहयोगी कार्यक्रम के तहत 03 अंतरराष्ट्रीय किस्म उपज मूल्यांकन परीक्षण, 03 राज्य किस्म मूल्यांकन परीक्षण 2022-23 के दौरान इंदौर केंद्र में आयोजित किए गए थे। राष्ट्रीय और स्टेशन क्रासिंग कार्यक्रम के तहत विभिन्न क्रास करने का प्रयास किया गया। परियोजना केंद्र में विकसित प्रजनन सामग्री का रखरखाव भी कर रही है और परियोजना समन्वयक, कानपुर से प्राप्त 25 क्रॉसों की F5 पृथक्करण पीढ़ी का मूल्यांकन करती है। केंद्र में चना जननद्रव्य के 250 परिग्रहण का मूल्यांकन, लक्षण वर्णन और अनुरक्षण भी किया गया। तत्पश्चात् मालवा क्षेत्र के अलीराजपुर जिले के विभिन्न गाँवों में किसानों के खेतों में टीएसपी के तहत छोले पर प्रदर्शन और चना पर फ्रंट लाइन प्रदर्शन जैसी विस्तार गतिविधि आयोजित की गई। इसके अलावा पोस्ट-ग्रेजुएट के छात्र मास्टर्स रिसर्च (जीपी 599) के लिए फील्ड एक्सपेरिमेंट भी करते हैं। परियोजना के परिणाम आगे के पृष्ठों में प्रस्तुत किए गए **हैं।**

9. Progress of research during 2022-23:

10-1 General information: The Indore centre is located in central highlands (*Malwa*) Gujarat Plain Kathiawar peninsula semi – arid eco- region (*AESR 5.1*). It represents *Malwa* region of Madhya Pradesh which is situated at $76^0$54' E longitudes and 22^0 43' N latitudes at an altitudes of 567 m above MSL.

10-2: Soil: The soils of the area are medium, deep and shallow black soils, mostly derived from Deccan trap. They are called black cotton soils and classified as *Vertisols*. These soils occupy 16.21 m ha area in the Central and Western parts of the State.

10-3: Meteorological data from October 2022 to April 2023 *i.e.,* during the crop growing season 2022-23 at Indore

Month	SMW	Date	Temperature (^{0}C)			RH	Rainfall	No. of Rainy
			Maxi	Mini	Average	(%)	(mm)	days
Oct.2022	40	Oct. 01–07 2022	31.1	22.1	26.6	88.8	37.3	3
	41	Oct. 08 – 14	28.7	20.9	24.8	88.4	24.3	3
	42	Oct. 15 – 21	29.8	16.3	23.1	79.9	0.0	0
	43	Oct. 22 – 28	30.3	14.4	22.4	73.2	0.0	0
Nov.2022	44	Oct. 29–Nov. 04	30.0	13.1	21.6	82.3	0.0	0
	45	Nov. 5-11	31.0	15.7	23.4	86.8	0.0	0
	46	Nov. 12-18	28.1	12.0	20.1	87.8	0.0	0
	47	Nov. 19-25	25.9	8.6	17.3	84.5	0.0	0
	48	Nov. 26- 2 Dec	27.0	8.7	17.9	83.7	0.0	0
Dec.2022	49	03 Dec -09 Dec	26.7	11.7	19.2	81.3	0.0	0
	50	10 Dec -16 Dec	26.5	14.3	20.4	84.7	4.1	1
	51	17 Dec -23 Dec	28.1	11.4	19.8	78.6	0.0	0
	52	24 Dec -31 Dec 2022	25.4	9.8	17.6	84.5	0.0	0
Jan 2023	1	Jan. 1 – 7, 2023	21.1	7.3	14.2	88.9	0.0	0
	2	Jan. 8 – 14	24.6	6.9	15.8	84.9	0.0	0
	3	Jan. 15 – 21	22.4	6.3	14.4	84.6	0.0	0
	4	Jan. 22 – 28	24.1	11.9	18.0	85.2	0.0	0
	5.	Jan. 29 – Feb. 4	25.6	9.1	17.4	82.4	0.0	0
Feb.2023	6	Feb. 5 – 11	28.4	9.6	19.0	77.6	0.0	0
	7	Feb. 12 – 18	30.1	9.0	19.6	75.6	0.0	0
	8	Feb. 19 – 25	32.7	11.0	21.9	81.1	0.0	0
	9	Feb. 26 – 4 Mar.	34.3	15.1	24.7	77.2	0.0	0
Mar.2023	10	March 5 – 11 2023	34.8	12.3	23.6	62.9	0.0	0
		TOTAL					65.7	07

The rainfall of 65.7 mm was received in 07 days during the crop growing season at Indore during 2022-23 Temperature (Maxi. and Mini.)

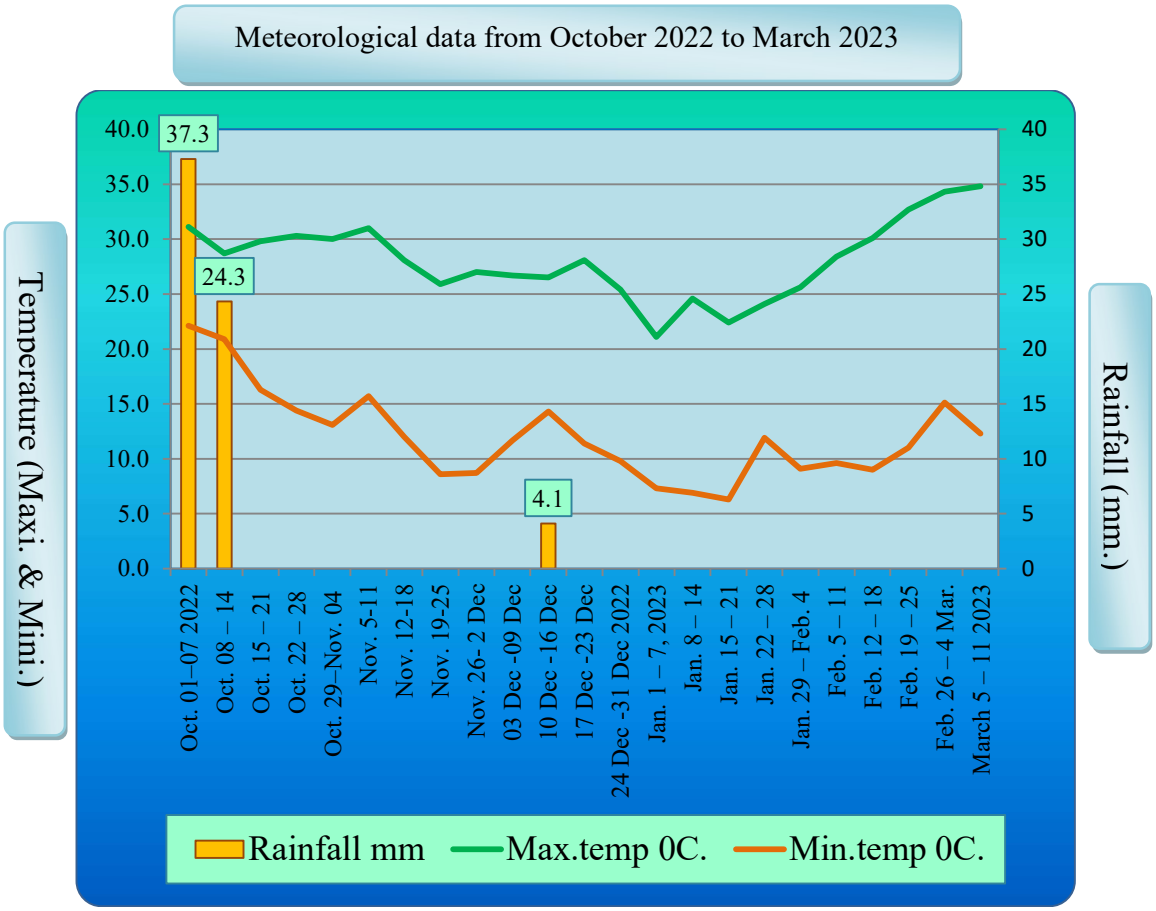


Figure: Meteorological data from October 2022 to March 2023 *i.e.,* (I Y axis temperature both Maxi. & Mini ^{0}C. II Y axis Rainfall mm.) During the growing season 2022-23 at Indore

Results of experiments conducted during 2022-23 *Rabi*

I- Plant Breeding

A- Coordinated Varietal Trial

Experiment No.1: IVT-*Desi Timely Sown*

Experimental details:

Number of entries	56 entries including local check *viz.,* CWRRN-1910 IG 2020-14
Replications	03
Design	RBD
No. of rows	4 rows
Row length	4 .00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation after dry sowing on 12.11.2022
Date of sowing	19.11.2022 (the effective date of sowing is 19.11.2022)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weedings on 12.12.2022 and 10.01.2023
Date of harvest	25.03.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Qunolphos 25 E	2.5 ml/l	26.12.2022
(ii) Chlorpyriphos	2.5 ml/l	10.01.2023

Previous crop	Moong and Urad

Results

Table PB-1: Performance of various entries in IVT- *Desi,* at Indore during *rabi* 2022-23

SN	Entry	Code	50% flowering	Maturity	Plant height	100 seed wt.	Yield	Remark
			Days	Days	cm	g	kg/ha	
1	RSGD 1186	C-22563	69.0	115.3	44.7	18.9	1569	
2	GNG 2589	C-22564	68.0	112.0	54.0	22.9	2208	V
3	**CSG 21-3**	C-22565	72.3	113.0	43.3	15.1	1042	
4	IG 2021-258	C-22566	81.0	121.7	40.3	21.6	1576	
5	RG 2021-55	C-22567	78.0	126.7	66.3	25.1	2125	

6	GL 18128	C-22568	82.7	122.3	41.3	14.0	1062	
7	H 19-26	C-22569	72.7	115.3	49.7	15.1	937	
8	PG 317	C-22570	79.0	121.7	50.3	20.8	861	
9	BAUG 115	C-22571	74.3	119.3	54.0	19.1	1382	
10	RKGD 22-2	C-22572	69.0	109.7	58.7	20.9	1500	
11	GJG 2011	C-22573	72.0	113.0	71.3	27.4	2270	
12	RLBG 12	C-22574	81.3	124.0	69.7	26.5	1534	
13	NBeG 1469	C-22576	80.3	122.7	62.7	20.4	1632	
14	RVSSG 115	C-22577	74.0	118.0	51.3	26.0	2743	I
15	PBC 581	C-22578	75.0	117.0	56.0	20.7	1035	
16	BDNG 2020-64	C-22579	63.7	113.0	47.0	19.0	1583	
17	RCEC - 6003	C-22580	79.0	119.3	53.7	21.9	958	
18	Phule G 1403-18-14	C-22581	78.3	124.3	63.0	21.0	1916	
19	BG 4039	C-22582	70.7	114.7	58.3	22.1	1972	
20	JG 2022-74	C-22583	74.3	117.3	56.3	13.9	2340	III
21	DC 22-1205	C-22584	74.0	115.7	58.0	19.8	1201	
22	IPC 2018-93	C-22585	73.0	117.0	59.7	19.6	2257	IV
23	JG 315 (Ch)	C-22587	72.7	117.0	53.7	18.0	1354	
24	IPCMB 19-3 (Ch)	C-22590	73.3	120.7	46.0	23.1	1042	
25	Phule G 0405	C-22594	69.0	111.3	56.0	21.4	2298	IV
26	GL 18151	C-22597	74.0	120.0	54.7	18.7	2104	
27	IPC 2018-90	C-22598	80.3	124.3	48.7	15.3	1347	
28	Jammu Chickpea 2	C-22600	77.0	124.7	62.3	21.9	1389	
29	H 20-39	C-22602	74.0	120.0	62.7	17.8	1250	
30	RSGD 1324	C-22603	75.0	114.3	68.3	26.2	1854	
31	RVSSG 116	C-22604	61.0	114.0	63.3	24.3	1937	
32	Mahabeej 2001	C-22605	69.0	117.3	50.0	24.5	1326	
33	RKG 22-1	C-22606	69.7	116.0	59.0	24.0	1055	
34	NBeG 1174	C-22607	72.0	115.3	42.0	21.7	1896	
35	BDNG 2021-5	C-22608	71.0	118.0	60.0	19.2	1048	
36	IG 2021-284	C-22609	81.0	122.3	65.7	23.5	2021	
37	CSG 21-1	C-22610	77.0	120.0	55.7	15.6	1451	
38	GNG 2588	C-22611	74.3	117.3	51.3	19.4	882	
39	Phule G1424-4-2	C-22612	81.7	128.3	71.0	22.4	2264	
40	BCD 22-5	C-22613	72.0	118.0	65.3	23.3	1132	
41	BG 4038	C-22614	69.0	115.7	58.7	30.9	2125	
42	CAU Desi-1	C-22615	76.7	121.3	53.0	24.8	1055	
43	PBC 597	C-22616	74.3	118.7	66.0	24.3	1819	
44	PG 311	C-22617	77.0	123.7	57.0	20.9	1042	
45	RCEC - 3	C-22618	77.0	123.3	62.0	25.2	1035	
46	JG 16 (Ch)	C-22620	81.0	118.3	46.0	17.7	1743	
47	RLBG 11	C-22624	73.0	124.7	64.3	27.0	1028	
48	Jammu Chickpea 1	C-22625	81.7	122.3	56.7	18.0	1215	
49	GJG 1907	C-22626	79.7	122.3	49.7	22.0	2007	
50	DC 22-1207	C-22627	77.0	118.0	62.3	20.6	1694	
51	JG 2022 -72	C-22628	69.0	121.3	66.3	28.9	1680	
52	BGM 20211 (Ch)	C-22631	80.0	124.3	54.7	17.0	2340	III
53	GCP 101 (Ch)	C-22634	70.7	118.3	41.7	18.3	2104	

54	AKG 1303 (Ch)	C-22636	80.0	126.7	55.0	17.4	1333	
55	NDG 21-11	C-22637	79.0	126.3	55.7	17.7	1354	
56	CWRRN-1910 (LC)	CWRRN -1910	65.0	115.3	58.0	25.0	2736	II
	GM		**74.6**	**119.2**	**56.3**	**21.2**	**2130**	
	SE (m)		**3.9**	**1.9**	**2.5**	**1.4**	**70.2**	
	CD (5%)		**1.3**	**5.3**	**6.9**	**4.0**	**194.5**	
	CV(%)		**2.0**	**4.9**	**13.3**	**20.4**	**9.9**	

Experiment No.2: IVT- ***Rainfed***

Experimental detail:

Number of entries	45 entries including check *viz.,* IG 15-15
Replications	03
Design	RBD
No. of rows	4 rows
Row length	4 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation just after dry sowing on 20.11.2022
Date of sowing	03.11.2022 (the effective date of sowing is 20.11.2022)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weedings on 30.12.2022 and 26.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	27.12.2022
(ii) Chlorpyriphos	2.5 ml/l	12.01.2023

Date of Harvest: 23.03.2023

Previous crop: Moong and Urad

Result:

Table PB-2: Performance of various entries in IVT- *Rainfed,* at Indore during *rabi* 2022-23

S. N	Entry	Code	50% flowering	Maturity	Plant ht.	100 seed weight	Seed Yield	Ranks
			Days	Days	cm	g	kg/ha	
1	Pusa Chickpea 10216 (Ch)	C- 22725	74.0	110.0	50.4	21.0	1528	
2	BG 4042	C- 22726	68.7	103.3	45.0	26.0	1257	
3	GNG 2586	C- 22727	75.3	114.0	49.7	17.7	1382	
4	PBC - 534	C- 22728	65.3	106.0	46.2	24.0	1403	
5	NBeG 699	C- 22729	64.0	105.7	54.3	29.9	1416	
6	Mahabeej 2003	C- 22730	61.7	101.7	57.4	19.5	986	
7	IPC 2017 - 54	C- 22731	77.7	117.0	57.5	19.9	1902	
8	Phule G 1517-22-2	C- 22732	61.0	96.7	53.0	25.2	1972	
9	GJG 2003	C- 22733	63.3	100.7	47.7	25.3	1583	
10	VICD 21-01	C- 22734	59.0	99.7	50.0	18.2	1160	
11	IG 2021-283	C- 22735	70.3	107.3	42.0	19.2	1923	
12	RSGD - 1198	C- 22736	69.0	108.3	46.7	21.6	833	
13	RKG 22 - 5	C- 22737	67.0	106.3	46.3	20.0	1208	
14	CSG 21 - 8	C- 22738	76.7	112.3	62.1	19.2	1069	
15	IG 2021-104	C- 22739	70.3	106.7	47.0	23.7	1902	
16	RVSSG - 118	C- 22740	75.7	107.7	53.7	25.3	1673	
17	H 19 - 14	C- 22743	72.3	113.0	51.0	21.2	1222	
18	GL 18151	C- 22744	81.0	119.0	45.7	20.0	1278	
19	BDNG 2020 - 71	C- 22745	54.0	108.3	47.3	18.0	1222	
20	VIJAY (Ch)	C- 22747	66.3	104.0	45.5	17.7	1375	
21	Phule G 211111	C- 22749	77.3	113.3	63.9	17.7	1472	
22	TKCH - 1	C- 22751	70.0	107.3	46.7	21.2	1389	
23	**AKG - 1805**	C- 22752	0.0	0.0	0.0	0.0	1486	
24	PG 336	C- 22753	69.0	111.0	40.3	23.2	1069	
25	GCP 101 (Ch)	C- 22754	72.7	108.3	41.4	16.3	667	
26	GL 19059	C- 22755	76.0	114.3	61.3	16.2	1042	
27	BDNG 2020-77	C- 22756	79.7	117.0	53.0	23.5	1354	
28	KCDE - 209	C- 22757	70.3	109.7	61.5	22.1	1965	
29	RVSSG - 117	C- 22758	69.7	109.7	60.5	23.6	1104	
30	H 20-18	C- 22759	76.7	114.3	57.9	20.4	1055	
31	VCD 21 - 07	C- 22762	73.0	112.0	47.3	28.7	1090	
32	PG - 319	C- 22763	71.7	113.0	51.2	17.3	1278	
33	RKG 22 - 6	C- 22764	71.0	112.7	59.3	18.2	1604	
34	**JG 16 (Ch)**	**C- 22765**	72.7	112.7	51.0	17.9	1180	
35	RSGD - 1273	C- 22766	75.7	112.0	48.0	17.7	1472	

36	JG 2022 - 77	C- 22767	75.0	112.7	66.3	23.1	1062	
37	GNG 2582	C- 22768	73.0	111.3	47.7	18.4	1715	
38	IPC 2017 - 369	C- 22769	81.3	117.0	57.3	18.2	1153	
39	KCDE - 208	C- 22770	72.0	109.7	58.7	29.4	1312	
40	GJG 2004	C- 22772	72.7	112.0	50.0	20.9	1132	
41	NBeG 1710	C- 22773	70.0	106.7	57.0	23.5	1125	
42	Mahabeej 2002	C- 22774	69.0	112.0	41.3	23.2	1548	
43	PBC - 544	C- 22775	70.0	109.7	57.3	22.4	1319	
44	BGD 20103	C- 22776	72.0	116.3	54.3	20.2	1680	
45	IG 15-15 (LC)	C- 22777	71.0	110.7	55.0	22.0	2264	
	GM		**79.0**	**115.7**	**55.3**	**24.3**	**1375**	
	SE (m)		**71.2**	**110.0**	**52.0**	**21.4**	**55.4**	
	CD (5%)		**7.2**	**6.2**	**10.2**	**0.6**	**153.6**	
	CV(%)		**2.1**	**1.8**	**3.0**	**1.6**	**12.1**	

Experiment No.3: **IVT-*Mechanical Harvest***

Experimental details:

Number of entries	49 including checks (IG 2020-15 and JG-6 X BGD-1085)
Replications	03
Design	RBD
No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation just after dry sowing on 06.11.2022
Date of sowing	03.11.2022(the effective date of sowing is 06.11.2022)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weedings on 30.11.2022 and 26. 12.2022
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	27.12.2022
(ii) Chlorpyriphos	2.5 ml/l	12.01.2023

Previous crop	Moong and Urad
Date of Harvesting	28.03.2023

Results:

Table PB-3: Performance of various entries in IVT- (*Mechanical Harvest),* at Indore during *rabi* 2022-23

S. N.	Entry	Code	50% flowering	Maturity	Plant ht	100 seed weight.	Seed Yield	Rank
			days	days	cm	g	kg/ha	
1	GJG 2010	C-22925	65.7	114.0	56.5	22.1	2007	
2	AKG 1804	C-22928	65.0	112.0	54.7	24.6	1271	
3	PBC - 593	C-22929	65.0	111.0	49.0	25.5	1521	
4	RLBGMH -8	C-22930	68.3	114.3	60.0	24.5	1389	
5	**AKG 1303 ©**	C-22931	65.3	114.7	55.3	20.5	1909	
6	H 20-94	C-22933	72.0	118.0	59.9	14.1	958	
7	PG 333	C-22934	69.0	117.0	47.7	13.6	1194	
8	RVSSG 121	C-22935	67.0	113.7	58.9	22.1	1798	
9	Phule G 1415-15-15	C-22936	64.0	113.3	50.7	25.9	1430	
10	DMHC 22-1109	C-22937	63.0	109.3	59.7	25.1	1257	
11	JG 2022-73	C-22938	68.0	114.7	50.7	19.6	1521	
12	RKGM 22-10	C-22939	66.0	113.3	36.3	22.2	1375	
13	**BG 3062 ©**	C-22940	67.0	114.7	54.5	21.6	2173	
14	H 20-12	C-22944	73.0	118.0	53.7	16.2	1493	
15	RVSSG 122	C-22945	59.0	108.7	61.6	26.7	1319	
16	BDNG 2020-22	C-22946	66.3	115.0	63.4	20.0	1083	
17	VCMH 21-20	C-22947	67.0	114.7	40.7	16.3	1000	
18	ICCV 211102	C-22948	72.3	118.3	54.7	27.0	1465	
19	GL 201112	C-22949	71.0	117.3	46.3	22.0	1021	
20	BG 4046	C-22950	73.0	118.0	48.3	19.1	2222	
21	JG-16 (C)	C-22952	72.0	117.3	40.9	20.7	1729	
22	KCD 21-105	C-22955	66.0	113.7	43.4	26.5	1125	
23	IG 2021-114	C-22956	55.0	103.0	51.1	37.4	1166	
24	PG 329	C-22957	71.3	116.3	52.7	15.6	1403	
25	RSGD - 1245	C-22958	66.0	113.7	52.9	21.3	1687	
26	IPC 2018-132	C-22959	66.3	114.3	64.3	13.7	1680	
27	NBeG 1923	C-22960	64.0	113.3	53.8	17.0	1708	
28	BRC 2022-11	C-22961	71.0	118.0	55.3	20.0	1840	
29	GJG 2007	C-22962	71.3	118.7	61.2	15.6	1368	
30	BDNG 2020-45	C-22963	70.7	118.7	51.7	17.7	1680	
31	RVG 204 ©	C-22964	67.0	114.3	58.7	21.8	1472	
32	Phule G 0405 ©	C-22967	65.0	112.7	48.1	20.2	1493	
33	JG 24 ©	C-22968	75.0	123.0	70.3	28.1	1389	
34	BG 4045	C-22969	68.0	115.0	63.9	22.0	1375	
35	RSGD - 966	C-22970	71.0	117.0	46.4	21.5	1014	
36	GL 19046	C-22971	74.0	120.0	36.1	13.5	1208	
37	IPC 2017-249	C-22972	72.0	118.7	52.1	17.9	1278	
38	RKGM 22-9	C-22973	62.0	112.0	45.5	23.0	1437	
39	NBeG 1740	C-22974	75.0	124.7	63.3	28.0	1507	
40	DMHC 22-1108	C-22975	68.7	115.7	64.6	21.4	1097	
41	VCMH 21-11	C-22976	68.7	117.7	61.8	18.8	1153	

42	Phule Vikram ©	C-22977	67.7	114.7	55.0	21.3	1784	
43	RLBGMH -7	C-22978	77.0	125.0	65.7	26.8	1437	
44	Phule G 1424-7-7	C-22979	75.3	124.3	62.4	22.7	1680	
45	IG 2021-110	C-22980	69.3	115.7	60.1	17.6	1375	
46	KCD 21-104	C-22981	71.0	118.3	66.9	26.0	1882	
47	PBC - 580	C-22982	65.7	115.0	45.4	21.4	1340	
48	IG 2020-05	IG 2020-05	67.7	113.7	55.4	23.6	2264	
49	JG-6 x BGD-1085	LC	68.3	110.7	63.3	34.3	2194	
	G. Mean		**68.3**	**115.6**	**54.6**	**21.7**	**1493**	
	SE m		**3.4**	**0.3**	**1.0**	**0.2**	**52.2**	
	CD (5%)		**1.0**	**0.8**	**2.7**	**0.6**	**144.7**	
	CV (%)		**1.5**	**0.8**	**5.3**	**2.9**	**10.6**	

Experiment No. 4: AVT-1 (*Rainfed)*

Experimental detail:

Number of entries	10 including checks viz., IG 2020-115, IG 21-06
Replications	04
Design	RBD
No. of rows	8 rows
Row length	4 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 2.40 m = 9.60 sq. m
Irrigation	One come up irrigation just after dry sowing on 29.11.2022
Date of sowing	22.11.2022 (the effective date of sowing is 29.11.2022)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Previous crop	Moong and Urad

Table PB-4: Performance of various entries in AVT-1 (*Rainfed) Desi* at Indore during *rabi* 2022-23

S. N.	Entry	Code	50% flowering	Maturity	Plant ht	100 seed wt.	Seed Yield	Ranks
			Days	Days	cm	g	kg/ha	
1	**JG 16 (Ch)**	C-22715	62.3	113.0	35.9	17.5	1378	
2	**IG 21-04**	C-22716	61.8	118.5	57.5	19.0	1639	
3	**IPC 2017-04**	C-22717	66.3	112.8	70.0	21.8	1547	
4	GCP 101 (Ch)	C-22718	67.3	119.0	41.7	17.4	1230	
5	GJG 1913	C-22719	69.8	120.0	47.9	18.8	1323	

6	PUSA CHICKPEA 10216 (Ch)	C-22720	70.3	121.3	44.8	20.6	1276	
7	GNG 2546	C-22721	77.5	121.0	35.1	18.6	1295	
8	VIJAY (Ch)	C-22722	75.8	120.3	34.1	17.9	1198	
9	IG 2020-115	LC	65.0	112.3	48.6	22.5	1149	
10	IG 21-06	LC	62.0	107.3	50.3	20.7	1123	
	G. Mean		**67.8**	**116.5**	**46.6**	**19.5**	**1196**	
	SE (m)		**0.4**	**0.5**	**2.1**	**0.3**	**41.4**	
	CD (5%)		**1.2**	**1.5**	**4.0**	**0.5**	**114.6**	
	CV(%)		**18.6**	**0.7**	**18.9**	**3.8**	**13.8**	

Experiment No. 5: IVT *Kabuli* + *ELSK*

Experimental detail:

Number of entries	36 including checks viz., IGK 2021-01, IGK 2021-05
Replications	03
Design	RBD
No. of rows	4 rows
Row length	4 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 2.40 m = 9.60 sq. m
Irrigation	One pre-sowing irrigation on 25.11.2022
Date of sowing	28.11.2022 (the effective date of sowing is 30.11.2022)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 30.12.2022 and 06.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	27.12.2022
(ii) Chlorpyriphos	2.5 ml/l	06.01.2023

Previous crop	Moong and Urad
Date of harvesting	26.03.2023

Result: Table PB-5: Performance of various entries in *IVT Kabuli + ELSK* at Indore during *rabi* 2022-23

S. N.	Entry	Code	50% flowering	Maturity	Plant ht	100 seed wt.	Yield	Remark
			Days	Days	cm	g	kg/ha	
1	BCK - 22-7	C- 22821	66.0	107.7	50.4	31.0	1160	
2	IGK 2021-115	C- 22822	62.3	104.0	45.0	53.0	1798	
3	GLK 19303	C- 22823	60.7	102.3	49.7	35.7	2000	
4	NBeG 844	C- 22825	65.0	106.7	46.2	40.3	1653	
5	VICK 21-11	C- 22826	70.0	111.7	54.3	30.3	1139	
6	RSKGD 1001	C- 22827	64.7	106.3	57.4	44.0	1055	
7	HK 20-02	C- 22828	69.3	111.0	57.5	28.7	757	
8	BDNGK 798 (Ch)	C- 22829	75.7	117.3	53.0	24.7	757	
9	PKV 4 (Ch)	C- 22830	69.0	110.7	47.7	50.0	1021	
10	Phule G 211406	C- 22832	64.0	105.7	50.0	47.3	1187	
11	BG 40044	C- 22833	68.3	110.0	42.0	50.0	1035	
12	RKGK 22-8	C- 22834	69.3	111.0	46.7	47.7	1493	
13	KAK 2 (Ch)	C- 22835	63.7	105.3	46.3	26.3	1194	
14	RLBGK - 8	C- 22837	66.3	108.0	62.1	43.3	993	
15	IPCK 2018-185	C- 22838	65.3	107.0	47.0	38.3	1236	
16	GJGK 2019	C- 22839	66.0	107.7	53.7	32.0	1236	
17	DK 22-1303	C- 22840	68.0	109.7	51.0	32.7	1160	
18	IGK 2021-116	C- 22841	63.0	104.7	45.7	37.3	1479	
19	NBeG 810 (Ch)	C- 22843	61.0	102.7	47.3	39.3	1423	
20	HK 20-07	C- 22844	72.0	113.7	45.5	27.3	1611	
21	RKGK 22-7	C- 22846	65.3	107.0	63.9	42.7	1166	
22	IPCK 2014- 125	C- 22847	69.7	111.3	46.7	34.0	937	
23	IPCK 2002 - 29 (Ch)	C- 22848	69.0	110.7	49.3	26.3	1104	
24	CSJK 176	C- 22849	69.3	111.0	40.3	25.3	1854	
25	NBeG 833	C- 22850	66.0	107.7	41.4	34.7	1333	
26	Phule G 0517 (Ch)	C- 22851	67.7	109.3	61.3	46.3	1250	
27	Phule G 211408	C- 22853	69.0	110.7	53.0	44.0	826	
28	RLBGK - 9	C- 22854	67.0	108.7	61.5	40.7	1194	
29	RKGK13-414 (Ch)	C- 22855	69.7	111.3	60.5	28.7	1028	
30	BG 4043	C- 22856	62.0	103.7	57.9	37.7	1403	
31	VCK 21-01	C- 22857	67.7	109.3	47.3	33.7	1389	
32	JGK 5 (Ch)	C- 22858	67.7	109.3	51.2	50.0	1368	
33	GLK 18088	C- 22859	70.3	112.0	59.3	25.0	757	
34	DK 22- 1305	C- 22860	66.0	107.7	51.0	35.3	1194	
35	IGK 2021-01 (LC)		61.3	103.0	48.0	52.3	1708	
36	IGK2021-05 (LC)		56.3	98.0	66.3	47.7	1590	
	Mean		66.5	108.2	51.6	37.9	**1263**	
	SE m		5.3	5.3	1.0	0.8	**73.9**	
	CD 5%		1.8	1.8	2.8	2.1	**204.8**	
	CV		2.9	1.8	5.9	6.0	**17.5**	

Experiment No. 6: ***AVT - 2 Kabuli + ELSK***

Experimental detail:

Number of entries	11 entries including checks viz., IGK 2020-01
Replications	04
Design	RBD
No. of rows	8 rows
Row length	4 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 2.40 m = 9.60 sq. m
Irrigation	One pre-sowing irrigation on 22.11.2022
Date of sowing	25.11.2022
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weedings on 20.12.2022 and 10.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	20.12.2022
(ii) Chlorpyriphos	2.5 ml/l	12.01.2023

Previous crop	Moong and Urad

Result:

Table PB-8: Performance of various entries in *AVT – 1 &2 Kabuli + ELSK* at Indore during *rabi* 2022-23

S. N.	Entry	Code	50% Flowering	Maturity	Plant Ht.	100 seed wt.	Seed Yield	Rank
			Days	Days	Cm	g.	kg/ha	
1	BG 4035 (ELSK) AVT-1	C-22800	62.3	113.8	52.5	43.2	1131	
2	**RKGK 13-414 (Ch)**	C-22801	64.8	115.0	53.2	24.8	1112	
3	**JGK 5 (Ch)**	C-22802	56.5	113.0	47.3	26.0	925	
4	**Phule G 0517 (Ch)**	C-22803	54.5	115.3	57.6	26.2	2311	
5	IGK 21-01 (ELSK) AVT-1	C-22804	63.8	113.3	51.2	51.5	1274	
6	**BDNGK 798 (Ch)**	C-22805	58.8	112.8	57.0	27.6	529	
7	**IPCK 2002-29 (Ch)**	C-22806	54.3	115.3	49.7	32.6	412	

8	**KAK 2 (Ch)**	C-22807	72.0	121.3	53.8	26.3	550	
9	**NBeG 810 (Ch)**	C-22808	58.0	116.3	49.7	35.7	586	
10	**PKV 4 (Ch)**	C-22809	59.3	114.8	59.5	50.6	1401	
11	LC	IGK-2020-01	54.8	114.3	60.3	51.3	1633	
		GM	**0.4**	**0.3**	**1.2**	**0.4**	**33.2**	
		SE (m)	**1.0**	**0.8**	**3.3**	**1.1**	**91.9**	
		CD (5%)	**2.4**	**1.0**	**9.0**	**4.5**	**12.3**	
		CV(%)	**62.3**	**113.8**	**52.5**	**43.2**	**1131**	

B- **ICAR-ICRISAT Collaborative Chickpea Breeding Program**

Experiment No.09: International Chickpea Varietal Trial - I – *Desi* (ICVT- *Desi-I*)

Experimental detail:

Number of entries	20 (18+2) including check entries viz., Phule vikram and GP-294
Replications	02
Design	RBD
No. of rows	4 rows
Row length	4 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	Dry sowing followed by a come up irrigation on 03.12.2022
Date of sowing	30.11.2022(dry sowing) (the effective date of sowing is 30.11.2023)
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 12.01.2023 and 25.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	15.01.2023
(ii) Chlorpyriphos	2.5 ml/l	27.01.2023

Previous crop	Moong and Urad

Result:

Table PB-09 (A): Performance of various entries in ICVT - *Desi –1* at Indore during *rabi* 2022-23

S. N.	Entry	50% Flowering	Maturity	Pl. Ht.	Pods /plant	100 seed wt.	Seed Yield	Rank
		(days)	(days)	(cm.)	(No.)	(g.)	(kg/ha)	
1	ICCV 221101	67.0	103.5	26.4	38.4	25.9	1531	
2	ICCV 221102	69.0	106.0	37.5	43.8	21.7	1646	
3	ICCV 221103	65.0	100.5	35.9	36.0	23.2	1948	
4	ICCV 221104	69.0	103.5	24.9	39.2	25.6	1646	
5	ICCV 221105	67.5	104.5	50.3	44.4	24.2	2198	
6	ICCV 221106	72.5	109.5	43.5	39.3	22.6	2052	IV
7	ICCV 221107	65.5	102.0	37.4	42.6	30.4	2125	III
8	ICCV 221108	63.0	99.0	44.0	38.8	23.6	1916	
9	ICCV 221109	65.0	100.0	27.8	34.5	33.8	1656	
10	ICCV 221110	64.0	99.5	47.5	34.9	24.8	1802	
11	ICCV 221111	68.5	103.0	39.5	44.7	24.6	1646	
12	ICCV 221112	61.0	98.5	30.9	44.1	26.8	1698	
13	ICCV 221113	63.0	98.5	35.2	40.2	24.9	1791	
14	ICCV 221114	67.0	104.0	44.9	42.7	27.8	1656	
15	ICCV 221115	69.0	106.0	38.0	35.2	31.0	2187	II
16	ICCV 221116	66.0	102.5	36.7	38.4	25.9	1625	
17	ICCV 221117	71.0	107.0	25.3	43.1	19.7	1479	
18	ICCV 221118	66.0	104.5	37.5	41.4	25.7	1791	
19	Phule Vikram ©	67.5	105.0	42.6	43.8	32.1	2021	V
20	GP-294 (LC)	63.5	98.5	32.8	36.0	26.1	2312	I
	GM	**66.5**	**102.8**	**55.4**	**40.1**	**26.0**	**1836**	
	SE (m)	**0.7**	**0.7**	**0.3**	**1.2**	**0.3**	**69.8**	
	C.D. (5%)	**1.9**	**2.1**	**1.0**	**3.2**	**0.9**	**193.4**	
	C.V.(%)	**2.0**	**1.4**	**1.3**	**5.8**	**2.6**	**7.6**	

Experiment No.10: International Chickpea Varietal Trial– *Desi* Extra Early (ICVT- *Desi* EE)

Experimental detail:

Number of entries	10 (8+2) entries including check entries Phule Vikram and IG 2020-015
Replications	02
Design	RBD
No. of rows	4 rows
Row length	4.00 m

Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One irrigation on 03.12.2022 after dry sowing
Date of sowing	Dry sowing on 30.11.2022; effective date of sowing is 03.12.2022
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 22.12.2022 and 06.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	15.01.2023
(ii) Chlorpyriphos	2.5 ml/l	27.01.2023

Previous crop: Moong and Urad

Table PB-09 (B): Performance of various entries in ICVT - *EE* at Indore during *rabi* 2022-23

S. N.	Entry	50% Flowering	Maturity	Plant height	100 seed wt.	Seed Yield	Rank
		days	days	cm.	g.	(kg/ha)	
1	ICCV 191121	61.0	108.5	55.7	17.5	896	
2	ICCV 191123	68.5	109.0	73.7	17.0	802	
3	ICCV 191124	63.0	107.5	67.0	18.0	906	
4	ICCV 191125	67.0	110.5	69.2	20.0	864	
5	ICCV 191126	58.0	104.5	67.7	21.0	885	
6	ICCV 191127	58.5	103.5	65.9	16.5	875	
7	ICCV 191128	57.0	103.0	46.3	19.5	885	
8	ICCV 191257	63.0	107.0	66.2	21.0	1166	
9	Phule Vikram ©	63.5	108.0	63.2	19.5	969	
10	IG 2020-015 (LC)	59.0	104.5	64.3	23.0	1250	
	G. Mean	61.9	106.6	63.9	19.3	950.0	
	SE m	0.6	0.8	0.6	0.6	70.0	
	CD 5%	1.5	2.2	1.7	1.6	193.9	
	CV	1.8	1.5	1.9	6.0	14.7	

Experiment No.11: International Chickpea Varietal Trial – *Kabuli 02* (ICVT- *Kabuli*)

Experimental detail:

Number of entries	20 (18+02) entries including check entries viz., NBeG 119 and IGK 2021- 01

Replications	02
Design	RBD
No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One irrigation (*Palewa*) on 30.11.2022 before sowing
Date of sowing	03.12.2022
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weedings on 12.01.2023 and 24.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	28.12.2022
(ii) Chlorpyriphos	2.5 ml/l	12.01.2023

Previous crop	Moong and Urad

Result:

Table PB-11: Performance of various entries in ICVT-*Kabuli* at Indore during *rabi* 2022-23

S. N.	Entry	50% flowering	Days to Maturity	Plant Height.	100 seed weight	Yield	Rank
		days	days	cm.	g.	(kg/ha	
1	ICCV-221301	61.0	100.5	46.3	25.9	1000	
2	ICCV-221302	63.0	101.5	53.0	21.7	958	
3	ICCV-221303	69.0	110.5	41.5	23.2	885	
4	ICCV-221304	64.0	102.0	50.8	25.6	1062	
5	ICCV-221305	66.0	105.0	46.8	24.2	1104	
6	ICCV-221306	65.5	106.5	46.0	22.6	1416	III
7	ICCV-221307	65.0	105.5	57.0	30.4	1229	
8	ICCV-221308	62.0	101.0	47.8	23.6	1646	I
9	ICCV-221309	70.0	113.0	43.5	33.8	989	
10	ICCV-221310	59.5	101.0	50.5	24.8	1000	
11	ICCV-221311	59.5	101.0	52.3	24.6	1187	
12	ICCV-221312	65.0	102.0	57.0	26.8	1094	
13	ICCV-221322	67.0	104.5	53.8	24.9	1031	

14	ICCV-221323	68.0	107.5	50.0	27.8	1021	
15	ICCV-221324	69.0	108.0	58.5	31.0	1083	
16	ICCV-191327	59.0	101.5	53.8	25.9	1031	
17	ICCV-201402	63.0	102.5	59.5	19.7	1104	
18	ICCV-201406	66.5	107.5	56.0	25.7	1427	
19	NBeG-119 ©	68.0	106.5	52.5	32.1	1500	II
20	IGK-2021-01(LC)	63.5	103.0	61.8	26.1	1364	
	G. Mean	**64.7**	**104.5**	**51.9**	**26.0**	**1157**	
	SE m	**0.7**	**1.5**	**1.1**	**0.3**	**86.1**	
	CD 5%	**1.9**	**4.2**	**3.0**	**0.9**	**238.6**	
	CV	**2.1**	**2.9**	**4.2**	**2.6**	**14.9**	

Table PB-11 (B): Entries of ICVT- *Kabuli* 02 and their pedigree

S. N.	Entry	PERENTAGE	Remarks
1	ICCV 211301	KRIPA / ICCV92311	LS & MH
2	ICCV 211302	KRIPA / ICC 14917	LS
3	ICCV 211303	KRIPA / ICC 14917	LS
4	ICCV 211304	ICCV 92311 / ICCV 95333	LS & MH
5	ICCV 211305	ICCV 92311 / ICCV 95333	LS & MH
6	ICCV 211306	ICCV 92311 / ICCV 95333	LS
7	ICCV 211307	ICCV 92318 / ICCV 95333	LS & MH
8	ICCV 211308	ICCV 92318 / ICC 16644	LS
9	ICCV 211309	ICCV 95333 / ICC 16644	LS & MH
10	ICCV 211310	ICCV 95333 / ICC 16644	LS & MH
11	ICCV 211311	ICCV 95333 / ICC 16644	LS & MH
12	ICCV 211312	ICCV 95333 / ICC 16644	LS & MH
13	ICCV 211313	ICCV 95333 / ICC 16644	LS & MH
14	ICCV 211314	ICCV 95333 / ICCV 01301	LS & MH
15	ICCV 211315	ICCV 95333 / ICCV 01301	LS
16	ICCV 211316	ICCV 95337 / ICCV 01301	LS
17	ICCV 211317	ICC 14194 / ICCV 95423	LS & MH
18	ICCV 211318	ICCV 95333 / ICCV 95423	LS
19	NBeG 119	NC	
20	Safed bold	LC	

Experiment No. 12: Station Varietal Evaluation Trial – *Desi*, Indore (SVET- *Desi-I*)

Experimental details

Number of entries	44 including check entries
Source	Indore
Replications	02
Design	RBD

No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation on 03.12.2021 after dry sowing
Date of sowing	28.11.2022 dry sowing, the effective date of sowing will be 03.12.2022
Fertilizer	20:40:20 N: P_2O_5: K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 18.12.2022 and 05.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	19.12.2022
(ii) Chlorpyriphos	2.5 ml/l	06.01.2023

Previous crop	Moong and Urad

Results:

Table PB-16: Performance of entries selected from advanced breeding population for seed yield and its contributing traits at Indore during 2022-23 *rabi.*

S. N.	Entry	50% Fl	Maturity	Pl. height	Lower Branch ht.	Pods/ Plant	100- seed wt.	Seed Yield / plant	Rank
		days	days	cm	cm	no.	g.	g.	
1	IG-2021-106	68.0	127.0	55.4	26.5	44.4	22.0	19.4	
2	IG-2020-02	67.7	124.0	70.8	33.1	77.7	45.0	24.0	
3	SFG-3D-Early	71.0	131.0	71.8	24.0	46.2	20.7	21.2	
4	IG-2021-110	72.7	120.3	76.6	40.5	154.0	16.3	25.5	
5	IG-SPS-284	63.0	127.0	76.8	35.5	72.9	42.3	25.4	
6	IG-SPS-291	70.0	122.3	44.4	20.8	45.7	18.3	17.8	
7	IG-2016-02	71.0	119.0	75.9	31.4	132.8	17.0	21.1	
8	IG-2021-06	71.0	117.7	77.8	33.4	66.8	30.3	28.4	
9	IG-2021-111	68.0	120.0	75.5	45.9	79.4	21.0	27.2	
10	IG-2021-108	68.3	119.7	65.2	39.7	69.9	12.3	23.5	
11	IG-SPS-281	61.3	126.7	77.7	35.9	89.3	22.3	28.6	
12	IGK-2020-116	71.0	119.3	69.2	31.4	96.7	33.0	24.8	

13	IG-SPS-291	68.0	121.3	68.5	23.6	151.2	16.3	27.4	
14	IG-SPS-258	71.0	119.3	68.6	26.6	55.3	14.3	28.3	
15	IG-2021-107	70.7	122.0	81.9	45.2	46.3	25.0	29.8	
16	SFG-42016-1 MH	72.3	124.0	73.7	31.8	88.2	22.3	27.6	
17	IGK-2021-115-Bold	70.3	128.0	79.5	33.9	59.0	45.0	26.4	
18	IG-2021-104	62.3	128.0	55.5	31.6	94.1	21.0	19.6	
19	IG-2021-112	72.0	119.0	73.7	32.9	108.6	22.3	20.1	
20	IG-SPS-300	71.0	118.7	56.3	24.5	118.4	22.3	15.3	
21	SGF-3D	76.0	126.0	78.2	39.7	134.7	18.7	27.3	
22	IG-2105	75.7	126.7	57.2	26.4	50.9	18.3	20.0	
23	IG-2018-111	76.0	129.7	55.7	34.3	55.4	14.0	16.6	
24	JG-33 x KAK-2	76.0	128.7	59.2	27.4	152.2	25.7	19.8	
25	IG-2020-122	69.0	119.0	59.3	33.9	90.7	20.7	19.2	
26	JG-6 x JSC-37	68.3	125.0	69.3	40.3	134.3	24.7	19.5	
27	IGK-2021-01 Bold	71.0	127.0	73.4	40.1	43.2	51.0	23.2	
28	IG-21-08	75.0	128.0	67.3	42.7	89.4	28.3	24.0	
29	JG-33 x KAK-2	77.0	132.3	62.8	31.3	99.3	24.3	17.9	
30	SGF-3D- Early	69.0	130.0	70.5	33.4	101.3	24.3	20.9	
31	SGF-3D-2016-2	77.0	120.7	77.7	33.7	168.3	20.0	22.2	
32	IG-2020-17	75.7	124.0	56.4	19.2	92.2	18.0	18.4	
33	IG-2020-19	65.7	127.0	61.6	33.8	99.1	17.0	17.4	
34	IG-2020-11	62.3	132.0	54.6	34.5	58.2	26.7	18.1	
35	IG-2020-02 Med	78.0	127.3	57.5	26.5	217.1	16.7	20.3	
36	SGF-3D	75.7	121.3	67.6	34.3	134.9	14.7	16.3	
37	SGF-3D-2016-4	70.7	125.3	51.5	33.6	144.5	24.0	19.4	
38	IG-2021-121	71.0	119.0	50.9	22.5	78.0	26.7	16.0	
39	SGF-3D	77.0	119.3	68.5	46.5	83.7	24.3	19.4	
40	IG-2020-13	74.0	122.3	71.6	54.9	81.2	27.0	23.0	
41	SGF-3D-2016-05	78.0	118.7	66.5	23.7	76.5	24.3	21.5	
42	IG-2020-02	70.0	122.7	66.0	52.5	51.4	15.3	20.0	
43	Digvijay	77.0	123.0	58.6	31.4	55.8	13.3	16.9	
44	Dollar	66.7	124.0	58.6	31.4	57.6	14.3	15.7	
	G. Mean	**71.2**	**123.9**	**66.3**	**33.5**	**92.0**	**23.2**	**21.7**	
	S.E. (m)	**0.33**	**0.56**	**0.39**	**0.4**	**0.9**	**0.3**	**0.4**	
	CD (5%)	**0.92**	**1.55**	**1.09**	**1.0**	**2.6**	**0.8**	**1.1**	
	CV (%)	**0.01**	**1.35**	**1.78**	**3.1**	**3.0**	**3.7**	**5.5**	

Experiment No. 17: Station Varietal Evaluation Trial – *Desi*, - II Indore (SVET- *Desi-II*)

Experimental details

Number of entries 42 including check entries

Source	Indore
Replications	02
Design	RBD
No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation on 03.12.2022 after dry sowing
Date of sowing	28.11.2022 dry sowing, the effective date of sowing will be 03.12.2022
Fertilizer	20:40:20 N: P_2O_5: K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 18.12.2022 and 05.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	19.12.2022
(ii) Chlorpyriphos	2.5 ml/l	06.01.2023

Previous crop	Moong and Urad

Results:

Table PB-17: II- Performance of entries selected from advanced breeding population for seed yield and its contributing traits at Indore during 2022-23 *rabi.*

S. N.	Entry	100-seed wt. (g.)	Rank for seed index	Seed Yield / Plot (kg/ha)	Rank for seed yield	Special feature
1	IG-2021-106	25.0		1986		
2	IGK 2020-02	44.0		2583		
3	SGF - 3D	20.0		1958		Early
4	IG 2021 - 110	16.0		2819		
5	IG SPS 284	42.0		1909		
6	IG SPS 291	18.0		2444		
7	IG 2016 - 02	16.0		3055		
8	IG 2021 - 06	30.0		2270		

9	IG 2021 - 111	21.0		2361		
10	IG 2021 - 108	12.0		2743		
11	IG SPS - 281	22.0		2555		
12	IGK 2020 - 116	32.0		1840		
13	IG SPS - 291	16.0		2291		
14	IG SPS - 258	14.0		2264		
15	IG 2021 - 107	25.0		2034		
16	SGF-4 2016-1	22.0		1819		MH
17	IGK 2021-115	44.0		2055		Bold
18	IG 2021 - 104	**20.0**		1687		
19	IG 2021 - 112	21.0		2125		
20	IG-SPS-300	20.0		2076		
21	SGF3D	19.0		2109		
22	IG 2105	18.0		2062		
23	IG 2018 - 111	13.0		2395		
24	JG-33 X KAK-2	26.0		1854		
25	IG 2020-122	20.0		2083		Yellow Medium
26	JG-6 X JSC-37	26.0		2513		
27	IGK 2021-01	50.0		2402		Bold
28	IG 21-08	28.0		1784		
29	JG-33X KAK-2	24.0		1777		
30	SGF-3D	24.0		1819		Early
31	SGF 3D 2016-2	20.0		1472		
32	IG 2020-17	18.0		1548		Small Choukletty
33	IG 2020-19	18.0		1278		Yellow Small
34	IG 2020-11	26.0		1458		
35	IG 2020-02	16.0		1896		Medium
36	SGF- 3D	14.0		1423		
37	SGF-3D 2016-4	18.0		1333		
38	IG 2020-121	26.0		1784		
39	SGF-3D	24.0		1555		
40	IG 2020-13	26.0		1250		
41	SGF-3D2016-5	25.0		1396		
42	IG 2020-02	14.0		1500		
	G. Mean	**23.2**		1990		
	S.E. (m)			**111.8**		
	CD (5%)			**438.4**		
	CV (%)			**16.9**		

ICAR - IARI – RVSKVV – Collaborative program:

Experiment No. 17: State Varietal Evaluation Trial – *Desi*, - IARI, New Delhi (SVET-*Desi- IARI, New Delhi*)

Experimental details

Number of entries	09 entries including check entries
Source	IARI New Delhi
Replications	02
Design	RBD
No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation on 03.12.2022 after dry sowing
Date of sowing	28.11.2022 dry sowing, the effective date of sowing will be 03.12.2022
Fertilizer	20:40:20 N: P_2O_5: K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 18.12.2022 and 05.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	19.12.2022
(ii) Chlorpyriphos	2.5 ml/l	06.01.2023

Previous crop	Moong and Urad

Results:

Table PB-17: Performance of entries-*Desi* from IARI for seed yield and its contributing traits at Indore during 2022-23 *rabi.*

S. N.	Entry	50 % flowering	Maturity	Plant height	Pods / plant	Seed Index	Seed yield	Rank
		days	days	cm	number	g	Kg/ha	
1	D-1	59.5	127.0	49.8	63.7	16.0	3114	II

2	D-2	61.5	129.0	52.5	133.1	21.0	2198	
3	D-3	59.0	127.0	42.2	60.9	22.0	2156	
4	D-4	64.5	127.0	49.7	80.6	27.0	2427	
5	D-5	63.5	129.0	50.4	111.9	25.0	2416	
6	D-6	60.5	129.5	40.2	87.2	21.0	2343	
7	D-7	61.5	129.5	44.8	72.1	19.0	3125	I
8	RVG-204	61.0	127.5	54.2	103.5	24.6	2458	III
9	IG 21-07	63.5	130.5	49.8	131.0	23.6	2448	IV
	G. Mean	**60.8**	**128.4**	**53.0**	**100.6**	**22.1**	**2520**	
	S.E. (m)	**0.0**	**0.5**	**0.6**	**1.2**		**136.2**	
	CD (5%)	**0.0**	**1.3**	**1.6**	**3.4**		**377.4**	
	CV (%)	**0.0**	**0.7**	**2.2**	**2.4**		**10.8**	

Experiment No. 18: Station Varietal Evaluation Trial – *Desi*, - II Indore (SVET- *Desi-II*)

Experimental details

Number of entries	10 entries including check entries
Source	IARI New Delhi
Replications	02
Design	RBD
No. of rows	4 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 1.20 m = 4.80 sq. m
Irrigation	One come up irrigation on 03.12.2022 after dry sowing
Date of sowing	28.11.2022 dry sowing, the effective date of sowing will be 03.12.2022
Fertilizer	20:40:20 N: P_2O_5: K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 18.12.2022 and 05.01.2023
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	19.12.2022

(ii) Chlorpyriphos 2.5 ml/l 06.01.2023

Previous crop Moong and Urad

Results:

Table PB-18: Performance of entries-*Kabuli* from IARI for seed yield and its contributing traits at Indore during 2022-23 *rabi.*

S. N.	Entry	50 % flowering	Maturity	Plant height	Pods / plant	Seed Index	Seed yield	Rank
		days	days	cm	number	g	Kg/ha	
1	K-1	59.5	127.0	49.8	63.7	41.0	2114	II
2	K-2	61.5	129.0	52.5	133.1	40.0	2406	I
3	K-3	59.0	127.0	42.2	60.9	41.0	2000	III
4	K-4	64.5	127.0	49.7	80.6	39.0	1823	IV
5	K-5	63.5	129.0	50.4	111.9	41.0	1802	V
6	K-6	60.5	129.5	40.2	87.2	43.0	1437	
7	K-7	61.5	129.5	44.8	72.1	41.0	1427	
8	K-8	61.0	127.5	54.2	103.5	45.0	979	
9	IGK 2021-01	63.5	130.5	49.8	131.0	56.0	1000	
10	IGK 2021-115	59.5	127.5	53.2	108.7	54.0	1198	
	G.Mean	**60.8**	**128.4**	**53.0**	**100.6**	**44.1**	**1618**	
	SE (m)	**0.0**	**0.5**	**0.6**	**1.2**		**88.5**	
	CD (5%)	**0.0**	**1.3**	**1.6**	**3.4**		**245.2**	
	CV(%)	**0.0**	**0.7**	**2.2**	**2.4**		**10.9**	

SPACED PLANTING OF F1 AND F2 GENERATIONS ALONG WITH THE PARENTS
26 ENTRIES

S.NO.	CROSS	NO.OF SEED
1	IARI-K-5 X IGK 20-01	1
2	ICCX 171042 X JAKI-9218 X JSC-37	1
3	JSC-37 X ICC-171061-BBB	4
4	IARI-K-5 X IGK 21-03	5
5	IGK-116 X IGK - 21-01	2
6	IG 21-03 X SPP-267	8
7	IARI - D-05 X IG 21-03	2
8	IG 21-03 X GP-21 (GULABI)	3
9	IARI-K-7 X DOLLOR	5
10	IG 21-03 X IG 2018-111	5
11	IG 21-03 X 21P-GP-21 (GULABI)	3
12	IG 21-03 X SPP-267	1
13	IARI-D-4 X SPP-267	2
14	IARI-K-6 X IGK 20-05	9

15	IGK-115 X IGK 21-01	3
16	IARI K-4 X IGK-116	
17	IARI - K-04 XSPP-267	5
18	IG - 2015-21 X ICCX171042	
19	DOLLOR X IGK-115	2
20	RVSSG-108 X GP-439	4
21	RVG-202 X RVSS-74	2
22	RVSSG-108 X ICCX17042-BBBB	5
23	ICCX 171061 BBBB X RVG-202 X JSC-37	1
24	IARI-D-03 X RVG-002	2
25	P-12 238 X P-12 223	
26	IG 2015-21 X ICCX 171030 BBBB	
27	IGK-115 X DOLLOR	
28	IGK 20-02	

F3 GENERATION

S.NO.	CROSS
1	IG-2020-02 X IG 2020-15
2	PKU-4 X SPS-267
3	SPP-267 X SGF-3D-2016
4	IG 2020-01 X IG 2020-02
5	IG 2020-15 X IG 2020-02
6	IG 2020-15 X IG 2020-02
7	SPP-267 X ICCX100
8	IG-2020-02 X SPP-267
9	IG2020-02 X IG 2020-15
10	IG 2020-02 X SPP No 267
11	IG 2020-15
12	SPP No-267 X PKU-4
13	IG 2020-01 IG 2020-02
14	SPP-267 X PKU-4
15	IG 2020-02 X SPP No 267
16	SPP-267 X PKU-4
17	SPP-267 X PKU-4
18	SPP-267 X PKU-4
19	SPP-267 X SGF-3D-2016
20	IG 2020-02 X SPP No 267
21	SSP- No 267 X PKU-4

22	SSP- No 267 X PKU-5
23	SGF-3D-2016 X IG 55-1
24	SPP-267 X SGF-3D-2016
25	SPP-267 X JG-315
26	SPP-267 X IG 2020-15
27	SPP-267 X BGD-1085 X PKU-4
28	SPP-267 X SGF-3D-2016
29	IG 2020-02 X SPP No 267
30	IPC 06-11 X JG 35

F6 GENERATION

S.NO.	CROSS	LINES
1	ICCX 171277-BBBB	4
2	ICCX 171088-BBBB	4
3	ICCX 171029-BBBB	8
4	ICCX 171043 -BBBB	8
5	ICCX 171061-BBBB	8
6	ICCX 171067 -BBBB	8
7	ICCX 171079-BBBB	8
8	ICCX 171017-BBBB	
9	ICCX 171011-BBBB	
10	ICCX 171001-BBBB	
11	ICCX 171049-BBBB	
12	ICCX 1100056-2-BBBBB	
13	ICCX 171027-BBBB	
14	ICCX 171018-BBBB	8
15	ICCX 120030-BBB-6-BB	4
16	ICCX 171020-BBBB	4
17	ICCX 171014-BBBB	8
18	ICCX 100025-F4-2-BBBB	8
19	ICCX 171021-BBBB	8
20	ICCX 171025-BBBB	8
21	ICCX 120035-BBB-10-BB	
22	ICCX 171015-BBBB	
23	ICCX 17012-BBBB	
24	ICCX 110049-BBBB-50-BB	
25	ICCX 171012-BBBB	
26	ICCX 1171054-BBBB	
27	ICCX 120042-BBBB-7-BB	
28	ICCX 120042-BBBB-7-BB	

Entry No.	ENTRY/CROSS	SEED TRAITS	PL.STAND	FLOWERING	MATURITY	100 S. WT.	PLOT YD.	YD/PLANT
1	SSP-15 X JG-6	yellow	118	49	112	22	1440	12.2
2	SGF-37 X JG-315	medium brown	127	62	114	23	1130	8.9
3	JG-593 X JG-741	medium brown	145	64	115	22	1630	11.2
4	SGF 3D 2016-01	medium brown	122	63	115	27	1240	10.2
5	SGF-3D-2016-01	medium brown	138	66	116	23	1150	8.3
6	SPS 2018-17	small greenish	161	60	117	17	1530	9.5
7	SGF-3D-E	medium	177	43	109	19	2080	11.8
8	SGF-37 X JG-315	small brown	91	43	119	43	1180	13.0
9	SGF 3D-2016-1	medium brown double podded	163	35	116	19	2340	14.4
10	SPP F5-68	brown smooth	153	45	119	34	2050	13.4
11	SGF 3D 2016-05	brown smooth small double podded	161	59	112	17	970	6.0
12	JG-6 X BGD-1085	medium small	162	58	115	27	1940	12.0
13	J-1140	medium, kabuli, early	145	35	105	28	1740	12.0
14	JG-33 X KAK-2	medium brown	156	58	107	19	2220	14.2
15	JCV 60033-P-6	medium	146	57	122	28	1190	8.2
16	RVG 27 X JG-6	medium brown	158	49	121	34	1500	9.5
17	SGF-3D-2016-04	smooth brown medium	160	54	117	23	1750	10.9
18	KAK-2 6-177	black medium	166	51	116	34	1560	9.4
19	JPC-163 X JG-33	black dot medium	154	57	114	27	1850	12.0
20	SGF-3D-2014-04	bold	160	58	115	116	1920	12.0
21	JG 2020-05	smooth medium	179	56	111	23	1680	9.4
22	SGF-3D-E	medium	178	43	121	19	1860	10.4
23	JCCV-1001-P-32	yellow bold	126	44	118	25	1400	11.1
24	SGF-3D-2016-04	brown medium	182	51	117	28	1760	9.7
25	SGF-3D-2016-01	brown medium	152	55	118	26	1860	12.2
26	IG-2020-15-E	medium	132	49	116	26	950	7.2

27	C-177 X RVSG-37	small greenish	140	58	120	23	1040	7.4
28	SPS No-7		167	53	117	22	1450	8.7
29	SPP No-7		184	56	119	23	1670	9.1
30	JG-593 X JG-747	brown bold	69	44	119	25	880	12.8
31	F5 21-25	Indore	149	56	118	24	1310	8.8
32	F5 21-14	Indore	163	48	113	23	1300	8.0
33	JG-33 X KAK-2	medium brown	176	53	114	19	1490	8.5
34	F5 21-21	Indore	173	56	112	28	1500	8.7
35	F5 21-20	Indore	209	56	113	29	1640	7.8
36	F5 21-52	Indore	201	57	119	24	1100	5.5
37	F5 21-30	Indore	192	51	117	29	1930	10.1
38	F5 21-23	Indore	165	40	117	28	1560	9.5
39	JG-14 X JG-35	medium brown	183	42	119	23	1830	10.0
40	F5 21-27	Indore	208	51	120	24	1710	8.2
41	ICCV-10023-P-64	wrinkled brown	198	57	120	32	1300	6.6
42	F5 21-56	Indore	187	56	112	27	1320	7.1
43	ICCV-10023-P-6	medium sharp edge	192	39	113	27	1430	7.4
44	JG-593 X IG 747	brown medium	165	52	113	30	2360	14.3
45	ICCV-0600-P-6		195	42	115	23	1570	8.1
46	SGF-3D-6	greenish rough	170	49	117	22	1450	8.5
47	J-1140	brown large	170	41	115	34	1750	10.3
48	JG-14 X JG-315		206	43	111	24	2000	9.7
49	JG-6 X JG-8	wrinkled medium	158	56	117	26	1110	7.0
50	IG 205-17	small brown	163	59	119	16	1230	7.5
51	BG-3062	CHECK	126	53	119	23	1520	12.1
52	IPC-1163 X IG-33		186	57	120	27	1880	10.1
53	VIKRAM		147	58	120	19	1850	12.6
54	IG 21-22 - 201		107	52	111	38	1680	15.7
55	PHULE G-0405		187	52	117	19	1340	7.2

56	JG-6 X BGD-1085		140	41	120	28	1790	12.8
57	IG 2020-15-E	medium double podded	88	51	112		1200	13.6
58	SGF-37 X JG-315	medium yellow	158	53	117		1220	7.7
59	JG-33 X KAK-2	medium brown	199	52	115		2330	11.7
60	IG-593 X IG 747	medium brown	157	59	117		1310	8.3
61	F5 21-14	Indore	182	50	114		1670	9.2
62	SGF-3D-2016-01	medium brown	162	56	112		1780	11.0
63	C-177 X RVSG-37	small greenish	94	57	119		930	9.9
64	JG-6 X JSC-8	wrinkled medium	153	56	112		1120	7.3
65	SGF-37 X JG-315	small brown	118	50	117		1710	14.5
66	SGF-3D-2016-05	small brown	126	56	115		1570	12.5
67	SGF-3D-2016-04	medium brown	182	56	112		1690	9.3
68	SGF-3D-2014-04	medium to bold	81	57	118		990	12.2
69	JG-6 X BGD-1085	medium to bold	141	57	120		1900	13.5
70	ICCV-1001-P-32	yellow bold	94	58	118		1050	11.2
71	SGF-3D-E	medium	115	43	112		1450	12.6
72	F5 21-21	Indore	125	56	112		1490	11.9
73	JG-6 X BGD-1085		151	44	119		1770	11.7
74	ICCV-60033-P-6	wrinkled	157	51	120		1150	7.3
75	F5-21-25	Indore	152	45	112		1520	10.0
76	IG 2018-17	small greenish	153		112		1500	9.8
77	F5 21-27	Indore	132	48	112		1270	9.6
78	IPC-1163 X JG33		156	56	113		1580	10.1
79	IG 21-22-201		102	43	113		1790	17.5
80	RVG-27 X JG-6		136	45	112		1890	13.9
81	VIKRAM		168	57	119		1820	10.8
82	SPP- NO-7		147	58	112		1550	10.5
83	F5 21-20	Indore	181	57	113		1610	8.9
84	F5 21-56	Indore kabuli early	142	44	113		1650	11.6

85	SGF-3D-2016-1	medium brown	151	48	117		1330	8.8
86	F5 21-52	Indore	188	44	119		1540	8.2
87	IG 2020-05	smooth medium	136	57	112		1930	14.2
88	SPS NO-7		193	48	112		1630	8.4
89	ICCV 10025-P-4	wrinkled brown	141	57	114		1120	7.9
90	JG-33 X KAK-2	medium brown	194	52	112		1640	8.5
91	IG-593 X IG 747	medium brown	176	40	112		2330	13.2
92	JG-14 X JG-315		197	40	115		1790	9.1
93	J-1140	brown thick seed coat	133	43	119		1490	11.2
94	SGF-3D-E	medium	143	43	112		1060	7.4
95	SPP-5 X JG-6	greenish yellow, medium	131	56	119		1260	9.6
96	SGF-3D-6	wrinkled greenish brown	133	43	119		1410	10.6
97	SGF-3D-2016-04	smooth brown	188	53	115		1620	8.6
98	F5 21-30	Indore	166	53	117		1550	9.3
99	BG-3062 (check)	Check	116	42	117		1900	16.4
100	JG 205-17	small	153	60	119		1610	10.5
101	ICCV 06-00-P-6		96	58	115		1430	14.9
102	PHULE -G 0405		124	56	115		1630	13.1
103	ICCV X 10023-P6	medium	127	55	112		1450	11.4
104	JG-14 X JG-315	medium brown	123	51	112		1790	14.6
105	SGF-3D-2016-01	medium brown	117	53	112		1190	10.2
106	SPP-F5-68	brown smooth	143	43	117		1500	10.5
107	KAK-2 X C-177		82	51	113		1520	18.5
108	SGF-3D- 2016-01	medium brown	58	45	113		1290	22.2
109	JPC-163 X JG-33		36	59	112		850	23.6
110	F5 21-23	Indore	61	58	116		1710	28.0
111	J-1140		35	53	117		1090	31.1
112	GP-208		108	45	113		2040	18.9

SVT-II (50)

D/S 11.11.2022

S.N.	Entry	Cross	FLOWERING	SEED INDEX	SEED YIELD					
			DAYS	g.	I	II	III	TOTAL	MEAN	KG/HA
1	IG-2022-01	F5 -SPP-15 X JG-6	58	23	720	560	680	1960	653.3	
2	IG-2022-02	SGF-37 X JG-35	59	20	1040	1080	1030	3150	1050.0	
3	IG-2022-03	IG-593 X IG-747	57	16	760	650	850	2260	753.3	
4	IG-2022-04	SGF-3D-2016-01	57	23	660	580	500	1740	580.0	
5	IG-2022-05	SGF-3D-2016-02	59	22	710	980	800	2490	830.0	
6	IG-2022-06	2018-17	66	17	720	690	900	2310	770.0	
7	IG-2022-07	SGF-3D-E	58	18	900	810	820	2530	843.3	
8	IG-2022-08	SGF-37 X JG-3I5	57	26	440	690	190	1320	440.0	
9	IG-2022-09	SGF-3D- 2016-01	58	20	610	650	360	1620	540.0	
10	IG-2022-10	SPP-F5-68	68	28	660	570	940	2170	723.3	
11	IG-2022-11	SGF-3D-2016-05	64	18	460	830	500	1790	596.7	
12	IG-2022-12	JG-6 X BGD-1085	62	24	980	1190	850	3020	1006.7	
13	IG-2022-13	J-1140	56	28	750	560	550	1860	620.0	
14	IG-2022-14	JG-33 X KAK-2	58	15	1090	830	560	2170	723.3	
15	IG-2022-15	ICCV-60033-P-6	58	26	660	960	710	2330	776.7	
16	IG-2022-16	RVG-27 X JG-6	58	22	610	580	490	1680	560.0	
17	IG-2022-17	SGF-3D-2016-14	60	22	620	640	580	1840	613.3	
18	IG-2022-18	KAK-2 X C-177	57	34	860	950	480	2290	763.3	
19	IG-2022-19	IPC -1163 X IG-33	60	24	960	780	690	2430	810.0	
20	IG-2022-20	SGF-3D-2014-04	58	28	800	680	660	2140	713.3	
21	IG-2022-21	**IG-2020-05**	60	20	820	650	630	2100	700.0	
22	IG-2022-22	SGF-3D-E	58	24	1040	610	720	2370	790.0	
23	IG-2022-23	ICCV-1001-P-32	62	26	860	770	680	2310	770.0	
24	IG-2022-24	SGF-3D-2016-04	63	28	850	630	840	2320	773.3	

25	IG-2022-25	SGF-3D-2016-01	63	22	820	580	520	1920	640.0	
26	IG-2022-26	**IG 2020-15 E**	60	23	770	550	530	1850	616.7	
27	IG-2022-27	C-177 X RVSG-37	68	27	840	730	800	2370	790.0	
28	IG-2022-28	SPP-N0-7	61	18	850	470	800	2120	706.7	
29	IG-2022-29	SPP-N0-7	62	21	780	540	630	1950	650.0	
30	IG-2022-30	IG-593 X IG-747	58	50	970	510	590	2070	690.0	
31	IG-2022-31	F-21-25	62	22	830	950	880	2660	886.7	
32	IG-2022-32	F5-21-14	59	24	720	700	780	2200	733.3	
33	IG-2022-33	JG-33 X KAK-2	61	16	740	660	670	2070	690.0	
34	IG-2022-34	F5 -21-21	63	28	990	730	760	2480	826.7	
35	IG-2022-35	F5 21-20	63	27	780	950	920	2650	883.3	
36	IG-2022-36	F5 21-52	65	23	560	650	490	1700	566.7	
37	IG-2022-37	F5 21-30	59	22	580	570	790	1940	646.7	
38	IG-2022-38	F5-21-23	61	26	740	640	710	2090	696.7	
39	IG-2022-39	JG-14 JG-35	58	28	570	760	600	1930	643.3	
40	IG-2022-40	F5 21-27	61	22	550	940	1090	2580	860.0	
41	IG-2022-41	ICCV-10023-P-64	63	28	500	360	500	1360	453.3	
42	IG-2022-42	F5-21-56	58	24	660	830	620	2110	703.3	
43	IG-2022-43	ICCV-10023-P-64	62	26	570	640	790	2000	666.7	
44	IG-2022-44	IG-593 X IG-747	58	28	750	640	590	1980	660.0	
45	IG-2022-45	ICCV-0600-P-6	59	24	550	690	840	2080	693.3	
46	IG-2022-46	SGF-3-D (double podded)	58	16	820	720	890	2430	810.0	
47	IG-2022-47	J-1140	59	36	570	980	1150	2700	900.0	
48	IG-2022-48	JG-14 X JG-315	59	20	540	780	590	1910	636.7	
49	IG-2022-49	JG-6 X JSC-8	67	26	680	570	610	1860	620.0	
50	IG-2022-50	IG 205-17	68	25	510	970	630	2110	703.3	

SVT-III (60)

D/S 11.11.2022

S.N.	Entry	Cross	**FLOWERING**	**SEED INDEX**	**PLANT STD.**	SEED YIELD					
			DAYS	**g.**		I	II	III	TOTAL	MEAN	
1	IG-III 2022-01	SGF-3-D-E	58	14	60	590	450		1040	520.0	
2	IG-III 2022-02	JG-33 X KAK-2	59	23	73	930	500		1430	715.0	
3	IG-III 2022-03	F5-21-50	57	20	62	220	370		590	295.0	
4	IG-III 2022-04	C177 X RVSG-37	57	22	72	690	710		1400	700.0	
5	IG-III 2022-05	SGF-3-D	59	23	74	680	470		1150	575.0	
6	IG-III 2022-06	C177 X RVSG-37	66	24	68	820	750		1570	785.0	
7	IG-III 2022-07	**IG 2020-115**	58	34	86	1030	800		1830	915.0	
8	IG-III 2022-08	IG-593 X IG 474	57	28	69	1390	980		2370	1185.0	
9	IG-III 2022-09	F5-21-49	58	16	52	930	700		1630	815.0	
10	IG-III 2022-10	SGF-3-D	68	21	94	950	650		1600	800.0	
11	IG-III 2022-11	SGF-3D-2016-MH	64	24	80	910	740		1650	825.0	
12	IG-III 2022-12	F5-21-38	62	23	77	670	520		1190	595.0	
13	IG-III 2022-13	BGD-1085 X PKU-4	56	28	79	1030	840		1870	935.0	
14	IG-III 2022-14	ICCVX100-100-P-32	58	24	60	990	910		1600	800.0	
15	IG-III 2022-15	F5 -21-05	58	25	81	1100	860		1960	980.0	
16	IG-III 2022-16	**IG 2020-115**	58	22	86	900	610		1510	755.0	
17	IG-III 2022-17	SGF-3D-2014-04	60	20	99	990	750		1740	870.0	
18	IG-III 2022-18	IG-593 X IG 474	57	32	70	1170	850		2020	1010.0	
19	IG-III 2022-19	F5-21-09	60	24	70	990	670		1660	830.0	
20	**IG-III 2022-20**	**IG-320**	**58**	**10**	**70**	**1040**	**790**		**1830**	915.0	
21	IG-III 2022-21	**J-1140**	60	34	91	1000	860		1860	930.0	
22	IG-III 2022-22	JG-6 X JSC-37	58	24	54	1400	1000		2400	1200.0	
23	IG-III 2022-23	RVSG-37 X IPC-1239	62	24	64	1090	820		1910	955.0	
24	IG-III 2022-24	SGF-3D-2016-01	63	20	64	590	890		1480	740.0	

25	IG-III 2022-25	SGF-4-2016 MH	63	22	95	820	670		1490	745.0	
26	IG-III 2022-26	**RVSG-37 X IPC-1239**	60	26	89	1290	950		2240	1120.0	
27	IG-III 2022-27	SGF-3D-2016-01	68	18	99	1250	900		2150	1075.0	
28	IG-III 2022-28	SGF-3D	61	21	94	1010	700		1710	855.0	
29	IG-III 2022-29	JG-6 X JG-315	62	16	89	1030	1340		2370	1185.0	
30	IG-III 2022-30	SGF-3D-2016-04	58	23	84	990	790		1780	890.0	
31	IG-III 2022-31	F5-21-34	62	28	92	1010	820		1830	915.0	
32	IG-III 2022-32	SPP-15 X JG-6	59	18	79	800	650		1450	725.0	
33	IG-III 2022-33	JG-33 X KAK-2	61	22	79	750	590		1340	670.0	
34	IG-III 2022-34	C-177 X KAK-2	63	20	79	960	770		1730	865.0	
35	IG-III 2022-35	JG-6 X JSC-37	63	22	76	500	680		1180	590.0	
36	IG-III 2022-36	JG-6 X JSC-8	65	24	78	700	870		1570	785.0	
37	IG-III 2022-37	SGF-3D-2016-04	59	22	90	440	430		870	435.0	
38	IG-III 2022-38	SPP-No-7	61	20	87	560	730		1290	645.0	
39	IG-III 2022-39	JG-33 X KAK-2	58	18	78	620	580		1200	600.0	
40	**IG-III 2022-40**	**RVSG-27 X JG-6**	**61**	**27**	**105**	**700**	**780**		**1480**	740.0	
41	IG-III 2022-41	SPP No 15 X JG-6	63	20	84	430	610		1040	520.0	
42	IG-III 2022-42	IG-747 X ICCV-10314	58	25	89	710	830		1540	770.0	
43	IG-III 2022-43	IG-593 X IG 474	62	27	76	530	790		1320	660.0	
44	IG-III 2022-44	C-177 X RVSG-37	58	22	105	450	590		1040	520.0	
45	IG-III 2022-45	SGF-3D-2016-05	59	20	120	500	640		1140	570.0	
46	IG-III 2022-46	SAGL-3D	58	28	58	420	420		840	420.0	
47	IG-III 2022-47	JG-33 X KAK-2	59	20	112	460	500		960	480.0	
48	IG-III 2022-48	SGF-3D-2016-04	59	21	52	550	860		1410	705.0	
49	IG-III 2022-49	JG-14 X JG-315	67	23	65	420	460		880	440.0	
50	IG-III 2022-50	SGF-3D-2016-01	68	26	83	550	580		1130	565.0	
51	IG-III 2022-51	JG-14 X JG-315		21	108	760	640		1400	700.0	
52	IG-III 2022-52	JG-33 X KAK-2		18	92	450	420		870	435.0	
53	IG-III 2022-53	RVG-27 X JG-6		18	62	810	720		1530	765.0	

D - **Hybridization programme**

The generation was advanced of the following crosses as well as the hybridization was also carried out.

I- **National crossing programme:**

Four fresh crosses of *Kabuli* x *Kabuli* were made by using KAK-2, Kripa, JGK-3 and IGK-1 as parents and one pollinator RVSSG-37 (donor for wilt resistance and bold seed size).

1. KAK-2 X RVSSG-37
2. Kripa X RVSSG-37
3. JGK-3 X RVSSG-37
4. IGK-1 X RVSSG-37

II- **Station crossing programme**:

Following twenty-two crosses were attempted to combination breeding to developed disease (*Fusarium* wilt) resistance / tolerance with high seed yield potential, bold seeded and plant growth traits which can address the climate change on sustainable basis:

Table PB-17: List of crosses made at Indore during 2019-2020 *rabi*

S.N.	Cross	S.N.	Cross
1.	SGLA-152223 x ICCV-10401	2.	ICCV-10401 x SGLA-152223
3.	JG-6 x JAKI-9218	4.	JG-130 x JG-14
5.	JG-6 x JG-315	6.	JG-474 x ICCV-10315
7.	JG-474 x ICCV-10315	8.	JG 474 x RVSSG-37
9.	JG-474 x ICCV-10401	10.	JG-315 x JG-6
11.	JSC-37 x IPC-1239	12.	ICCV-1034 x ICCV-10305
13.	ICCV-1034 x KAK-2	14.	RVKG-101 x KAK-2
15.	ICCV-10305 x RVSSG-37	16.	ICCV-06301 x BDG-1185
17.	JG-33 x KAK-2	18.	ICCV-10401 x JG-474
19.	JG-14 x JG-474	20.	JG-14 x ICCV-152223
21.	RVSG-201 x RG 2015-07*	22.	RG 2015-07* x RVSG-201

*Note: *C-1743: IVT- Desi (2017-18 Rabi)*

Status of breeding materials:

Following breeding materials were grown in different segregating generations for evaluation and generation advancement:

Table PB-18: Evaluation of breeding materials at various segregating generations at Indore during 2019-2020 *rabi*

S.N.	Generation	Crosses / Progenies	SPS	Remarks
1.	F3	10 crosses /18 progenies	25	
2.	F4	08 crosses / 14 progenes	22	
3.	F5	5crosses / 28 progenies	30	
4.	F6	25crosses /53 progenies	33	
5.	F7	4 crosses/ 38 progenies	35	

F4 generation of following ten crosses of *Kabuli* x *Desi* were made for considering earliness, double podded, large seed size, and suitable plant ideotype for efficient use of natural resources *viz.,* soil and water management for improving productivity in the region

i. JG-315 x KAK-2
ii. JAKI-9218 x JG-62
iii. SGF3D x JG-315
iv. BAUG 108 x KAK-2
v. JGK-3 x RVSSG-37
vi. KAK-2 x JG-315
vii. BAUG 108 x KAK-2
viii. BAUG 108 x JG-315
ix. BAUG 108 x JSC-43
x. BAUG 108x RVS-202

Evaluation of F_1 generation and generation advancement to F_2 generation and also screened for exploitation of heterosis and inbreeding depression i.e., dominance gene action in the population.

Evaluation of F2 generation to F3generations of following crosses during 2019-2020 *Rabi*

No. of crosses	14 F1 + Parents (12)
Total	(14 + 12) = 26
Single row plot	30 cm apart
Date of sowing	25.11.2018

Table-PB-19: The performance of Hybrids vs. Parents at Indore during 2019-2020 *rabi*

S. N.	Experimental material	Cross / Parent	S. N.	Experimental material	Cross / Parent
1	RVSSG-37	Parent	14	JAKI-9218	Parent
2	IGK-1 x RVSSG-37	F_1	15	BAUG-108 (C-177) x JG-315	F_1
3	JGK-3 x RVSSG-37	F_1	16	JG-315	Parent
4	RVSSG-37	Parent	17	KAK-2 X BAUG-108 (C-177)	F_1
5	Kripa X RVSSG-37	F_1	18	KAK-2	Parent
6	JGK-3	Parent	19	BAUG-108 (C-177) x RVS-202	F_1
7	JGK-3 x RVSSG-37	F_1	20	JAKI-9218	Parent
8	KAK-2 x RVSSG-37	F_1	21	JAKI-9218 x JG-62	F_1
9	RVSSG-37	Parent	22	JG-62	Parent
10	SGF 3D x JG-315	F_1	23	JG-315 x KAK-2	F_1
11	KAK-2 x JG-315	F_1	24	BAUG-108 (C-177) x KAK-2	F_1
12	JG-315	Parent	25	KAK-2	Parent
13	JAKI-9218	Parent	26	RVSSG-37	Parent

1	ICCX 191033-B
2	ICCX 191035-B
3	ICCX 191052-B
4	ICCX 191055-B
5	ICCX 191075-B

F_3 Generation

S.N.	CROSS
1	JG-130 X JSC-37
2	HC-5 X ICC 4958
3	RVSSG-74 x RSG-888
4	RVG-202 X RVSSG-74
5	RVG-204 X RSG-888
6	RVG-201 X NBeG-47
7	RVG-202 X ICC - 4958
8	RVG-204 X NBeG - 47
9	RVG-203 X ICC-4958
10	RVG-205 X JSC-37

F4 Generation

S. No.	GENOTYPE	Flower initiation (days)	50% Flowering (days)	Pod initiation (days)	Plant height (cm)	Plant height For MH (cm)	Branches /plant	Pods/ plant
1	RVSSG-74 x NBEG 47	41	67	75	75.51	37.15	10.31	84.36
2	NBEG-47 x HC-5	42	68	77	62.34	33.45	11.21	93.21
3	RVSSG-74 x	43	66	76	64.31	49.51	9.78	87.31

	RVG-202							
4	IPC-12-229 x IPC 10-10	47	68	77	61.43	31.42	9.33	88.54
5	JG-130 x HSC-37	49	69	79	58.32	31.21	11.21	97.26
6	RVG-203 x JSC-37	47	68	76	63.42	24.51	12.31	107.65
7	IG-14 x JSC-37	46	67	77	59.61	26.35	11.11	102.31
8	IPCK-11-110 x RVG-202	46	67	77	61.21	34.51	9.71	86.41
9	RVSSG-74 x IPC 11-61	48	68	78	64.12	39.61	10.31	85.41
10	BGO-112 x RVG-205	49	69	79	68.71	33.15	7.86	87.63

F_5 Generation-I

S.No.	GENOTYPE
1	RVG-202 X JSC-37
2	JAKI-9218 X JSC-37
3	RVSSG-74 X HC-5
4	NBIG-47 X HC-5
5	IPCK-1092 X JSC-4958
6	JG-6 X ICC- 4958
7	IPC 11-10 X JSC-37

F_5 Generation II from Selections from ICRISAT

S. N.	Designation	Cross	Fl. Ini.	50% Fl.	Mat.	Pl. ht.	L. Pl. ht.	Br. / Pl	Pods / Pl	Remarks
1	ICCX 171001-B-B-B-B	HC 5/ICC 4958	39	64	113	70.57	36.51	4.23	45.00	Drought tolerance
2	ICCX 171003-B-B-B-B	ICCV 08108/ICC 4958	36	58	104	72.34	48.65	3.24	34.61	Drought tolerance
3	ICCX 171008-B-B-B-B	ICCV 08108/JG-14	42	63	113	69.68	28.36	3.68	37.66	Heat tolerance
4	ICCX 171011-B-B-B-B	HC 5/JSC 37	35	56	102	71.56	35.31	6.21	61.87	DDR resistance
5	ICCX 171012-B-B-B-B	NBeG 47/JSC 37	37	57	103	74.59	32.67	4.75	56.45	DDR resistance
6	ICCX 171014-B-B-B-B	ICCV 08102/ JSC 37	40	59	106	71.36	38.75	5.34	49.78	DDR resistance
7	ICCX 171015-B-B-B-B	ICCV 96836/ JSC 37	39	52	104	67.82	38.51	4.25	58.97	DDR resistance
8	ICCX 171017-B-B-B-B	NBeG 47/ JG 24	42	57	103	69.54	32.74	4.66	57.87	DDR resistance
9	ICCX 171018-B-B-B-B	ICCV 08108/ JG-24	34	57	103	77.49	24.61	3.66	53.46	DDR resistance
10	ICCX 171019-B-B-B-B	ICCV 08102/ JG-24	36	62	109	72.31	31.54	4.21	54.24	DDR resistance

11	ICCX 171020-B-B-B-B	ICCV 96836/ JG-24	36	58	104	69.48	29.48	3.74	39.44	DDR resistance
12	ICCX 171021-B-B-B-B	HC 5/ICC 5912	41	57	103	61.38	27.66	3.21	29.42	High protein and Zn
13	ICCX 171022-B-B-B-B	NBeG 47/ ICC 5912	35	56	102	68.48	41.37	5.94	61.75	High protein and Zn
14	ICCX 171023-B-B-B-B	ICCV 08108 / ICC 5912	40	57	103	69.78	34.55	4.65	55.47	High protein and Zn
15	ICCX 171024-B-B-B-B	ICCV 08102/ ICC 5912	36	58	104	69.74	29.44	4.44	51.66	High protein and Zn
16	ICCX 171025-B-B-B-B	ICCV 96836/ ICC 5912	38	57	103	68.77	37.41	3.21	28.49	High protein and Zn
17	ICCX 171027-B-B-B-B	NBeG 47/ ICC 17163	35	56	102	67.12	27.54	4.15	38.47	High protein and Fe
18	ICCX 171029-B-B-B-B	ICC 08102/ 1CC 17163	37	57	103	73.51	32.71	5.31	49.77	High protein and Fe
19	ICCX 171030-B-B-B-B	ICCV 96836/ ICC 17163	37	56	102	75.25	40.52	3.64	37.21	High protein and Fe
20	ICCX 171042-B-B-B-B	ICCV 93952 / ICCV 08102	37	57	103	67.34	35.24	3.21	38.44	Mechanical harvesting
21	ICCX 171043-B-B-B-B	ICCV 90201 / ICCV 08102	39	54	109	69.87	35.64	3.15	34.99	Mechanical harvesting
22	ICCX 171046-B-B-B-B	ICCV 93954 /ICCV 08102	35	56	102	64.72	33.57	5.77	52.11	Mechanical harvesting
23	ICCX 171054-B-B-B-B	ICCV 88202/ ICCV 08108	39	54	102	64.51	38.15	6.33	50.47	Mechanical harvesting
24	ICCX 171061-B-B-B-B	ICCV 07118/ ICCV 08108	36	58	104	70.13	30.51	4.11	46.21	Mechanical harvesting
25	ICCX 171088-B-B-B-B	ICCV 00305/ ICCX-110031-F3-P16-BP-BP	35	57	103	69.54	36.51	3.77	28.64	Mechanical harvesting

B- **Germplasm Evaluation and Maintenance:**

250 chickpea germplasm accessions were evaluated and maintained at the centre.

Germplasm Evaluation and Maintenance

Experimental details:

Number of entries	250 accessions
Replications	Non-replicated

Design	Observational plots
No. of rows	1 rows
Row length	4.00 m
Row to row distance	30 cm
Plant to plant distance	8-10 cm
Plot size	4.00 m x 0.30 m = 1.20 sq. m
Irrigation	One pre-sowing irrigation (*Palewa*) on 24.11.2021
Date of sowing	26.11.2021
Fertilizer	20:40:20 N:P_2O_5:K_2O kg/ha as basal application at the time of sowing
Bacterial culture	Not used
Inter culture operations	Two weeding on 08.12.2021 and 28.12.2021.
Plant protection measures	Two spraying of insecticide to control gram pod borer effectively

Pesticide/Fungicide	Dose	Date of application
(i) Endosulphan	2.5 ml/l	12.12.2022
(ii) Chlorpyriphos	2.5 ml/l	27.12.2022

Previous crop	Moong and Urad

Results: 250 accessions were evaluated for some quantitative traits. The accessions were classified for earliness, plant growth habit wilt incidence and are presented in table given below:

Table PB-23: Classification of accessions and their frequency for quantitative traits

S.N.	Trait	Class	Frequency
1.	Earliness in maturity	Early	151
		Medium	072
		Late	018
2.	Plant growth habit	Erect	078
		Semi spreading	078
		Spreading	085
3.	Wilt incidence (%)	< 10%	024
		> 10 to < 20 %	035
		> 20 %	191

Out of 250 evaluated 59 accessions were selected on the basis of % wilt incidence (less than 20%) screening under wilt sick plot condition with the incidence of wilt in susceptible check entry JG-62 (100.00%), L-550 (95.83%) and a resistant check entry JG-315 (10.25). The LSI was 46.88%. The performance of these selected accessions is presented in table given below:

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. B.S. Baghel
Director Research Services

Ph. No. **0751-2970509, 2970510** (Fax)
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2019/ 162 Dated: 01/06/19

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2018-19
Crop : Wheat

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. B.S. Baghel
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. : RVSKVV BSP I No./DRS/Farm/2018-19/736
   Date : 13.11.2018
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Wheat			
RVW 4106	250.0	859.0	Satisfactory Fit for breeder seed
HI 1605		65.9	
HI 1531		157.0	
HI 8759		76.0	
HI 8713		157.0	
Lok-1		46.0	
HI 1544		135.0	
MP 3288		259.0	
MP 3382		332.0	
MP 3211		67.0	
Total		**2153.9**	

(B) Breeder Seed produced in addition to above allocation------
(C) Carry over seeds -- Nil

Director Research Services
Dated: 01/06/19

No. DRS/Farm/BSP-IV/2019/ 163
CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. The Director, ICAR, Indian Institute of Wheat and Barley Research (IIWBR), Post Box No. 155, Kunjpura Road, Karnal, Haryana.
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal
9. (M.P.)- 462004

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayarajeScindiaKrishiVishwaVidyalaya
Opposite Mela Ground, Race Course Road, Gwalior (M.P.) – 474 002

Director Research Services

NO./DRS/Farm/2021/ 156

Date: 22/9/21

Subject: Supply Plan for Rabi 2020-21 (Breeder Seed)

S. No.	Crop/Variety	Allotted by GOI (Qt.)	Lifting Agency	Allotted Quantity	Name of Supply Center	
					Quantity	Center
1.	**Gram**					
	RVG 202	705.16	CG	50.0	50.0	Ujjain
			KCO	22.0	22.0	Dewas
			MP	329.96	90.0	Badwani
					90.0	Manawar
					50.0	Sheopur
					50.0	Alirajpur
					30.0	Morena
					20.0	Indore
			MH	150.0	50.0	Sehore
					100.0	Khargone
			NSAI	0.20	0.20	Indore
			NSC	150.0	100.0	Bhind
					50.0	Patan (Mandsaur)
			WB	3.0	3.0	Indore
	RVG 203	232.2	MP	232.2	90.0	Bagwai
					40.0	Indore
					35.0	Khandwa
					27.2	Aron
					20.0	Jhabua
					20.0	Mandsaur
	RVG 201	100.0	CG	50.0	50.0	Dhar
			MP	50.0	20.0	Khandwa
					15.0	Indore
					15.0	Dhar
	RVG 204	107.0	NSC	100.0	25.0	Mandsaur
					25.0	Dewas
					25.0	Ujjain
					25.0	Khandwa
			NAFED	7.0	7.0	Dhar
	JAKI 9218	1.0	OR	0.50	0.50	Sehore
			NSAI	0.50	0.50	Sehore
	RVG 205	7.0	NAFED	7.0	7.0	Sehore
	JG 130	0.40	NSAI	0.40	0.40	Sehore
	JG 16	0.50	OR	0.50	0.50	Sehore
	JG 11	0.70	NSAI	0.70	0.70	Sehore
	RVKG 151	1.2	NAFED	1.2	1.20	Sehore
	RVKG 111	2.0	NAFED	2.0	2.00	Sehore

2.	**Lentil**					
	RVL 11-6	16.90	CG	7.2	7.20	Sehore
			NSC	1.10	1.10	Indore
			MP	8.6	2.90	Indore
					5.70	Sehore
	RVL 31	12.0	CG	6.6	6.6	Sehore
			MP	5.0	3.0	Morena
					2.0	Sehore
			NSC	1.1	1.10	Sehore
	RVL 13-5	5.2	NAFED	5.20	5.20	Sehore
	RVL 13-7	0.40	NAFED	0.40	0.40	Sehore
3.	**Mustard and Toria**					
	RVM 2	5.0	MP	4.96	2.96	Morena
					2.0	Sirsod
			NSC	0.40	0.40	Morena
	RVT 1	0.02	HIL	0.02	0.02	Morena

1. The seed allotted above may please be lifted by **31.10.2021** on advance payment through **RTGS/NEFT to the concern center (separately for each unit)**
2. The allotment is provisional and may be modified/canceled depending upon the allotment by the GOI and availability of seed at the time of lifting. In case of any controversy on this allocation the decision of the **Director Research Services, Gwalior** will be final.
3. Lifting agency must ensure himself regarding good quality of breeder seed before lifting.
4. **Concern unite/center Incharge, must be ensure to supply good quality of Breeder Seed as per standard Norms.**

Director Research Services
Date: 27/4/21

No. DRS/Farm/2021/ 157

Cc. to information and necessary action:

1. The Deputy Commissioner (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bahawan, New Delhi-110001
2. The Assistant Director General (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bhawan, New Delhi-110001
3. The Project Director, Directorate of Seed Research, Post Beg No. 11, Village Kushmaur, P.O. Kaithauli, Mau-275101 (U.P.)
4. The Project Director, Concerned crop.....
5. The Director, Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
6. Joint Director (Seeds), Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
7. The Managing Director, M.P. State Certification Agency, Bhopal (M.P.)-110012
8. The Managing Director, MP. Seed & Farms Development Corporation Ltd. E-1/88, Arera Colony, Bhopal (M.P.)
9. The Managing Director, MP District Poverty Initiatives Project (MP-DPIP) (Panchayat & Rural Development Department, Govt of M.P.), Ist floor EPCO, Paryavaran Parisar, E-5, Arera Colony, Bhopal (M.P.) – 462016
10. The Managing Director, MP. Rajya Sahkari Beej Utpadak avam Viparan Sangh Maryadit, 3rd floor, Apex Bank, TT Nagar Bhopal (M.P.) – 462008
11. National Seeds Corporation Limited, Beej Bhawan, Pusa Complex, New Delhi-110012
12. Maharashtra State Seeds Corporation Ltd. Krishi Nagar, Mahabeej Bhawan,Akola, Maharashtra-444104

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

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Email- drsrvskvv@rediffmail.com

NO./DRS/Farm/2022/ 103

Date: 18-04-2022

Subject: Supply Plan of Breeder Seed for Kharif-2022

S. No.	Crop/Variety	Allotted by GOI (Qt.)	Lifting Agency	Allotted Quantity	Name of Supply Center	
					Quantity	Center
1.	**Soybean**					
	RVS 2001-4	331.0	SSC	140.0	140.0	Manawar
			Beej Sangh	137.0	10.0	Manawar
					13.0	Sheopur
					18.0	Rajgarh
					70.0	Khargone
			MPRAF	4.0	26.0	Sehore
			SFAC	20.0	4.0	Sehore
			NFL	4.8	20.0	Etkhedi
			NSC	19.20	4.8	Sehore
			NSAI	5.80	19.20	Sehore
	JS 20-116	346.0	JH	2.0	5.80	Sehore
			KCO	10.0	2.0	Dewas
			KVSS	25.0	10.0	Dewas
			NAFED	7.0	25.0	Dewas
			NFL	2.0	7.0	Sehore
			RJ	300.0	2.0	Sehore
	JS 20-98	481.0	CG	20.0	300.0	Ujjain
			KVSS	30.0	20.0	Dewas
			IFFDC	15.0	30.0	Dewas
			NAFED	11.0	15.0	Dewas
			NFL	10.0	11.0	Sehore
			SSC	200.0	10.0	Sehore
					32.0	Dewas
					74.0	Jhabua
					8.0	Aron
					44.0	Shajapur
			Beej Sangh	125.0	42.0	Shivpuri
					98.0	Dhar
			Govt. Farm	15.0	27.0	Aron
			MPRAF	45.0	15.0	Sehore
	Raj Soya 24	444.0	SFAC	10.0	45.0	Dewas
			KCO	10.0	10.0	Dewas
			KVSS	20.0	10.0	Indore
			NAFED	7.0	20.0	Ujjain
			SSC	100.0	7.0	Sehore
					90.0	Alirajpur
			Beej Sangh	150.0	10.0	Dhar
					18.0	Badwani
					80.0	Ujjain
			Govt. Farm	312.0	52.0	Dhar
					127.0	Indore
					50.0	Dhar
					44.0	Khargone
					44.0	Khandwa
					31.0	Sehore
			MPRAF	5.0	14.0	Ujjain
			SFAC	25.0	5.0	Ujjain
	Raj Soya 18	267.0	NAFED	7.0	25.0	Ujjain
			SSC	150.0	7.0	Sehore
					35.0	Indore
					90.0	Mandsaur

					20.0	Jaora
					5.0	Sehore
			Beej Sangh	110.0	100.0	Indore
					10.0	Sehore
			Govt. Farm	80.0	50.0	Jaora
					30.0	Sehore
	JS 20-34	190.0 * against the production of 99.0q allotment of 190.0 is done by GOI	NSC	188.0	7.0	Sehore
					19.0	Aron
					57.0	Shajapur
					14.0	Khandwa
					2.0	Sehore
	JS 20-29	145.0	SSC	70.0	70.0	Indore
			Beej Sangh	50.0	30.0	Sehore
					20.0	Patan
			Govt. Farm	15.0	15.0	Indore
			MPRAF	10.0	10.0	Indore
	JS 95-60	156.0	CG	5.79	5.80	Neemuch
			MH	21.72	21.80	Mandsaur
			NSC	14.48	14.40	Neemuch
			RJ	82.15	27.80	Neemuch
					55.0	Mandsaur
			SSC	5.0	5.0	Mandsaur
			MPRAF	16.86	15.80	Sehore
			SFAC	10.0	10.0	Mandsaur
	JS 20-69	7.8	Govt. Farm	7.8	7.8	Sehore
2.	**Arhar**					
	TJ 501	4.5	Govt. Farm	4.5	4.5	Khandwa
	JKM 189	4.5	Govt. Farm	4.5	4.5	Khargone

1. The seed allotted above may please be lifted by **15.05.2022** on advance payment through **RTGS/NEFT to the concern center (separately for each unit)**
2. The allotment is provisional and may be modified/canceled depending upon the allotment by the GOI and availability of seed at the time of lifting. In case of any controversy on this allocation the decision of the **Director Research Services, Gwalior** will be final.
3. Lifting agency must ensure himself regarding good quality of breeder seed before lifting.
4. **Concern unite/center Incharge, must be ensure to supply good quality of Breeder Seed as per standard Norms.**

Director Research Services
Date: 18-04-2022

No. DRS/Farm/2022/ 104

Cc. to information and necessary action:

1. The Deputy Commissioner (seed), Department of Agriculture and Corporation, Ministry of Agriculture, ShastryBahawan, New Delhi- 110001
2. The Assistant Director General (seed), Department of Agriculture and Corporation, Ministry of Agriculture, ShastryBhawan, New Delhi-110001
3. The Project Director, Directorate of Seed Research, Post Beg No. 11, Village Kushmaur, P.O. Kaithauli, Mau-275101 (U.P.)
4. The Director, Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)- 462004
5. Project Director, Directorate of Soybean Research Khandwa Road, Indore (M.P.)
6. Joint Director (Seeds), Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
7. The Managing Director, M.P. State Certification Agency, Bhopal (M.P.)- 110012
8. The Managing Director, M.P. State Seed and Fram Development Corporation, Bhopal (M.P.)
9. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509, 2970510 (Fax)
Email- drsrvskvv@rediffmail.com

NO./DRS/Farm/2023/ 93

Date: 18-04-2023

Subject: Supply Plan of Breeder Seed for Kharif-2023

S. No.	Crop/Variety	Allotted by GOI (Qt.)	Lifting Agency	Allotted Quantity	Name of Supply Center	
					Quantity	Center
1.	Soybean					
	JS 20-69	6.0	NFL	1.5	1.5	Etakhedi
			NSAI	4.5	4.5	Sehore
	RVS 2001-4	142.0	M.P.	131.0	50.0	Sehore
					60.0	Khandwa
					11.0	Alirajpur
					5.0	Indore
			NSC	10.0	5.0	Jaora
			NSAI	1.0	10.0	Jaora
	JS 20-34	260.0	M.P.	260.0	1.0	Jaora
					46.0	Ashoknagar
					164.0	Shajapur
					48.0	Shivpuri
	JS 20-116	294.0	KCO	10.0	2.0	Sehore
			NAFED	5.2	10.0	Ujjain
			RJ	274.0	5.2	Ujjain
					95.0	Manavar
					10.0	Khandwa
					155.0	Ujjain
			NFL	3.0	14.0	Sehore
			UP	2.0	3.0	Ujjain
	JS 20-29	11.0	M.P.	11.0	2.0	Ujjain
	JS 95-60	172.0	IFFDC	13.0	11.0	Sehore
			MH	47.0	13.0	Patan
					7.0	Patan
					21.0	Khandwa
					14.0	Badwani
			NSC	32.0	5.0	Agar Malwa
			RJ	32.0	32.0	Patan
					10.0	Patan
					10.0	Khandwa
			NSAI	16.0	12.0	Badwani
			SOPA	32.0	16.0	Patan
	JS 335	8.0	NFL	1.5	32.0	Patan
			NSAI	6.5	1.5	Sehore
	RVS 2011-35	13.3	NSAI	13.3	6.5	Sehore
	Raj Soya 18	450.0	KCO	5.0	13.3	Indore
			NAFED	5.2	5.0	Indore
			MP	290.0	5.2	Indore
					34.0	Indore
					70.0	Mandsaur
					120.0	Jhabua
					66.0	Khandwa
			NSC	100.0	31.0	Mandsaur
					44.0	Khandwa
					25.0	Neemach

			NSAI	0.04	0.30	Neemach
			SOPA	50.0	44.0	Neemach
					6.0	Sehore
	Raj Soya 24	376.0	CG	42.0	42.0	Dhar
			HIL	42.0	42.0	Dhar
			KVSS	9.0	9.0	Khargone
			KCO	17.0	17.0	Sehore
			MP	189.0	105.0	Mandsaur
					16.0	Dhar
					55.0	Alirajpur
					13.0	Badwani
			NAFED	5.0	5.0	Dhar
			NFL	2.5	2.5	Dhar
			NSC	34.0	34.0	Dhar
			NSAI	14.0	14.0	Khargone
			SOPA	21.0	21.0	Badwani
	JS 20-98	448.0	MP	253.0	102.0	Dewas
					46.0	Dhar
					90.0	Aron
					12.0	Alirajpur
					3.0	Jaora
			NAFED	7.0	7.0.	Jaora
			NFL	7.0	7.0	Dewas
			NSC	176.0	86.0	Dewas
					90.0	Dhar
			SOPA	3.5	3.5	Dewas
			UP	1.5	1.5	Dewas
2.	**Til**					
	TKG 55	0.50	CG	0.50	0.50	Sirsod
	TKG 308	1.21	MP	1.21	1.0	Sirsid
					0.21	Gwalior

1. The seed allotted above may please be lifted by **15.05.2023** on advance payment through **RTGS/NEFT to the concern center (separately for each unit)**
2. The allotment is provisional and may be modified/canceled depending upon the allotment by the GOI and availability of seed at the time of lifting. In case of any controversy on this allocation the decision of the **Director Research Services, Gwalior** will be final.
3. Lifting agency must ensure himself regarding good quality of breeder seed before lifting.
4. **Concern unite/center Incharge, must be ensure to supply good quality of Breeder Seed as per standard Norms.**

Director Research Services
Date: 18.04.2023

No. DRS/Farm/2023/ 94

Cc. to information and necessary action:

1. The Deputy Commissioner (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bahawan, New Delhi- 110001
2. The Assistant Director General (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bhawan, New Delhi-110001
3. The Project Director, Directorate of Seed Research, Post Beg No. 11, Village Kushmaur, P.O. Kaithauli, Mau-275101 (U.P.)
4. The Director, Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)- 462004
5. Project Director, Directorate of Soybean Research Khandwa Road, Indore (M.P.)
6. Joint Director (Seeds), Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
7. The Managing Director, M.P. State Certification Agency, Bhopal (M.P.)- 110012
8. The Managing Director, M.P. State Seed and Fram Development Corporation, Bhopal (M.P.)
9. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Research Services

निदेशालय अनुसधान सवाए
राजमाता विजयाराजे सिंधिया कृषि विश्वविद्यालय
मेला ग्राउण्ड के पास, राजा पंचम सिंह मार्ग, ग्वालियर (म.प्र.) 474002

डॉ. एस.के. शर्मा
निदेशक अनुसंधान सेवाएँ

फोन / (फैक्स) : 0751-2970509 (O)
ई–मेल : drsrvskvv@rediffmail.com

क्रं. / नि.अ.सें. / फार्म / 2023–24 / 1661 दिनांक : 10.10.2023

विषय : शासकीय प्रक्षेत्रों को प्रजनक बीज आवटंन।

संदर्भ : संचालनालय, किसान कल्याण तथा कृषि विकास, भोपाल के पत्र कं. प्रक्षेत्र–1 / 42 / प्रज.बीज / रबी / 2023–24 / 422 दिनाक 09 अक्टूवर 2023, भोपाल के अनुसार प्रजनक बीज का आंवटन निम्नानुसार किया जाता है।

उपरोक्त पत्रानुसार शासकीय कृषि प्रक्षेत्रों को प्रजनक बीज का आवंटन निम्नानुसार किया जाता है।

क.	प्रक्षेत्र का नाम	जिला	फसल का नाम	प्रजाति किस्म	आंवटिन बीज मात्रा	प्रजनक बीज प्रदायक केन्द्र का नाम
1.	गेंहू					
	गोहद	भिण्ड	गेंहू	DBW 187 (Karan Vandna)	18.0	भिण्ड
	भिकनगांव	खरगौन	गेंहू	DBW 187 (Karan Vandna)	5.00	ग्वालियर
	नरसिंहपुर	नरसिंहपुर	गेंहू	DBW 187 (Karan Vandna)	4.00	ग्वालियर
	अनो वेरखेड़ी	रायसेन	गेंहू	DBW 187 (Karan Vandna)	2.50	ग्वालियर
2.	चना					
	फंदा	भोपाल	चना	RVG 203	22.0	सीहोर
	पंचेड़	भोपाल	चना	RVG 203	8.00	आरोन (गुना)
	सारंगपुर	राजगढ़	चना	RVG 203	12.00	आरोन (गुना)
	पानतलाई	हरदा	चना	RVG 203	8.00	ग्वालियर
	महागढ़	नीमच	चना	RVG 202	12.00	मंदसौर
	पंचेड़	रतलाम	चना	RVG 202	12.00	इन्दौर
	गजोरा	शिवपुरी	चना	RVG 202	2.40	खण्डवा
	सतराठी	खरगोन	चना	RVG 202	4.00	खण्डवा
	भिकनगांव	खरगौन	चना	RVG 202	4.00	खण्डवा
	सिलवानी	रायसेन	चना	RVG 202	12.00	खण्डवा
	अनोरी वेरखेड़ी	रायसेन	चना	RVG 202	1.60	खण्डवा
	रन्नोद	शिवपुरी	चना	RVG 202	8.00	खण्डवा
	फंदा	भोपाल	चना	RVG 202	2.00	मंदसौर
	जवेरा	दमोह	चना	RVG 204	8.00	सीहोर
	देलाखड़ी	छिंदवाड़ा	चना	RVG 204	3.20	सीहोर
	चंद्रकेसर	देवास	चना	RVG 204	24.00	देवास
	गिरवर	शांजापुर	चना	RVG 204	4.80	शाजापुर
	महुआखेडा	ग्वालियर	चना	RVG 204	16.00	मुरैना
	नोगांव	धार	चना	RVG 204	4.00	धार
	रेहटी	सीहोर	चना	RVG 204	12.20	सीहोर
	गुदगॉव	बैतुल	चना	RVG 204	9.60	सीहोर
3.	सरसों					
	गहवरा	सतना	सरसों	RVM 1	0.50	सिरसौद (ग्वालियर)
	अजयगढ़	पन्ना	सरसों	RVM 1	0.15	सिरसौद (ग्वालियर)
	भैंसवाही	पन्ना	सरसों	RVM 1	0.10	सिरसौद (ग्वालियर)
	देलाखड़ी	छिंदवाड़ा	सरसों	RVM 1	0.15	सिरसौद (ग्वालियर)
	नांदघाट	जबलपुर	सरसों	RVM 1	0.25	सिरसौद (ग्वालियर)
	हरगढ़	शहडोल	सरसों	RVM 1	0.15	सिरसौद (ग्वालियर)
	गजोरा	शिवपुरी	सरसों	RVM 1	0.65	सिरसौद (ग्वालियर)

	महुआखेडा	ग्वालियर	सरसों	RVM 1	1.00	सिरसौद (ग्वालियर)
	आंतरी	ग्वालियर	सरसों	RVM 1	0.60	सिरसौद (ग्वालियर)
	जौरा	मुरैना	सरसों	RVM 1	1.00	सिरसौद (ग्वालियर)
	गोहद	भिण्ड	सरसों	RVM 1	1.00	सिरसौद (ग्वालियर)

निदेशक अनुसंधान सेवाऐ
दिनांक : 10.10.2023

क्रं./नि.अ.सें./फार्म/2023–24/1662

प्रतिलिपि : सूचनार्थ

1. संयुक्त संचालक (बीज), किसान कल्याण तथा कृषि विकास, भोपाल (म.प्र.)
2. अधिष्ठाता, कृषि/उद्यानिकी महाविद्यालय, ग्वालियर, सीहोर, इन्दौर, खण्डवा/मन्दसौर
3. प्रभारी अधिकारी प्रक्षेत्र भिण्ड, ग्वालियर, सीहोर, आरोन (गुना), मंदसौर, इन्दौर, खण्डवा, देवास, शाजापुर, मुरैना, धार, सिरसौद (ग्वालियर),
4. निज सचिव, माननीय कुलपति, रा.वि.सिं. कृषि विश्वविद्यालय, ग्वालियर

निदेशक अनुसंधान सेवाएं

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayarajeScindiaKrishiVishwaVidyalaya
Opposite Mela Ground, Race Course Road, Gwalior (M.P.) – 474 002

Director Research Services

NO./DRS/Farm/2024-25/ 2006

Date: 14-10-24

Subject: Final Revised Supply Plan for Rabi 2024-25 (Breeder Seed).

S. No.	Crop/Variety	Allotted by GOI (Qt.)	Lifting Agency	Allotted Quantity	Name of Supply Center	
					Quantity	Center
1.	**Gram**					
	RVG 202	235.99	GJ	20.0	20.0	Sehore
			MP SSC	50.0	40.0	Khargone
					10.0	Sehore
			Govt. Farm	31.20	31.20	Mandsaur
			MPRAF	10.0	10.0	Khargone
			SFAC	10.0	10.0	Sehore
			NSAI	4.3	4.3	Mandsaur
			NSC	100.0	80.0	Bhind
					20.0	Bagwai
			WB	0.69	0.69	Sehore
	RVKG 121	10.0	SSC	15.0	3.0	Etakhedi
					2.0	Sehore
					10.0	Khandwa
	RVG 204	419.15	CG	100.0	50.0	Ujjain
					50.0	Indore
			GJ	20.0	20.0	Dhar
			KRIBHCO	7.0	7.0	Dewas
			SSC	50.0	20.0	Neemach
					30.0	Badwani
			Beej Sangh	95.70	25.0	Badwani
					25.0	Jaora
					30.0	Khargone
					16.0	Khandwa
			SFAC	4.0	4.0	Dhar
			NF	2.0	2.0	Indore
			NSAI	0.75	0.75	Indore
			NSC	50.0	50.0	Dewas
			UP	70.0	70.0	Sheopur
	RVG 205	22.2	CG	6.2	6.2	Sehore
			KRIBHCO	2.1	2.1	Indore
			SSC	10.3	7.0	Sehore
					3.3	Patan
			NSAI	0.40	0.40	Indore
			NSC	3.2	3.2	Sehore
	RVG 210	26.8	CG	18.0	15.0	Sehore
					2.0	Etakhdi
					1.0	Indore
			NF	0.50	0.50	Sehore
			NSC	5.80	4.0	Ujjain
					1.8	Agar malwa
			UP	2.5	2.5	Indore

	RVKG 151	7.2	SSC	7.2	4.5	Manawar
					2.7	Sehore
	Pusa Chickpea 10216	From Surplus	SSC	30.0	25.0	Mandsaur
					5.0	Dewas
	Pusa Parvati 3062	From Surplus	SSC	27.0	20.0	Badwani
	RVG 203	8.1	CG	3.45	3.45	Sehore
			SSC	4.5	4.5	Sehore
			NSAI	0.15	0.15	Sehore
	JAKI 9218	16.0	NSAI	16.0	14.0	Sehore
					2.0	Etakhdi
	JG 11	1.80	NSAI	1.2	1.2	Sehore
			NSC	0.60	0.60	Sehore
2.	**Lentil**					
	RVL 13-5	23.0	CG	4.0	4.0	Sehore
			SSC	5.0	3.0	Sehore
					2.0	Morena
			NF	14.0	14.0	Morena
	RVL 13-7	13.5	SSC	5.0	5.0	Sehore
			Beej Sangh	4.35	4.35	Sehore
			NF	4.0	4.0	Sehore
			NSAI	0.15	0.15	Sehore
	RVL 11-6	18.9	CG	3.0	3.0	Sehore
			SSC	3.0	3.0	Mandsaur
			NF	7.0	7.0	Sehore
			NSC	5.9	4.5	Agar Malwa
					1.4	Ashok Nagar
	RVL 31	10.0	CG	5.0	5.0	Sehore
			NSC	5.0	5.0	Morena
3.	**Mustard**					
	RVM 1	4.16	CG	2.0	2.0	Morena
			Beej Sangh	3.0	3.0	Morena
			Govt Farm	1.16	1.60.16	Morena
	RVM 2	1.0	Beej Sangh	3.48	3.48	Sirsod
4.	**Wheat**					
	DBW 187	50.0	UP	50.0	50.0	Morena
	DBW 303	100.0	UP	100.0	50.0	Gwalior
					50.0	Bhind
			SSC	30.0	30.0	Gwalior

1. The seed allotted above must be lifted by **31.10.2024** on advance payment through **RTGS/NEFT to the concern center (separately for each unit)**
2. The allotment is provisional and may be modified/canceled depending upon the allotment by the GOI and availability of seed at the time of lifting. In case of any controversy on this allocation the decision of the **Director Research Services, Gwalior** will be final.
3. Lifting agency/the person deputed by the lifting agency must ensure himself regarding quality of breeder seed physically before lifting.
4. **Concern unite/center Incharge, must be ensure to supply good quality of Breeder Seed as per standard Norms.**

Director Research Services

No. DRS/Farm/2024-25/2007

Date: 14-10-24

Cc. to information and necessary action:

1. The Deputy Commissioner (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bahawan, New Delhi-110001
2. The Assistant Director General (seed), Department of Agriculture and Corporation, Ministry of Agriculture, Shastry Bhawan, New Delhi-110001
3. The Project Director, Directorate of Seed Research, Post Beg No. 11, Village Kushmaur, P.O. Kaithauli, Mau-275101 (U.P.)
4. The Project Director, ICAR, IIRP, Kanpur (U.P.)
5. The Director, Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
6. Joint Director (Seeds), Farmer Welfare & Agriculture Development, Vindhyachal Bhawan, Bhopal (M.P.)-462004
7. The Managing Director, M.P. State Certification Agency, Bhopal (M.P.)-110012
8. The Managing Director, MP. Seed & Farms Development Corporation Ltd. E-1/88, Arera Colony, Bhopal (M.P.)
9. The Managing Director, MP. Rajya Sahkari Beej Utpadak avam Viparan Sangh Maryadit, 3rd floor, Apex Bank, TT Nagar Bhopal (M.P.) – 462008
10. National Seeds Corporation Limited, Beej Bhawan, Pusa Complex, New Delhi-110012
11. National Seed Association of India, Surya Kiran Buliding, Kasturba Gandhi Marg, New Delhi-110001
12. Krishak Bharati Co-operative Ltd. Kribhco Bhawan, A-10, Sector-1 Gautam Budh Nagar Noida-(UP)
13. Dean, College of Agriculture/Horticulture, Gwalior/Indore/sehore/Khandwa/Mandsaur.
14. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Director Research Services

Ph. No. **0751-2970509, 2970510** (Fax)
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2020-21/65

Dated: 10/6/2021

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2020-21
Crop : Wheat

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. Dr. M.P. Jain
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP I No./DRS/Farm/PS/2020/160 23.09.2020
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Wheat			
HI 8759	-	696.0	Satisfactory Fit for breeder seed
MP 3382	-	143.0	
HI 8805	-	11.20	
HI 1544	-	810.2	
GW 322	-	38.6	
HI 1605	-	64.8	
Lok-1	-	69.9	
MP 3288	-	431.5	
RVW 4106	-	30.6	
Total		**2295.8**	

(B) Breeder Seed produced in addition to above allocation------

(C) Carry over seeds -- Nil

Director Research Services

No. DRS/Farm/BSP-IV/2020-21/66

Dated: 10/6/21

CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. The Director, ICAR, Indian Institute of Wheat and Barley Research (IIWBR), Post Box No. 155, Kunjpura Road, Karnal, Haryana.
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
9. The P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Director Research Services

Ph. No. **0751-2970509, 2970510** (Fax)
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2020-21/ 55 Dated: 08/06/2021

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2020-21
Crop : Gram (Chickpea)

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. Dr. M.P. Jain
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP I No./DRS/Farm/PS/2020/160 : 23.09.2020
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Chickpea			
RVG 202	775.7	1564.0	Satisfactory
RVG 201	110.0	117.0	Fit for breeder seed
RVG 203	255.4	435.0	
RVG 204	117.7	267.0	
RVKG 111	5.5	2.0	
RVKG 151	5.5	1.20	
JG 11	88.0	0.70	
JAKI 9218	110.0	1.0	
JG 16	1.1	0.50	
JG 130	1.32	0.40	
RVG 205	7.7	8.0	
Total	**1477.92**	**2396.8**	

(B) Breeder Seed produced in addition to above allocation------

(C) Carry over seeds -- Nil

Director Research Services

No. DRS/Farm/BSP-IV/2020-21/ 56 Dated: 08/06/2021

CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. The Director, ICAR, Indian Institute of Pulse Research (IIPR), Kalyanpur, Kanpur (U.P.)-208024
6. Projech Director, Indian Institute of Pulse Research (IIPR), Kalyanpur, Kanpur (U.P.)-208024
7. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
8. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
9. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
10. The P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. **0751-2970509, 2970510**
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2022-23/ 2868 Dated: 06-12-22

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2022
Crop : **Moong & Urid**

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP-I No./DRS/Farm/2022/813 : 16.06.2022
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Moong			Satisfactory Fit for breeder seed
IPM 205-7(Virat)	--	8.32	
PDM (Samrat)	--	5.10	
IPM 410-3(Shikha)	--	1.90	
MH 421	--	2.35	
	-	**17.67**	
Urid			
T-9	--	0.50	
IPU 13-1	--	3.60	
IPU 11-02	--	0.65	
		4.75	

(B) Breeder Seed produced in addition to above allocation------

(C) Carry over seeds -- Nil

Director Research Services
Dated: 06-12-22

No. DRS/Farm/BSP-IV/2022-23/ 2869

CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. Project Coordinator, All Indian Coordinated Research Project on MULLaRP, IIRP, Kalyanpur Kanpur-208024
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509, 2970510
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2022-23/2828

Dated: 29-11-22

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2022
Crop : **Soybean**

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP-I No./DRS/Farm/2022/813 16.06.2022
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Soybean			
RVS 2001-4	375.0	142.0	Satisfactory Fit for breeder seed
JS 20-29	200.0	11.0	
Raj Soya 24	460.0	376.0	
JS 95-60	250.0	172.0	
JS 20-98	750.0	448.0	
JS 20-34	300.0	260.0	
JS 335	50.0	8.0	
Raj Soya 18	475.0	471.0	
JS20-116	500.0	295.0	
JS 20-69	200.0	6.0	
RVSM-2011-35	20.0	469.0	
RVS 76	20.0	26.0	
JS 93-05	-	33.0	
Total	**3600.0**	**2716.0**	

(B) Breeder Seed produced in addition to above allocation------
(C) Carry over seeds balance -- Nil

Director Research Services
Dated: 29-11-22

No. DRS/Farm/BSP-IV/2022-23/2829
CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. The Director, ICAR, Indian Institute of Soybean Research, Khandwa Road, Indore- 452001.
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004

Director Research Service

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. **0751-2970509, 2970510**
Email- drsrvskvv@rediffmail.com

No. DRS/Farm/BSP-IV/2023-24/2072

Dated: 30.11.2023

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2023
Crop : **Soybean**

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP-I No./DRS/Farm/2023-24/575 07.06.2023
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Soybean			
RVSM-2011-35	500.0	576.0	Satisfactory Fit for breeder seed
JS 20-29	20.0	16.0	
RVS 76	195.0	154.0	
Raj Soya 24	525.0	692.0	
JS 95-60	100.0	83.0	
JS20-116	500.0	794.0	
JS 20-98	300.0	164.0	
JS 20-34	150.0	95.0	
JS 335	-	14.0	
Raj Soya 18	330.0	409.0	
RVS 2001-4	20.0	32.0	
JS 20-69	20.0	25.0	
Total	**2160.0** 2660.0	**3054.0**	

(B) Breeder Seed produced in addition to above allocation------

(C) Carry over seeds balance -- Nil

Director Research Services
Dated: 30.11.2023

No. DRS/Farm/BSP-IV/2023-24/2073

CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)-275103
5. The Director, ICAR, Indian Institute of Soybean Research, Khandwa Road, Indore- 452001.
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
9. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Research Service

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509, 2970510
Email- drs@rvskvv.net

No. DRS/Farm/BSP-IV/2023-24/ 575 Dated: 12-06-2024

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2023-24
Crop : Lentil

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP I No./DRS/Farm/2023-24/1935 : 03.11.2023
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Lentil			
RVL 31	-	28.1	Satisfactory Fit for breeder seed
RVL 13-5	-	43.4	
RVL 13-7	-	13.5	
RVL 11-6	-	18.9	
Total	-	**103.9**	

(B) Breeder Seed produced in addition to above allocation------
(C) Carry over seeds -- Nil

Director Research Services
Dated: 12-06-2024

No. DRS/Farm/BSP-IV/2023-24/ 576
CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)- 462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)- 275103
5. The Director, ICAR, Indian Institute of Pulse Research (IIPR), Kalyanpur, Kanpur (U.P.)-208024
6. The Project Director, AICRP on MULLaRP, Indian Institute of Pulse Research (IIPR), Kalyanpur Kanpur-208024
7. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
8. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
9. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
10. The P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509, 2970510
Email- drs@rvskvv.net

No. DRS/Farm/BSP-IV/2023-24 / 571

Dated: 12-06-2024

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2023-24
Crop : Gram (Chickpea)

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. : RVSKVV BSP I No./DRS/Farm/2023-24/1935
   Date : 03.11.2023
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Chickpea			
RVG 202	271.0	432.7	Satisfactory Fit for breeder seed
RVG 201	-	6.3	
RVG 203	111.5	8.1	
RVG 204	483.0	1387.3	
RVKG 121	12.0	28.8	
RVG 205	123.0	22.2	
RVKG 111	-	1.35	
RVKG 151	11.5	7.2	
JG 11	115.0	1.8	
JAKI 9218	230.0	21.96	
RVG 210	135.0	26.28	
BG 3062 (Pusa Parvati)	-	27.0	
Pusa Chickpea 10216	-	36.7	
BG 20211	-	50.4	
JG 24	-	102.4	
Total	**1492.0**	**2160.0**	

(B) Breeder Seed produced in addition to above allocation------

(C) Carry over seeds -- Nil

Director Research Services
Dated: 12-06-2024

No. DRS/Farm/BSP-IV/2023-24/ 572

CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)- 275103
5. The Director, ICAR, Indian Institute of Pulse Research (IIPR), Kalyanpur, Kanpur (U.P.)-208024
6. Projech Director, Indian Institute of Pulse Research (IIPR), Kalyanpur, Kanpur (U.P.)-208024
7. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
8. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
9. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
10. The P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Director Research Services

DIRECTORATE OF RESEARCH SERVICES
RajmataVijayaraje Scindia Krishi VishwaVidyalaya
Near Mela Ground, Raja Pancham Singh Marg, Gwalior (M.P.) – 474 002

Dr. S.K. Sharma
Director Research Services

Ph. No. 0751-2970509, 2970510
Email- drs@rvskvv.net

No. DRS/Farm/BSP-IV/2023-24/573 Dated: 12-06-2024

Breeder Seed Actually Produced

Proforma : BSP-IV
Year of Indent : 2023-24
Crop : Wheat

1. Name of the Producing Institution : Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior
2. Name of Producing Authority : Dr. S.K. Sharma
3. Allocation of Breeder Seed : Director Research Services
4. Allocation vide PD/PC Letter No. Date : RVSKVV BSP I No./DRS/Farm/2023-24/1935 03.11.2023
5. Actual Breeder Seed Produced :

(A) As per BSP-I

Crop/Variety	Quantity of Breeder Seed allocated to be produced (q)	Quantity of Breeder Seed Actually produced (q)	Comments of the monitoring team. (Satisfactory Unsatisfactory)
Wheat			
HI 8759 (Pusa Tejas)	-	242.25	Satisfactory Fit for breeder seed
HI 1544	-	955.4	
GW 322	-	448.8	
Lok-1	-	332.6	
RVW 4106	-	33.0	
DBW 187(Karan Vandana)	100.0	203.66	
DBW 303 (Karan Vaishanavi)	100.0	293.2	
Sujata	-	17.0	
MP 3465	-	23.8	
Total	**200.0**	**2549.6**	

(B) Breeder Seed produced in addition to above allocation------
(C) Carry over seeds -- Nil

Director Research Services
Dated: 12-06-2024

No. DRS/Farm/BSP-IV/2023-24/574
CC for favour of information to:

1. The Assistant Director General (Seed) ICAR, Krishi Bhawan, New Delhi-110001.
2. The Deputy Commissioner (Seeds) Govt. of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare F-Wing Hall, 2nd Floor Shastri Bhawan, New Delhi-110001
3. The Director, Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawa, Bhopal (M.P.)-462004
4. The Project Director, Directorate of Seed Research, P.B.No.11 Village Kusmaur, P.O. Kaithauli, Mau (U.P.)- 275103
5. The Director, ICAR, Indian Institute of Wheat and Barley Research (IIWBR), Post Box No. 155, Kunjpura Road, Karnal, Haryana.
6. The General Manager (Production) National Seeds Corporation, Beej Bhawan, Pusa Campus, New Delhi-110012
7. The Managing Director, Madhya Pradesh State Seed Certification Agency, Office Complex B-2 III Floor Gautam Nagar, Bhopal (M.P.)- 462023
8. Joint Director (Seed), Dept. of Farmer Welfare and Agriculture Development, Vidhyanchal Bhawan, Bhopal (M.P.)- 462004
9. The P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior.

Director Research Services

कार्यालय वि. प्र.
क्रमांक क्र. 202/A
दिनांक 31/5/18
रा.वि.सिं.कृ.वि.वि.

Memorandum of Agreement
Between
Borlaug Institute of South Asia Jabalpur
And
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya

Borlaug Institute of South Asia Jabalpur and Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya (RVSKVV) intend to jointly enter into an agreement for collaboration in the Breeder seed production programme with following terms and conditions.

1. The Breeder seed production programme will be taken up at the BISA farm Jabalpur.
2. The Nucleus seed will be provided by the RVSKVV at a premium price (Double the price of Nucleus seeds) on bill basis.
3. The Breeder seed production programme will be executed under the monitoring and supervision of BISA Breeder. They will do the necessary monitoring of the crops.
4. The tagged breeder seed will be delivered by BISA to the clients as per the letters of allocation.
5. Breeder seed produced at BISA will be supplied as per the allocation made by RVSKVV as priority basis. RVSKVV will facilitate the disposal of Breeder seeds produced by BISA.
6. The seed produced under this agreement will be reported GoI against the indents received to RVSKVV.

The present memorandum shall be valid for a period upon by both the parties. Either party can terminate this agreement with prior notice in writing to the other party before 90 days to termination of this agreement. This agreement may be amended/deleted/modified by means of exchange of letters between the two institutions. Once approved by the two institutions, such amendments shall become part of this Memorandum of Agreement.

BS Baghel

Dr. B.S. Baghel
Director Research Services
(Chairman)

Signature PANKAJ SINGH
Station Coordinator, BISA, Jabalpur
Station Coordinator
Borlaug Institute for South Asia
Jabalpur (M.P.) Pin-482005

Dr. R.L. Rajpoot 31/5/18
Director Instruction
(Member)

Dr. A.K. Singh
Prof. & Head, Plant Breeding & Genetics
(Member)

18/5/18

Dr. J.P. Dixit
Director Farms
(Member)

DIRECTORATE OF EXTENSION SERVICES

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya,

Raja Pancham Singh Marg, Gwalior – 474002 (M. P.)

Dr. Y. P. SINGH
Director Extension Services

Phone: 0751 2970512 (O)
E. mail: des@rvskvv.net

No. /DES/TRG/EEI/2024/ 3009 Dated: 13/02/2024

Order

Following KVK scientists/extension professionals, assistant professor & contractual teachers working in various units of the university are hereby nominated & directed to participate in a Capacity Building Training Programme on "**Enhancing soft skills and managerial proficiency for organizational success**" being organised by Directorate of Extension Services, RVSKVV, Gwalior in collaboration with EEI, Anand during **February 21-23, 2024** at University headquarters. All the nominated participants are directed to reach the training venue before the inaugural session of the training programme.

Venue: Directorate of Extension Services Training Hall
Time: 10:00 AM onwards

S. No.	Name of Participant	Designation	KVK/ College/ ZARS
1.	Mr Mukesh Benel	PA (Hort.)	Alirajpur
2	Dr. H.K.Trivedi	Scientist (Plant Protection)	Ashoknagar
3.	Dr. D.K. Jain	Scientist (Hort.)	Badwani
4.	Dr. Rupendra Kumar	Sr. Scientist (Ext.)	Bhind (Lahar)
5.	Dr. Rajeev Chauhan	Scientist (Ext.)	Datia
6.	Mrs. Neeraja Patel	Scientist (Ext.)	Dewas
7.	Dr. D.S. Mandloi	PA (Hort.)	Dhar
8.	Dr. Dharvendra Singh	Sr. Scientist (Agronomy)	Manawar (Dhar-II)
9.	Mr Varun P. Singh	PA (Ext.)	Guna (Aron)
10.	Dr. S.C. Srivastava	STO (Ag. Eco.)	Gwalior
11.	Dr. Vikas Kumar	Asstt. Professor (Ext.)	Gwalior
12.	Dr. Arpan Upadhyay	Asstt. Professor (A.H. & Dairy.)	Indore
13.	Dr. Ankita Sahu	Asstt. Professor (Ag. Eco.)	Indore
14.	Dr. Rajbabbar Jatav	Asstt. Professor (Plant Patho.)	Gwalior
15.	Dr. Ravi Yadav	Scientist (Plant Patho.)	ZARS, Morena
16.	Dr Pankaj Maida	Asstt. Professor (Veg. Science)	Mandsaur
17.	Dr Anand Harshana	Asstt. Professor (Entomology)	Indore
18.	Dr. C.S. Tomar	Sports Officer	Gwalior
19.	Dr. Ashish Patel	Sports Officer	Khandwa
20.	Dr. Purnima Singh	Contractual Teacher	Gwalior
21.	Dr. Jaya Prajapati	Contractual Teacher	Gwalior
22.	Dr. Sneha Pandey	Contractual Teacher	Gwalior
23.	Dr. Aswini Kumar	Contractual Teacher	Sehore
24.	Dr. Lalita Nargawe	Contractual Teacher	Indore
25.	Dr Sachin Balpandey	Contractual Teacher	Sehore
26.	Dr. J Himanshu Rao	Contractual Teacher	Indore
27.	Dr Megha Sahu	Contractual Teacher	Khandwa
28.	Miss Astha Pandey	Contractual Teacher	Sehore
29.	Mr. Pawan Devansh	Contractual Teacher	Mandsaur
30.	Dr Priyanka Gurjar	Contractual Teacher	Sehore
31.	Mr Vinod Patel	STO (Computer)	KVK Gwalior

For further queries contact: Dr. Y. D. Mishra, Training Co-ordinator, Mob. 8989284257

By the order of Hon'ble Vice Chancellor

Director Extension Services

No. /DES/TRG/EEI/2024/ 3010 Dated: 13/02/2024

Copy to: for information & necessary action to:

1. Director, EEI, Anand.
2. Dean Faculty of Agriculture, RVSKVV, Gwalior (M.P.)
3. Director Research Services, RVSKVV, Gwalior (M.P.)
4. Dean, College of Agriculture & College of Horticulture, Indore/Gwalior/ Sehore/ Khandwa & Mandsaur.
5. ADR, ZARS, Morena, Khargone.
6. Senior Scientist/Head, Krishi Vigyan Kendra.....
7. Dr. Y. D. Mishra, Training Co-ordinator, DES, RVSKVV, Gwalior
8. Person Concerned .....
9. PS to Hon'ble Vice-Chancellor, RVSKVV, Gwalior (M.P.)
10. Guard File.

Director Extension Services

DIRECTOR EXTENSION SERVICES
DES-RVSKVV, Gwalior (M.P.)

Note-Sheet

Subject: Permission for Organization of Training Programmes for University/KVK Scientists/Assistant Professors/Technical Personnel In collaboration with EEI, Anand at DES, RVSKVV, Gwalior -reg.

With reference to Letter No./AAU/EEI/Trg./Off Campus/2184-94/2024 Dated January 08, 2024 and subsequent telephonic discussion with Director, EEI, Anand regarding consent for organization of two training programmes of (Three Days Each) for University/KVK Scientists/Assistant Professors/Technical Personnel under their off campus training programme scheme at Directorate of Extension Services, RVSKVV Gwalior. These programmes are completely organised by the EEI, Anand faculty and training expenditure is borne by the institute as per their norms while TA/DA of nominated participants is borne by the organizing host university/institute/unit. Moreover, we have to make stay arrangement of the EEI faculty and nominated participants in our guest houses.

Therefore, it is proposed to organize two such courses for University/KVK Scientists/Assistant Professors/Technical Personnel/etc during third/last week of February 2024 as per following tentative schedule at Directorate of Extension Services.

Proposed Dates	Title of the Programme	No. of Participants
February 21-23, 2024	Enhancing soft skills and managerial proficiency for organizational success	25-30
February 26-28, 2024	Behavioral skills for scientists and extension professionals	25-30

Submitted for your kind approval please.

25/01/24

Dr. Yagya Dev Mishra
Scientist/In-charge Training Programme
DES Office

Director Extension Services

Forwarded for approval Sir.

25-1-24.

Hon'ble Vice Chancellor

25/01/24

DES

& Y. P. Mishra 26-1

DIRECTORATE OF EXTENSION SERVICES
Rajmata Vijayaraje Scindia Krishi VishwaVidyalaya,
Raja Pancham Singh Marg, Gwalior (M. P.) – 474002

Dr. Y. P. Singh
Director Extension Services

Phone: 0751 2970512
E-mail: des@rvskvv.net

No. /DES/Trg./2023-24/2835 –

Dated: 31.01.2024

To,

Dr. J. K. Patel
Director, Anand Agriculture University
Anand- Gujarat

Subject: Organization of Training Programme In collaboration with EEI, Anand 2024- reg.

Ref: No.AAU-/EEI/Trg./Off Campus/2184-94/2024, dated 08/01/2024

Dear Sir,

The Directorate has received above referred letter from from EEI Anand regarding consent for organization of two training programmes of Three days each for University/KVK Scientists/ Assistant Professors/ Technical Personal under their off campus training programme scheme at Directorate of Extension Services, RVSKVV, Gwalior. These programmes will be completely organized by EEI Anand faculty and Training expenditure will be borne by the institute as per their norms while TA/DA of nominated participants is borne by the Organizing University. The University nominate faculty and make arrangement for nominated participants in our guest houses.

Therefore, it is proposed to organize two such courses during the third/last week of February 2024 as per following tentative schedule at Directorate of Extension Services RVSKVV, Gwalior.

Proposed Dates	Title of the Programme	No. of Participants
February 21-23, 2024	Enhancing soft skills and managerial proficiency for organizational success	25-30
February 26-28, 2024	Behavioral skills for Scientist and extension professionals.	25-30

Looking for confirmation about travel and other relevant details from your end. The list of nominated participants will be shared within week.

Director Extension Services
Dated: 31.01.2024

No. /DES/Trg./2023-24/2836

Copy to: for information

1. Dr. Y. D. Mishra, Training Incharge, DES Office, RVSKVV, Gwalior
2. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Extension Services
DIRECTOR EXTENSION SERVICES
DES-RVSKVV, Gwalior (M.P.)

Gmail

Yagyadev Mishra <ydmpantnagar@gmail.com>

Organization of Training Programme In collaboration with EEI, Anand 2024- reg.

2 messages

DES RVSKVV <des@rvskvv.net>
To: EEI Anand AAU <eei@aau.in>
Cc: "Dr. Y. D. Mishra" <ydmpantnagar@gmail.com>, PS to VC <pstovc@rvskvv.net>
Wed, Jan 31, 2024 at 12:26 PM

Dr. Y. P. Singh
Director Extension Services,
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya,
Raja Pancham Singh Marg, Gwalior-474002 (M.P.), INDIA
Phone No. : 0751-2970512, Mob. No. 9425719950
Fax No. 0751-2970513

2835_31012024121958.PDF
350K

DES RVSKVV <des@rvskvv.net>
To: "Dr. Y. D. Mishra" <ydmpantnagar@gmail.com>
Thu, Feb 1, 2024 at 5:21 PM

---------- Forwarded message ---------
From: **EEI Anand AAU** <eei@aau.in>
Date: Thu, Feb 1, 2024 at 5:15 PM
Subject: Re: Organization of Training Programme In collaboration with EEI, Anand 2024- reg.
To: DES RVSKVV <des@rvskvv.net>

Respected Sir,

Greetings from Extension Education Institute, Anand !!!

With reference to above cited subject, Extension Education Institute, Anand is confirmed two off campus training programmes as per below details:

Sr.	Title of the Course	Final Duration	Venue
1	Enhancing soft skills and managerial proficiency for organizational Success	**21.02.2024 to 23.02.2024**	DES, RVSKVV, Gwalior
2	Behavioral skills for scientist and extension professionals	**26.02.2024 to 28.02.2024**	DES, RVSKVV, Gwalior

With Best Regards,
[Quoted text hidden]
--
Director
Extension Education Institute
Anand Agricultural University
Anand - 388 110, Gujarat (INDIA).
Phone & FAX: 02692-261270
Email: eei@aau.in

Training Programme on Enhancing Soft Skills and Managerial Proficiency for organizational Success, February 21-23, 2024

S. No.	Name	Designation	Place of Posting	Signature Day-I 21/2/24	Day-II 22/02/24	Day-III 23/02/24
1.	Prof Arvind Kumar Shukla Hon'ble VC, RVSKVV		Gwalior			
2.	Dr. Y.P. Singh, DEE, RVSKVV, Gwalior					
3.	Dr T.S. Tomar DEAN, Coll. Mandsaur					
4.	Dr Akhilesh Singh Scientist		DEE office RVSKVV Gwalior			
5.	Dr. Y.D. Mishra Scientist/Proj Coordinator		DEE/DEE RVSKVV, Gwalior			
6.	Dr Keyur Gadhavia, Trainer,	EEE, AAU,	Anand			
7.	Dr. Vishwajeet Patel, Trainer,	EEE, AAU,	Anand			
8	Dr. D.K. Paliwal, Scientist,	DEE's office,	RVSKVV, Gwalior			
9.	Dr. Ashish Patel Sports Officer		College of Agri Khandwa			
10.	Dr. Amrit Kumar, Contractual teacher		COA, Khandwa	Amarnath	Amarnath	Amarnath
11.	Dr. Ravi yadav. Scientist		ZARS, A.B. Road Morena			
12.	Mr Varun Pratap Singh Sc.T.O. (Agri Ext)		KVK Bhind, Umrai			
13	Rupendra Kumar Scientist (Agri Extn)		KVK, Lahar (Bhind)			
14	Dr. R.B. Jatav Assistant Professor		College of Agri. Gwalior			
15.	Dr. S.C. SRIVASTAVA Sr. Technical officer		KVK, Gwalior			
16.	Dr Neeja Patel Scientist		KVK, Dewas			
17.	Dr. Lalita Nargave Contractual		COA, Indore			
18.	Dr. Arpan Upadhyay Asst. Prof. (Agril Extn)		COA Indore			
19	Dr. Vandana Yadav Asst. Prof. (A.H & Dairy)		COA, Sehore			
20.	Dr. Purnima Singh Contractual Teacher (Pl. Path)		COA, Gwalior			
21	Dr. Sneha Pandey Contractual Teacher (Ag. Econ)		COA, Gwalior			
22	Dr. Astha Pandey Contractual Teacher (SSAC)		COA Sehore			
23	Dr. O.K. JAIN Scientist - HORT.		KVK Banswara			
24.	M.K. Rana PA (Horticulture)		KVK, Alirajpur			
25.	Dr. Ankita Sahu Ass. Professor		COA, Indore			
26.	Dr. D.S. Mandloi PA (Horticulture)		KVK, Dhar			
27.	Dr. Dhaswendra Singh Senior Scientist		KVK, Manawar Dhar-II			
28	Dr. Priyanka Gurjar Contractual teacher		RAK COA Sehore.			
29.	Dr H.K. Trivedi Scientist (Pl. Path)		KVK, Ashoknagar			
30.	Mr Navneet mishra PhD Scholar Gen		COA. Gwalior			
31.	Mr Sher Singh Bachalya P.hD Scholar Ext. Edu		COA. Gwalior			

Training Programme on Enhancing Proficiency for organizational Soft Skills and Managerial Success, February 21-23, 2024

S.No.	Name	Designation	Place of Posting	Signature Day-I 21/02/2024	Day-II 22/02/2024	Day-III 23/02/2024
~~32~~.						
33	Pankaj Maida	Assistant professor	KNK COH Mandsaur			
34.	~~Dr.~~ Sachin Deshmukh	Cont. Teacher	RAK. COA. Sehore.			
35.	Dr. J Hirmanshu Rao	Cont. Teacher	COA, Indore			
36.	Dr. Anand Harsham	Asstt. Prof.	COA, Indore			
37	Dr. Ashwini Kumar	Cont. Teacher	COA, Sehore			
38	V.K. Patel	Sr. Technical Officer	KVK, Gwalior Sehore			
39	Ravindra Dohley	Ph.D Scholar Ext. Edu.	Ex: Gwalior Gwalior			
40	Pankaj Maida	Assistant professor	KNK COH Mandsaur			
41	Azlan Khan	ph.D. scholar	COA, Gwalior			
42.	Sher Singh Bachalya	Ph.D Scholar	COA, Gwalior			
43.	Navaneet Mishra	PhD Scholar	COA. Gwalior			
~~43~~	~~Dr Ashish Patel~~	~~Sports officer~~	~~COA. Gwalior~~			
44.	Dr Rajeev Sharma	Scientist (Ag Ext)	KVK datia			
45	Dr Hemraj Patel	Scientist (Ag Ext)	KVK Dewas			
46	Ravindra Dohley	Ph.D Research Scholar Ext. Edu.	Ex: Gwalior			
47.	Dr. Pawan Dewesh	Cont. Teacher	COH, Mandsaur			
48	Mr. Azlan Khan	Ph.D. Scholar	COA, Gwalior			
49	Suresh Bande	Ph.D. Scholar	COA, Gwalior			
50.	Sher Singh Bachalya	Ph.D Scholar	COA, Gwalior			

DIRECTORATE OF EXTENSION SERVICES

Rajmata Vijayaraje Scindia Krishi VishwaVidyalaya,
Raja Pancham Singh Marg, Gwalior (M. P.) – 474002

Dr. Y. P. Singh
Director Extension Services

Phone: 0751 2970512
E-mail:des@rvskvv.net

No./DES/2022_2023/2250

Dated: 07/12/2022

//ORDER//

EEI, Anand, Gujrat is organizing a three days training programme on "Behavioural skills for extensionist and scientist", at Directorate of Extension Services, RVSKVV, Gwalior from December, 13 to 15, 2022. The following Scientist of DES & KVKs are hereby nominated and directed to attended the above training programme:

S. No.	Name of KVK	Name of Scientist	DES/ Nominee	Mobile No.	E-Mail
1	DES Office	Dr. S. S. Bhadauria	T.O./A.P.	7489407897	sudhir.bhadauria@rediffmail.com
2	DES Office	Dr. P. D. Singh	Scientist	9406785220	pradyumn.singh1@gmail.com
3	DES Office	Dr. Y. D. Mishra	Scientist	8989284257	ydmpantnagar@gmail.com
4	DES Office	Dr. Neeraj Hada	Scientist	8989695172	nhada2021@gmail.com
5	DES Office	Dr. R. C. Aswani	Scientist	8209214485	rameshaswani69@gmail.com
6	Alirajpur	Dr. Mukesh Banel	P.A.	9630086474	benelmukesh150@gmail.com
7	Ashoknagar	Dr. H. K. Trivedi	Scientist	9826481664	hemantplp78@gmail.com
8	Badwani	Dr. D. K. Jain	Scientist	9425511228	dinhortflor@rediffmail.com
9	Bhind (Lahar)	Dr. K. V. Singh	Sr. Scientist	9424510006	dr.karanvir@rediffmail.com
10	Datia	Dr. V. S. Kansana	P.A.	9926250769	vnkansana@gmail.com
11	Dewas	Mrs. Neerja Patel	Scientist	9074437119	neerja.patel1988@gmail.com
12	Dhar	Dr. S. S. Chauhan	Scientist	9826509604	sandeep_somil@rediffmail.com
13	Dhar-II (Manawar)	Dr. Dharvendra Singh	Sr. Scientist	9907402225	dharvendrasingh56@gmail.com
14	Guna	Sh. Sudeep Singh Tomar	P.A.	9993444701	sudeep_tomar80@rediffmail.com
15	Gwalior	Dr. Suruchi Soni	Scientist	9406542521	suruchiswarn@yahoo.com
16	Jhabua	Dr. Vinay Kumar Singh	Scientist	8349292493	vinaysoil@yahoo.com
17	Khandwa	Dr. M. K. Gupta	P.A.	9826503410	gmukesh643@gmail.com
18	Khargone	Dr. Rajiv Kumar Singh	Scientist	9479689704	rajiv.k_singh@yahoo.co.in
19	Mandsaur	Dr. S. P. Tripathi	Sr. Scientist	8770446139	tripathisun84@gmail.com
20	Morena	Dr. S. V. S. Chauhan	Sr. Scientist	9027324348	chauhansukhvirsingh@gmail.com
21	Neemuch	Dr. J. P. Singh	P.A.	9837447338	singhjodhpal@gmail.com
22	Rajgarh	Dr. Lal Singh	Scientist	9926315545	lalsingh_sagar@rediffmail.com
23	Shajapur	Dr. Mukesh Singh	P.A.	9926755978	mukeshsingh1974@rediffmail.com
24	Sheopur	Sh. C. B. S. Jatav	Scientist	9926961276	cbsjatav@rediffmail.com
25	Shivpuri	Dr. A. L. Basediya	Scientist	8989884847	blamrit@gmail.com
26	Ujjain	Dr. Moni Singh	P.A.	9827094417	m_jadon@rediffmail.com
27	Bhopal	To be nominated by Sr. Scientist & Head			
28	Burhanpur	To be nominated by Sr. Scientist & Head			
29	Indore	To be nominated by Sr. Scientist & Head			
30	Ratlam	To be nominated by Sr. Scientist & Head			
31	Sehore	To be nominated by Sr. Scientist & Head			

Sr. Scientist & Head, KVK, Bhopal, Burhanpur, Indore, Ratlam and Sehore are requested to nominate one scientist from your KVK to participate in this training program.

Director Extension Services
Dated: 07/12/2022
Director Extension Services
DES-RVSKVV, Gwalior (M.P.)

No./DES/2022_2023/2251

Copy to: for information and necessary action

1. Director, EEI, ANAND – 388110 (Gujarat)
2. Director, ICAR-ATARI, Zone-IX, Jabalpur
3. Dean College of Agriculture/Horticulture – Gwalior, Indore, Sehore, Khandwa & Mandsaur
4. Associate Director Research, ZARS – Jhabua, Khargone & Morena
5. Sr. Scientist & Head, KVK (All) RVSKVV, Gwalior
6. Person Concerned.....
7. PS to Hon'ble Vice-Chancellor, R.V.S.K.V.V., Gwalior

Note-Sheet

Subject: Permission for Organization of Training Programmes for University/KVK Scientists/Assistant Professors/Technical Personnel In collaboration with EEI, Anand at DES, RVSKVV, Gwalior -reg.

With reference to Letter No./AAU/EEI/Trg./Off Campus/2184-94/2024 Dated January 08, 2024 and subsequent telephonic discussion with Director, EEI, Anand regarding consent for organization of two training programmes of (Three Days Each) for University/KVK Scientists/Assistant Professors/Technical Personnel under their off campus training programme scheme at Directorate of Extension Services, RVSKVV Gwalior. These programmes are completely organised by the EEI, Anand faculty and training expenditure is borne by the institute as per their norms while TA/DA of nominated participants is borne by the organizing host university/institute/unit. Moreover, we have to make stay arrangement of the EEI faculty and nominated participants in our guest houses.

Therefore, it is proposed to organize two such courses for University/KVK Scientists/Assistant Professors/Technical Personnel/etc during third/last week of February 2024 as per following tentative schedule at Directorate of Extension Services.

Proposed Dates	Title of the Programme	No. of Participants
February 21-23, 2024	Enhancing soft skills and managerial proficiency for organizational success	25-30
February 26-28, 2024	Behavioral skills for scientists and extension professionals	25-30

Submitted for your kind approval please.

25/01/24

Dr. Yagya Dev Mishra
Scientist/In-charge Training Programme
DES Office

Director Extension Services

Forwarded for approval Sir.

25-1-24.

Hon'ble Vice Chancellor

25/01/24

DES

& Y. P. Mishra 2-8

DNO/VC/22-24/2504
25/01/2024

DIRECTORATE OF EXTENSION SERVICES

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya,
Raja Pancham Singh Marg, Gwalior (M. P.) – 474002

Dr. Y. P. Singh
Director Extension Services

Phone: 0751 2970512
E-mail: des@rvskvv.net

No. /DES/Trg./2023-24/2835

Dated: 31.01.2024

To,

Dr. J. K. Patel
Director, Anand Agriculture University
Anand- Gujarat

Subject: Organization of Training Programme In collaboration with EEI, Anand 2024- reg.

Ref: No.AAU-/EEI/Trg./Off Campus/2184-94/2024, dated 08/01/2024

Dear Sir,

The Directorate has received above referred letter from from EEI Anand regarding consent for organization of two training programmes of Three days each for University/KVK Scientists/ Assistant Professors/ Technical Personal under their off campus training programme scheme at Directorate of Extension Services, RVSKVV, Gwalior. These programmes will be completely organized by EEI Anand faculty and Training expenditure will be borne by the institute as per their norms while TA/DA of nominated participants is borne by the Organizing University. The University nominate faculty and make arrangement for nominated participants in our guest houses.

Therefore, it is proposed to organize two such courses during the third/last week of February 2024 as per following tentative schedule at Directorate of Extension Services RVSKVV, Gwalior.

Proposed Dates	Title of the Programme	No. of Participants
February 21-23, 2024	Enhancing soft skills and managerial proficiency for organizational success	25-30
February 26-28, 2024	Behavioral skills for Scientist and extension professionals.	25-30

Looking for confirmation about travel and other relevant details from your end. The list of nominated participants will be shared within week.

Director Extension Services
Dated: 31.01.2024

No. /DES/Trg./2023-24/2836

Copy to: for information

1. Dr. Y. D. Mishra, Training Incharge, DES Office, RVSKVV, Gwalior
2. P.S. to Hon'ble Vice Chancellor, RVSKVV, Gwalior

Director Extension Services
DIRECTOR EXTENSION SERVICES
DES-RVSKVV, Gwalior (M.P.)

DIRECTORATE OF EXTENSION SERVICES

Rajmata Vijayaraje Scindia Krishi VishwaVidyalaya,
Raja Pancham Singh Marg, Gwalior (M. P.) – 474002

Dr. Y. P. Singh
Director Extension Services

Phone: 0751 2970512
E-mail:des@rvskvv.net

No./DES/2022_2023/ 2177

Dated: 29|11|2022

To,

Director,
Extension Education Institute,
Anand (Gujrat)

Subject:- Off campus training programme - reg.

Sir,

This is in response to our telephonic conversation with you. The training programme as proposed by you, may be conducted with certain modification in date as per below details:

S. No.	Title of the course	Duration	Venue
1.	Behavioural Skills for Extensionist and Scientist	13-12-2022 to 15-12-2022	Directorate Of Extension Services, RVSKVV, Gwalior (M.P.)

Kindly confirm if it is convenient to you.

Required facilities/arrangements mentioned by you are available at proposed venue. The list of participant will be provided soon.

Dr. Neeraj Hada, Scientist (Crop Science), DES, RVSKVV, will coordinate the programme. Contact Details of Dr. Neeraj Hada, E-mail: nhada2021@gmail.com, Mob. No.: 7976126864, What's app No. 8989695172

Director Extension Services
Director Extension Services
RVSKVV, Gwalior (M.P.)

No./DES/2022_2023/ 2178

Dated: 29-11-2022

Copy to:-

1. Dr. Neeraj Hada, Scientist, DES, R.V.S.K.V.V., Gwalior
2. PS to Hon'ble Vice-Chancellor, R.V.S.K.V.V., Gwalior

Director Extension Services
Director Extension Services
RVSKVV, Gwalior (M.P.)

सत्यमेव जयते

Government of India
Ministry of Agriculture
Extension Education Institute
(Western Region)
Anand Agricultural University Campus
AAU, Anand, Gujarat - 388110

Training programme on

"Behavioural Skills for Extensionist and Scientist" Jointly organized by EEI, Anand & RVSKVV, Gwalior (MP) from **13/12/2022 to 15/12/2022** at DES, RVSKVV, Gwalior (MP)

Training Schedule

Time	Topic	Method	Speaker
13-12-2022 (Tuesday)			
09:00 to 09:30	Registration of the Participants	-	EEI Faculties
09:30 to 10:00	Inauguration of the Training	-	Director RVSKVV & EEI Faculties
10:00 to 11:30	Communication Skill	Talk/ Disc.	Dr. Payal Vihariya
11:30 to 13:00	Nonverbal Communication Skill	Talk/ Disc.	Dr. Yogesh Rathwa
13:00 to 14:00	**Lunch Break**		
14:00 to 15:30	Barriers of Communication	Talk/ Disc.	Dr. A. P. Ninama
15:30 to 17:00	Exercise on barriers in communication	Talk/ Disc.	EEI faculties
14-12-2022 (Wednesday)			
09:00 to 09:30	Retrospection	Talk/ Disc.	Dr. A. P. Ninama
09:30 to 11:00	Time management Skill	Talk/ Disc.	Dr. Yogesh Rathwa
11.00 to 12.30	Exercise on Time management Skill	Exercise	EEI faculties
12:30 to 14:00	**Lunch Break**		
14:00 to 15:00	Positive Attitude	Talk/ Disc.	Dr. Payal Vihariya
15.00 to 16.00	Leadership skill	Exercise	Dr. A. P. Ninama
16:00 to 17:00	Exercise on leadership skill	Exercise	Dr. Yogesh Rathwa
15-12-2022 (Thursday)			
09:00 to 10:30	Retrospection	Talk/ Disc.	Dr. Payal Vihariya
10.30 to 12.00	Stress management Skill	Talk/ Disc.	Dr. Yogesh Rathwa
12:00 to 14:00	**Lunch Break**		
14:00 to 15:30	Public Speaking Skill	Talk/Disc.	Dr. Payal Vihariya
15:30 to 16:00	Post Evaluation and Course Evaluation	Exercise	Dr. A. P. Ninama
16:00 to 17:00	Valedictory & Feedback Session	-	Director RVSKVV & EEI Faculties

Link for all PPTs: www.bit.ly/EEI_PPT

Team: (1) **Dr. A. P. Ninama**, Faculty, EEI, Anand - Course Director (M) 9624599964
(2) **Dr. Payal Vihariya**, Faculty, EEI, Anand - Associate Course Director (M) 7043155637
(3) **Dr. Yogesh Rathwa**, Faculty, EEI, Anand - Associate Course Director (M) 9974626959
(4) **Dr. Neeraj Hada**, Scientist, DES,RVSKVV, Gwalior – Liaison officer (M) 8989695172

DIRECTOR

Date: 10/12/2022
Place: AAU, Anand.

सत्यमेव जयते

Government of India
Ministry of Agriculture& Farmers Welfare
Extension Education Institute
(Western Region)
Anand Agricultural University Campus
AAU, Anand, Gujarat - 388110

AAU

Dr. J. K. Patel
Director

Phone 02692-261270
Mobile 09601279243
e-mail: eei@aau.in

Anand/EEI/Trg./ 2103/2022

Date: 16/11/2022

To,
Dr. Y.P. Singh
Director Extension Services,RVSKVV, Gwalior
Madhya Pradesh – 474 002

Sub: Intimation for off campus training programme regarding….

Respected sir,

This is in response to our earlier conversation with you. Following propose course is to be conducted by EEI in collaboration with DES, RVSKVV, Gwalior. EEI, Anand propose herewith the tentative date of off campus training programme to be conducted as per below details:

Sr.	Title of the Course	Duration	Venue
1	Behavioral skills for Extesionist and Scientist	14-12-2022 to 16-12-2022	DES, RVSKVV, Gwalior. Madhya Pradesh

Kindly confirm the dates if it is convenient to you and let us inform at the earliest so as to plan the programme effectively.

In this connection, you are requested to see that the following arrangements / requirements may be availed at your selected venue for effective conduction of the programme.

1) Facility for accommodation of **25-30 participants** at the selected venue.
2) Accommodation of 2-3 faculty members of EEI at your Guest House during the programme.
3) One class room with white board, computer with LCD, flannel board and with sitting capacity of around 35-40 persons.
4) One Senior Officer from your Department to work as Liaison Officer throughout the programme.

However, as per guidelines issued by the Govt. of India, New Delhi for the organization of off-campus training course, the expenditure on following items will be borne by Extension Education Institute, Anand.

1) Stationary items such as file/ folder / pen / writing pad / materials for practical exercise.
2) Expenditure to avail lodging and boarding facilities of the participants to be limited **up to Rs. 550/- per participant per day** on actual basis.

In order to incur such expenditure by EEI, Anand, you have to provide terms and conditions/norms and/or agreements if any made by your institute to avail lodging and boarding facilities for current financial year (which includes tea, breakfast, lunch and dinner for participants).

The TA/DA of the participants shall be borne by Concerned Department.

Moreover, you are requested to make sure of **25-30 participants to attend the training** and send the list of the participants to this Institute at the earliest. For further communication, you may contact **Dr. Arvind Ninama, Course Director** on his **Mobile No. 9624599964** (E-mail: eei@aau.in, apn@aau.in)

A line of confirmation in this regard from your end is highly solicited.

With regards,

DIRECTOR

Training Programme on Behavioural Skills for Scientist and Extension Professional, February, 26 -28, 2024.

S.No.	Name	Designation	Place of Posting	Signature Day-I 26/02/24	Day-II 27/02/24	Day-III 28/02/24
1.	Dr. S.K. Sharma	DRS,	RVSKVV, Gwalior			
2.	Dr. Y.P. Singh	DES	-do-			
3.	Dr. Akhilesh Singh	Scientist, DES office,	RVSKVV, Gwalior			
4.	Dr. Y.D. Mishra	Scientist/Prg coordinator,	RVSKVV Gwalior			
5.	Dr. Keyur Gondhalia	Trainer.	EEI, AAU, Anand			
6.	Dr. Vishwajeet Patil	Trainer,	EEI, AAU Anand.			
7.						
8	Dr. Shahin Khan	Scientist (Ento.)	ZARS, Khargone (M.P.)	26/02/24		
9.	Varsha Patil	Ph.D. Scholar	RVSKVV, Gwalior			
10.	Dr. Pramod K. Fatehpuria	Scientist (Pl. Path)	KVK, COH, Mandsaur.	26.02.24		
11.	Dr. Ashish Bobode	Scientist (P.P.)	KVK, Khandwa			
12.	Dr. M.K. Tiwari	Asstt. Prof. (Ext. Edu.)	COA, Khandwa	26/02/24	27/02/24	28/02/24
13	Dr Hans Raj Jatav	Scientist (Ag Ext)	KVK, Vidisha			
14.	Dr. Rohan Sharma	C.T. (Ag. Extension)	R.A.K., COA, Sehore, RVSKVV			
15	Vinod Kumar Mittoliya	Senior Technical offic	ICVIC, Icharja			
16	Dr. J.P. Singh	Technical officer (Agronomy)	K.V.K. Neemuch			
17	Dr. Mukesh Singh	A.C.T.O. Extension	KVK Shajapur			
18	Dr. L.S. Gurjar	Scientist (Agri Engg)	KVK Sheopur			
19.	Dr. Richa Pyasi	Contractual teacher	KNK. COH. Mandsaur.			
20	Kirti Ahirwar	Ph.D Scholar	RVSKVV Gwalior			
21	Anjula Bhartiya	PhD. Scholar	RVSKVV Gwalior			
22	Sarita Parvalkar	PhD Scholar	RVSKVV Gwalior.			
23.	Dr. Rajesh Barwa	Assistant Professor	KNK, COH, Mandsaur			
24	Dr S.P. Tripathi	Sr. Scientist	RVSKVV, KVK Mandsaur			
25.	Pradeep Thakrane	SPORTS OFFICER	KNK COH, Mandsaur			
26	Dr. Shahin Khan					
26	Sri. Archana Khare	ST.O (Home-Science)	KVK Morena			

Training Programme on Behavioural Skills for Scientists and extension Professional, February 26-28, 2024.

S.No.	Name	Designation	Place of Posting	Signature Day - I 26/02/24	Day - II 27/02/24	Day - III 28/02/24
29	S.S.Salanki	Sport's officer	College of Agri. Indore			
30.	Dr. Sunil Nahatkar	Assistant Professor	COA, Indore.			
31.	Dr. M.K. Tamoriya	~~RAK, CoA~~ Cum. Teach	RAK, CoA, Sehore.			
32.	Dr. Sudhir Singh	Guest faculty	COA Gwalior			
33.	Kapil Maran	PhD Research Scholar	C.O.A Gwalior.			
34.	Yogesh Chandra Rikhari	STO Fisheries	KVK Shivpuri			
34.	Dileep Kumar Jatav	Ph.D. (Research Scholar)	RVSKVV Gwalior. MP			
35.	Dr. LAL SINGH	Scientist (Horti)	KVK, Rajgarh.			
36.	Dr. Arjun Kashyap	Contractual teacher	COA Gwalior			
37.	Dr. Neelam Bunkar	Contractual Teacher	COA, Gwalior			
38.	Dr. Neha Dwivedi	Contractual Teacher	CoA, Indore, (M.P.)			
39	Dr. Arjun Kashyap	Contractual teacher	COA Gwalior			
39.	~~Sarita Parsedkar~~	~~PhD (Extension Edu) Research Scholar~~	College of Agriculture, Indore College.			
37	~~Dr. Savita Sharma~~	~~Contractual Teacher~~	~~COA, Indore (MP)~~			
32	~~Dr. Bhawna Tomar~~	~~Contractual Teacher~~	~~COA, Indor~~			
39	Dr. VINAY KUMAR SINGH,	Scientist-Soil Science,	K.V.K. (RVSKVV) Khetasa, M.P.			

SKILL DEVELOPMENT PROGRAMME

ON

AGRO BASED ENTREPRENEURSHIP

(November 1 – November 28)

Venue : EDII Campus, Ahmedabad, Gujarat (India)

Organized by :

Rajmata Vijyaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

Powered by :

Organized by:

Entrepreneurship Development Institute of India Ahmedabad

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BACKGROUND -

The purpose of this training was to provide ability to recognize commercial opportunities, self-esteem, knowledge and analytical & logical skills to act upon them. It includes instruction in opportunity recognition, commercializing a concept, managing resources, and initiating a business venture. It also included traditional business disciplines such as management, marketing, information systems and finance. Entrepreneurs or the move towards self-employment is, and will continue to become, an increasingly important element of economic growth and development.

EDII facilitates entrepreneurial mind-set and encourage self-employment. Having a culture of the creation of a new enterprise is a critical aspect of this infrastructure, as it will encourage students to take the risk of starting a business. The training was held at EDII Ahmadabad from November 01,2022 – November, 28,2022. A total of 20 participants from five different colleges of RVSKVV attended the training.

Training included various topics such as entrepreneurship concept and mindset , behavior and strategic and effective communication, creativity and innovation, boot strapping , opportunity scanning marketing skills, pricing & costing, agriculture problems and solutions branding and brand extensions, various case studies like – AMUL, IFFCO, Kurkure, Nestle etc.

The training methodology was interactive as the trainers ensured that knowledge was not only disseminated but accurately perceived and understood by the participants. And in order to ensure this, trainers engaged participants in discussions and kept the forum open for feedback, queries and suggestions. These discussions and interactive sessions were supported through ice breaking sessions, activities and games, training material such as pre and post-test, power point presentations and handouts on participatory planning.

TRAINING PROGRAMME

The objectives of this three-day training were as follows:

- To increase the understanding of participants on entrepreneurship and its importance in current scenario through training sessions.
- Train about opportunity recognition, commercializing a concept, managing resources, and initiating a business venture.
- It also included traditional business disciplines such as management, marketing, information systems and finance.
- To Promote First Generation Businessman and Industrialists
- To Create Awareness about Availability of Resources
- To Promote Small, Cottage & Local Industries
- To Encourage Self Employment Tendencies
- To Provide Knowledge about Government Plans and Programmes
- To Remove Doubts of Entrepreneurs, Give Solutions and Suggest Remedies of Problems

PARTICIPANTS' PROFILE

- The training participants included 20 students of RVSKVV from 5 different colleges.
- Total number of participants were 20 (males: 13; females: 7)



(**In frame : RVSKVV students with Dr. Dinesh Jain)**

INTERNAL (EDII) FACULTY'S PROFILE

	NAME	DESIGNATION
	Dr. Dinesh Jain	EDII Assistant Professor (Grade-I) **(Our training incharge)**
	Shri S B Sareen	Director, Dept. of Projects (Government)
	Dr. Satya Ranjan Acharya	Professor & Director - Dept. of Entrepreneurship Education
	Dr. Baishali Mitra	Assistant Professor (Grade-I)
	Dr. Pankaj Bharti	Associate Professor
	Dr. Raghvendra Kumar Singh	Assistant Faculty
	Dr. Raman Jee	Assistant Professor (Grade-Ii)
	Dr. Hari Baabu	Assistant Professor (Grade-Ii)
	D M Parikh	Adjunct Faculty
	Dr. Sanjay Mangala	Faculty

PROGRAMME SCHEDULE 1ST WEEK

The team which delivered sessions during the training comprised of internal experts, entrepreneurs guest lectures and CrAdLe startup owners.

Given below is a brief description of the trainers along with their sessions conducted by them.

Day/day	**Recap session (9:45 am to 10:00 am)**	**1 session (10:00 am to 11:00 am)**	**2 session (11:15 am to 12:15 m)**	**3 session (1:30 pm to 2:30 pm)**	**4 session (2:45 pm to 3:45 pm)**	**5 session (4:00 pm to 5:00 pm)**
November 01. 2022 Tuesday	-	Registration & briefing on administrative arrangements, familiarization and micro lab **Dr. Dinesh Jain**		Entrepreneurial need & importance **Shri S B Sareen**	Intro to entrepreneurship **Dr. Satya Ranjan Acharya**	Traits of an entrepreneur : individual mapping **Dr. Dinesh Jain**
November 02.2022 Wednesday	Recap of the previous days learning **Dinesh Jain**	Critical thinking (CEO at Venus engineering works) **Anay Mashruwala**		Risk taking and goal achievement (simulation) **Dinesh jain**		Entrepreneur interaction
November 03..2022 Thursday	Recap of the previous days learning **Dinesh Jain**	Understanding the entreprneurial mindset and entrepreneurial tendencies **Dr. Pankaj Bharti**	Entrepreneurial motivation **Dr. Pankaj Bharti**	Soft sklls for inter – personal communication **Dr. Baishali Mitra**		Creativity & innovation **Shri Raman Jee**
November 04..2022 Friday	Recap of the previous days learning **Dinesh Jain**	Intro of agro based entrepreneurship **Dr. Dinesh Jain**	Idea to business idea **Shri Raman Jee**	Business opportunities identification **Umesh shukla**		Business opportunity validation **Dr. Satya Ranjan Acharya**

1ST WEEKS PHOTOGRAPHS



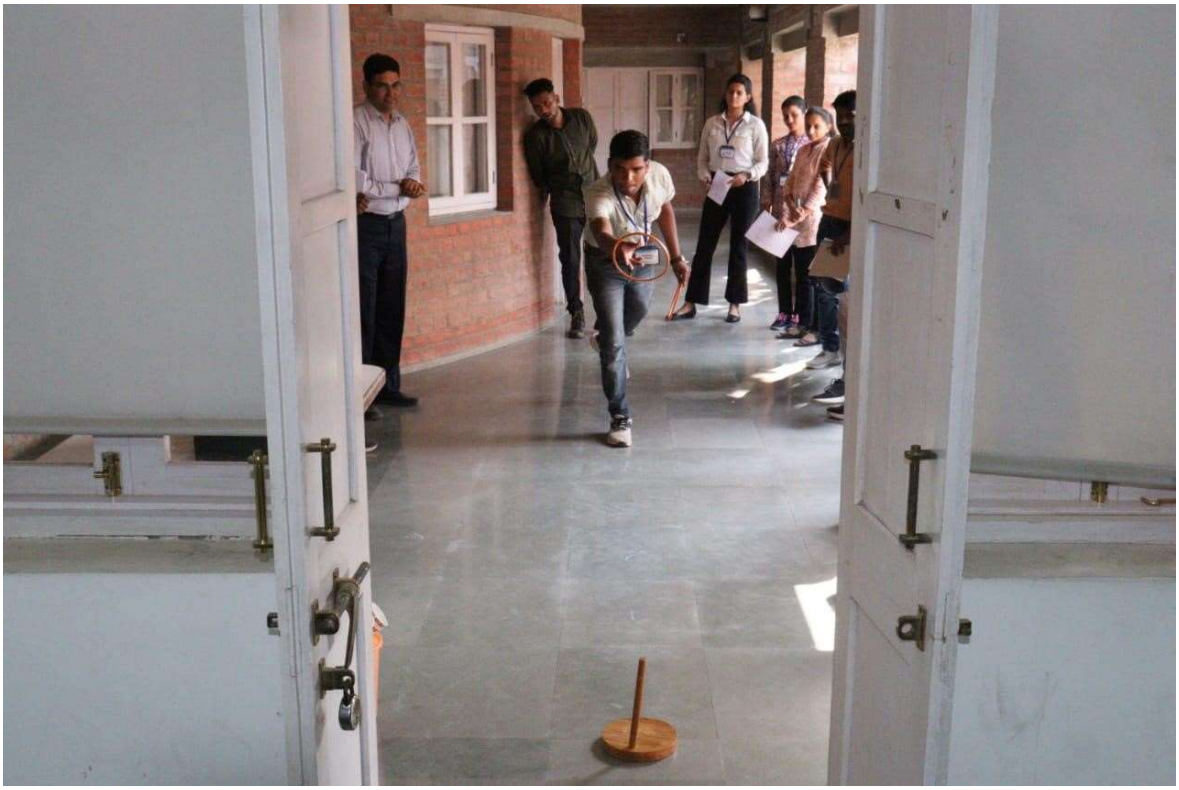
November 01. 2022 : Familiarization And Micro Lab By Dr. Dinesh Jain



November 01. 2022 : Entrepreneurial Need & Importance By Shri S B Sareen



November, 02,2022 : Interactive session with **Anay Mashruwala – CEO at Venus engineering works**



November, 02,2022 : Risk taking and goal achievement (simulation) activity conducted by Dinesh Jain



November 03, 2022 : Soft skills for inter – personal communication by **Dr. Baishali Mitra**



November, 04,2022 : Intro of agro based entrepreneurship **Dr. Dinesh Jain**

PROGRAMME SCHEDULE: 2nd WEEK

Date/day	Recap session (9:45 am to 10:00 am)	1 session (10:00 am to 11:00 am)	2 session (11:15 am to 12:15 pm)	3 session (1:45 pm to 2:45 pm)	4 session (3:00 pm to 4:00 pm)	5 session (4:00 pm to 5:00 pm)
November 07. 2022 Monday	Recap Of Previous Days Learning	Marketing Skills For An Entrepreneur **Dr. Raghvendra Singh**		Agri Innovations **Shri Raman Jee**	Team Building Simulation **Dr. Dinesh Jain**	
November 08.2022 Tuesday	Recap Of Previous Days Learning	Opportunities In Food Processing Sector **Dinesh Jain**	Interaction With Entrepreneur : Next gen Biotech **Abhishek Pipaliya**	Agri Data Visualisation **Dr Hari Babu**	Business Essentials : Quantity, Quality, Time, Cost **Dr. Dinesh Jain**	
November 09.2022 Wednesday	Recap of previous days learning	Interaction With Entrepreneur : Futurevon **Shri Nikhil Kumar**	Opportunities In protected cultivation **Dinesh Jain**	Renewable energy and application in agriculture **Shri Raman Jee**	National entrepreneurship day events and idiosyncratic startup	
November 10.2022 Thursday	Recap of previous days learning	Opportunities in milk based businesses **Shri Laxman Rathod**		VISIT TO AMULFED DAIRY		International business opportunities in agriculture sector - 2 **Sanjay mangala**
November 11 .2022 Friday	Recap of previous days learning	Persuasion skills **Dr. Baishali Mitra**		Opportunities in poultry sector **Dinesh Jain**		Opportunity canvas **Dinesh Jain**

2nd WEEKS PHOTOGRAPHS



November 07, 2022 : Team Building Simulation By **Dr. Dinesh Jain**

Team building is an essential part of entrepreneurship and its very important for a person to be leader and to lead everybody in the group. Thus the activity conducted by Dr. D.K Jain was very helpful and it guided us about team building.



November 08, 2022 : agri data visualization by **Dr. Hari Babu**



November 09. 2022 : Interaction With Entrepreneur- Futurevon, **Shri Nikhil Kumar**



November 09. 2022 : National Entrepreneurship Day Events & Startups.



November 10. 2022 : Visit To Amulfed Dairy



Classroom (Adhyayan-II)

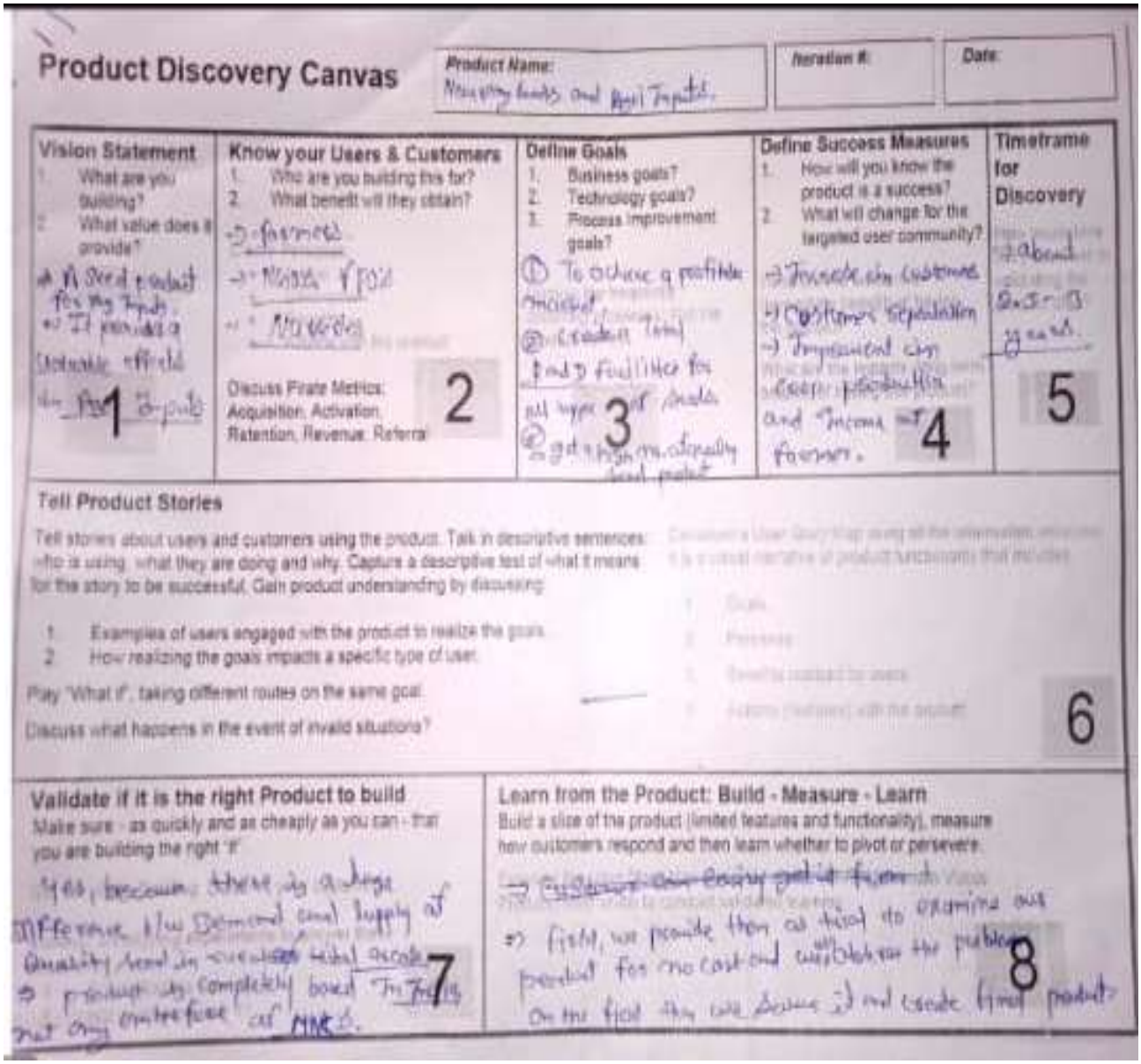
November 11, 2022 : opportunity canvas for business idea guided by **Dr. Dinesh Jain**

PROGRAMME SCHEDULE : 3rd WEEK

Date/day	**Recap session (9:45 am to 10:00 am)**	**1 session (10:00 am to 11:00 am)**	**2 session (11:15 am to 12:15 pm)**	**3 session (1:45 pm to 2:45 pm)**	**4 session (3:00 pm to 4:00 pm)**	**5 session (4:00 pm to 5:00 pm)**
November 14, 2022 Monday	Recap Of Previous Days Learning	Product discovery canvas **Dr. Dinesh Jain**		Impact of climate change & opportunities **Shri Raman Jee**	Opportunities in micro finance sector **Dr. Shrikant Sharma**	Opportunity scanning in export business **Shri Sanjay Mangala**

November 15.2022 Tuesday	Recap Of Previous Days Learning	Costing & pricing policy **Dr. Dm Parikh**	Opportunities in mushroom production and processing **Dr. Dinesh Jain**	Agri machineries **Shri Raman Jee**	Agro industries : institutional innovations & models **Dr. Dinesh Jain**	
November 16.2022 Wednesday	Recap of previous days learning	Breakeven points & viability indicators **Dr. Dm Parikh**	Branding & promotion **Shri Raghvendra Singh**	Atal incubation center at Gujarat technological university : **VISIT**		
November 17.2022 Thursday	Recap of previous days learning	Startup basics and incubation **Dr. Neha Sharma**	Meet up with the students of Central Agriculture University, Imphal.	Market research **Shri Raghvendra Singh**	Product discovery canvas **Dr. Dinesh Jain**	
November 18.2022 Friday	Recap of previous days learning	Startup pitching & discussion : exilio		Introduction to agri business plan **Dr. Dinesh Jain**		Exilio events & programmes (4:30 to 11:00 pm)

November 14, 2022 : product discovery canvas guided by **Dr. Dinesh jain**



Product Discovery Canvas

Product Name:

Iteration #:

Date:

Vision Statement
1. What are you building?
2. What value does it provide?

1

Know your Users & Customers
1. Who are you building this for?
2. What benefit will they obtain?

Discuss Pirate Metrics: Acquisition, Activation, Retention, Revenue, Referral

2

Define Goals
1. Business goals?
2. Technology goals?
3. Process improvement goals?

3

Define Success Measures
1. How will you know the product is a success?
2. What will change for the targeted user community?

4

Timeframe for Discovery

5

Tell Product Stories

Tell stories about users and customers using the product. Talk in descriptive sentences: who is using, what they are doing and why. Capture a descriptive test of what it means for the story to be successful. Gain product understanding by discussing:

1. Examples of users engaged with the product to realize the goals
2. How realizing the goals impacts a specific type of user

Play "What if", taking different routes on the same goal.

Discuss what happens in the event of invalid situations?

6

Validate if it is the right Product to build
Make sure - as quickly and as cheaply as you can - that you are building the right 'it'

7

Learn from the Product: Build - Measure - Learn
Build a slice of the product (limited features and functionality), measure how customers respond and then learn whether to pivot or persevere.

8

3rd WEEKS PHOTOGRAPHS



November 15, 2022 : Costing & pricing policy by **Dr. D M Parikh**



November 17, 2022: Interactive session with **sir Harkesh Mittal**, Senior Adviser at EDII

November 16, 2022 :
Visit At Atal Incubation Center At Gujarat Technological University





November 17, 2022 : Meet up with the students of Central Agriculture University, Imphal.



November 18,2022 :
Exilio Events And Programmes
Chief Guests : AMUL & IFFCO Directors





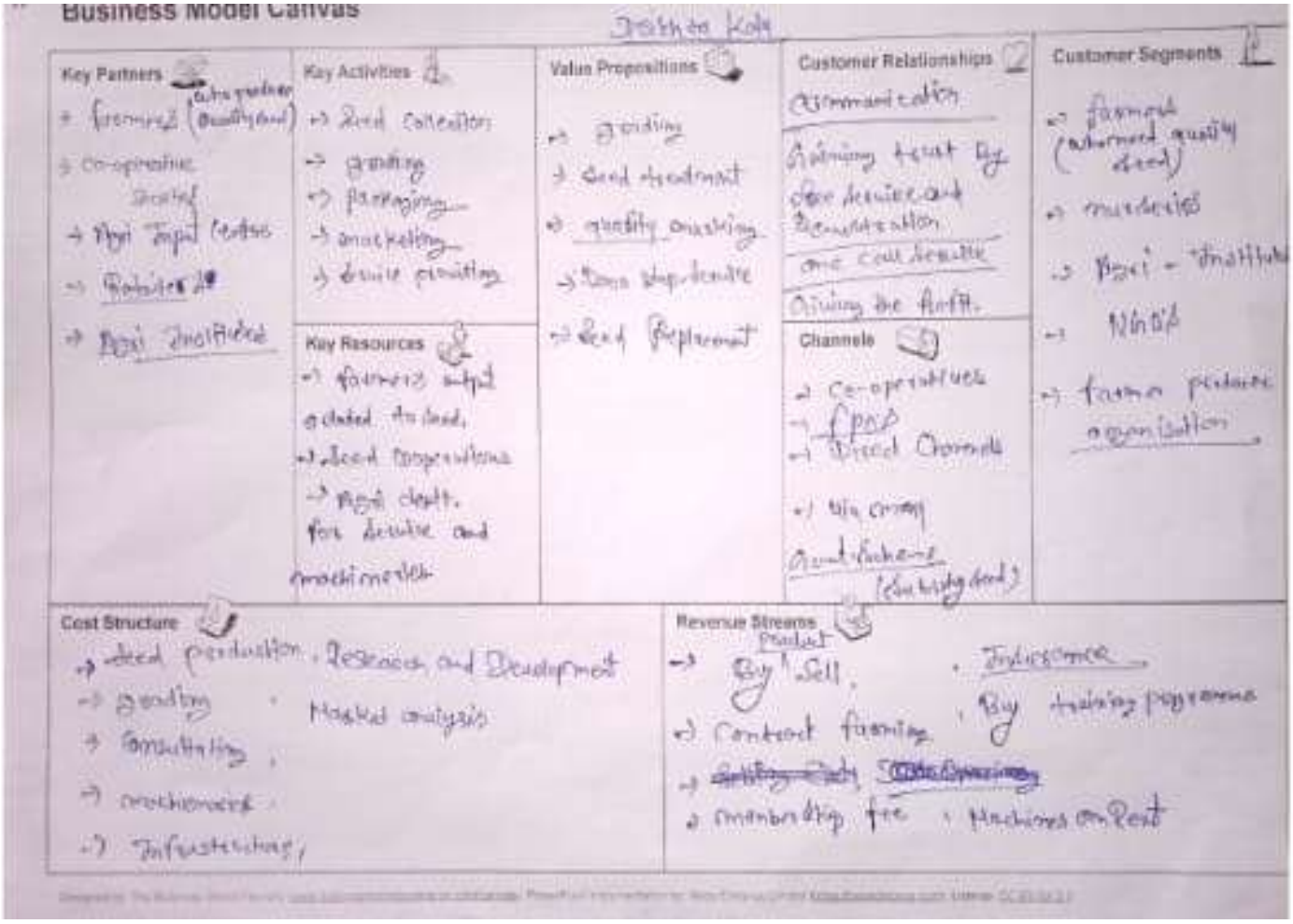


CHIRANJIV PATEL (PC SNEHAL GROUP) **MUSICAL EVENT (EVENING)**

PROGRAMME SCHEDULE : 4TH WEEK

Date/day	Recap session (9:45 am to 10:00 am)	1 session (10:00 am to 11:00 am)	2 session (11:15 am to 12:15 pm)	3 session (1:45 pm to 2:45 pm)	4 session (3:00 pm to 4:00 pm)	5 session (4:00 pm to 5:00 pm)
November 21, 2022 Monday	Recap Of Previous Days Learning	Rural Technopreneurship **Shri Raman Jee**	Interaction With Director General **Prof Sunil Shukla**	Iot In Agriculture **Dr. Hari Babu**	Business Model Canvas Presentation **Dr. Dinesh Jain**	Working Capital Management **Ms. Nikita Anand**
November 22.2022 Tuesday	Recap Of Previous Days Learning	Business Model Canvas Presentation **Dr. Dinesh Jain**	Technical Analysis For Business Plan **Dr. Dinesh Jain**	Persuation Skills **Dr. Baishali Mitra**	Business Writing **Dr. Baishali Mitra**	Financial Analysis For Business Plan **Ms. Nikita Anand**
November 23.2022 Wednesday	Recap of previous days learning	Market Analysis For Business Plan **Shri Raghavendra Singh**	Scm In Agriculture **Dr. Dinesh Jain**	Digital Marketing **Shri Raghavendra Singh**	Block Chain in Agriculture **Dr. Dinesh Jain**	Business Plan Preparation For Selected Opportunity (Class Activity)
November 24.2022 Thursday	Rewa Nursery Visit			IFFCO Kalol Plant Visit		
November 25.2022 Friday	Recap of previous days learning	Bank Financing For A Enterprise **Dr. DM Parikh**	Risk management in agribusiness **Dr. Dinesh Jain**	Business Plan Preparation For Selected Opportunity (Class Activity)	Career design canvas **Dr. Dinesh Jain**	

Business model canvas by Dr. Dinesh Jain

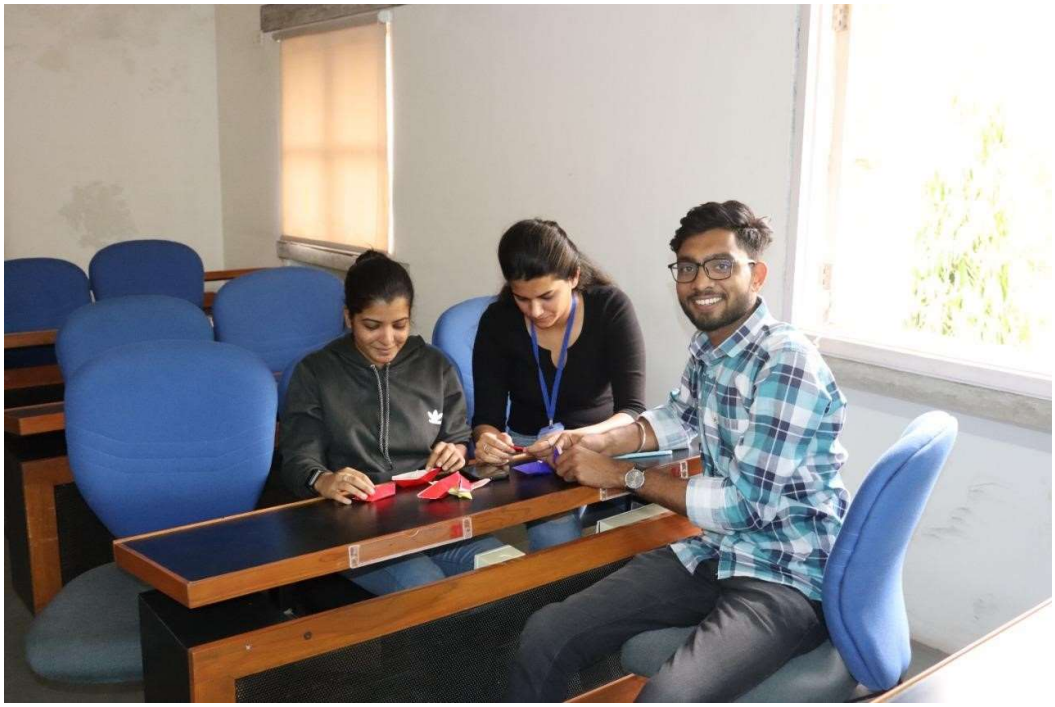




NOVEMBER 21, 2022 : Interaction With Director General **Prof. Sunil Sharma**



November 22, 2022: Persuation Skills & Business Writing Activity By **Dr. Baishali Mitra**



November 23,2022 : Team Building Activity By **Dinesh Jain**



November, 24, 2022 : REWA Nursery visit



November 24, 2022 IFFCO kalol plant visit



Problem Solving & Leadership Quality Development Activity With Dr. Dinesh Jain

VALEDICTORY PROGRAMME
NOVEMBER, 28, 2022



Regd. No.: AHD2022113613

EDII

ENTREPRENEURSHIP DEVELOPMENT INSTITUTE OF INDIA

Ahmedabad

is pleased to certify that

PRIYANSHI SINGH

has successfully attended

INSTITUTIONAL DEVELOPMENT TRAINING PROGRAMME ON "AGRO BASED ENTREPRENEURSHIP"

conducted during

1 - 28 November, 2022

sponsored by

Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

at

EDII Campus

Satyaranjan Achary

SATYA RANJAN ACHARYA
Program Director

SUNIL SHUKLA
Director General

INSTITUTIONAL DEVELOPMENT TRAINING PROGRAMME ON
"AGRO BASED ENTREPRENEURSHIP" FOR THE STUDENTS OF
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya- Gwalior – Madhya Pradesh
[1 – 28 November, 2022]





(IV)

Orientation programme on quality issues for teachers and students

(Submission of information with Relevant documents previously not enclosed)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

List of Orientation programme conducted on quality issues for teacher & students

S.No.	Topic	Date	Mode
1.	One day workshop on Education	10 January 2022	Online
2.	Urban farming for young entrepreneur	21 January 2022	Online
3.	Webinar on soil health: role of microorganisms and soil organic matter	6 July 2020	Online
4.	Improving the visibility indicators and productivity of state Agricultural universities	27 January 2022	Online
5.	Agro-forestry & its Eco-system Services	6 January 2021	Online
6.	Online Seminar: scope of study abroad in agriculture	18 December 2020	Online
7.	Opportunity for Agriculture graduate and scientist abroad	11 December 2020	Online

IDP - NAHEP, RSKVV,
Gwalior College of Agriculture, Indore

FREE to ALL
ZOOM WORKSHOP
"FOR STUDY ABROAD OPPORTUNITIES TO AGRICULTURE STUDENTS"

Date : 10 Jan. 2022		
Resource Persons:	**TOPIC**	**TIME**
Nilesh Jain Dr. Swati Jain Chairpersons Swati Jain Academy Indore	Why Study Abroad ? What all exams to appear ? And How to Begin exam preparation ?	10 AM - 11 AM
	Various Agricultural Courses, Program countries wise .	11 AM - 12 Noon
	Application Process	2 PM - 3 PM
	Visa Process	3 PM - 4 PM

Join us on Zoom ID: 2880593606

Date:- 10 Jan, 2022
Time:- 10 AM to 4 PM

Organised By :

Dr. S.K.Chaudhary, Nodal Officer

Dr. Swati Barche, Co-ordinator
Dr. B.B. Parmar, Co-ordinator
Dr. H.L. Khapedia, Co-ordinator
Dr. Devendra, SRF
Mr. Piyush Jain, Computer Operator

Certificates will be given to participants attending all sessions and registration is compulsory

Knowledge Partner

Estd. 1992

Swati Jain Academy, Indore

(An Exclusive Institute for the US and the Canadian universities admission on the basis of academic Merit and GRE/ GMAT/SAT/ACT/TOEFL/IELTS scores/ 30 years of expert counselling of Admission-Scholarship-VISA)

Attendances:-

S.NO.	NAME OF STUDENTS
1	MUNEERA
2	ANURAG KAMATHKAR
3	PRIYANKA GAWARE
4	SANJU MAEPALLI
5	PRADEEP PATEL
6	MAYURI RATHURE
7	YOGENDRA
8	MAVENDRA BISMIL
9	ABHISHEK PATIDAR
10	TISHA GONDEY
11	JAYESH LONGRE
12	VISHAL PATHAK
13	SUMAN OJHA
14	POONAM OJHA
15	VISHAL MORAR
16	YASH PATIDAR
17	NIKHIL SHARMA
18	PRABHJOT KAUR
19	AMIT RAJA BUNDELA
20	ASKHAT
21	ALKA MUJALDE
22	SUMAYLA KHAN

	SHIKHA ARYA
24	ROSHAN GALLANI
25	VIDHI
26	SHUBHAM PATIDAR
27	SUKANYA SINGH
28	VIDHUTI
29	KALPANA GOUR
30	GOKUL DHANORA
31	PUNIYA BULE
32	PRADEEP PATEL
33	HARIOM PATIDAR
34	ADITI PRADHAN
35	DR. HEMANT KUMAR BHARADWAJ
36	DR. BHARAT LAL
37	Dr. Swati Barche
38	Mr. Piyush Jain

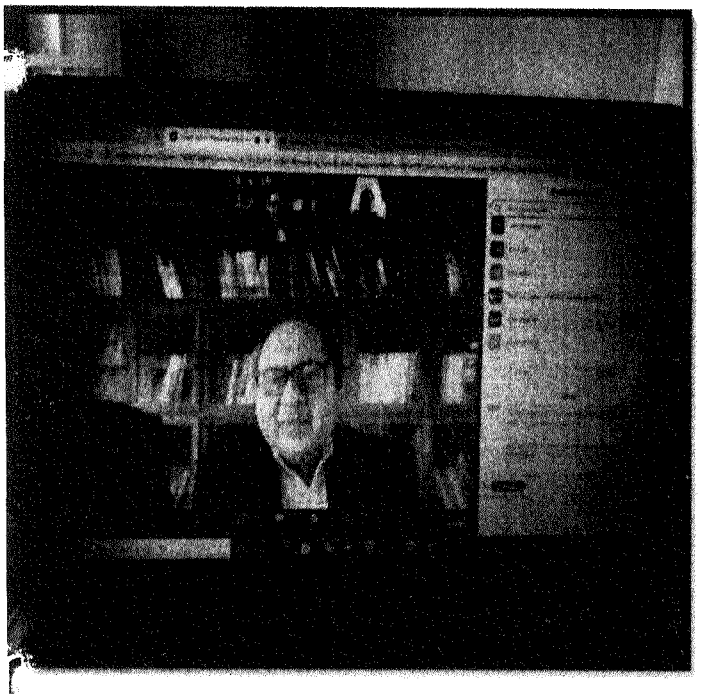
A) Why study Abroad? What all exams to appear? And How to begin exam preparation?

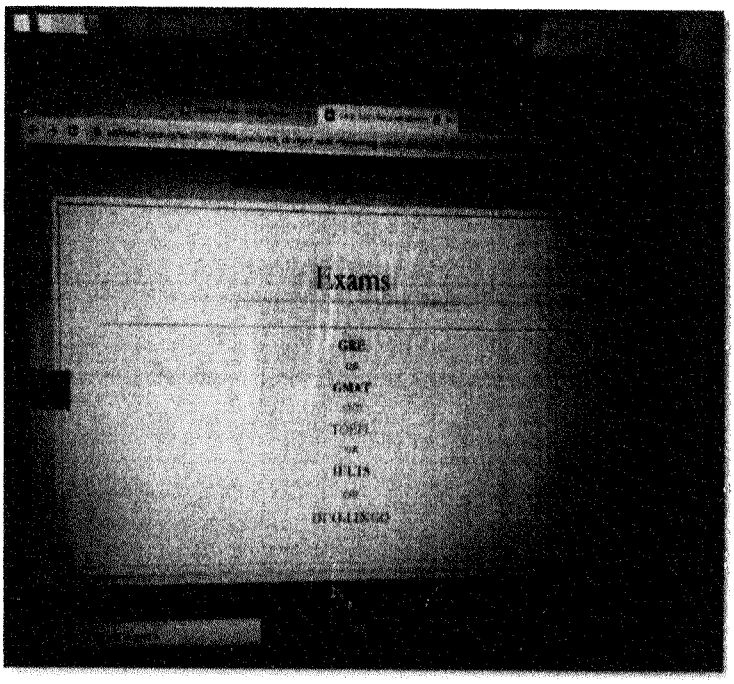
Lecture 1: Why study Abroad? What all exams to appear? And How to begin exam preparation?

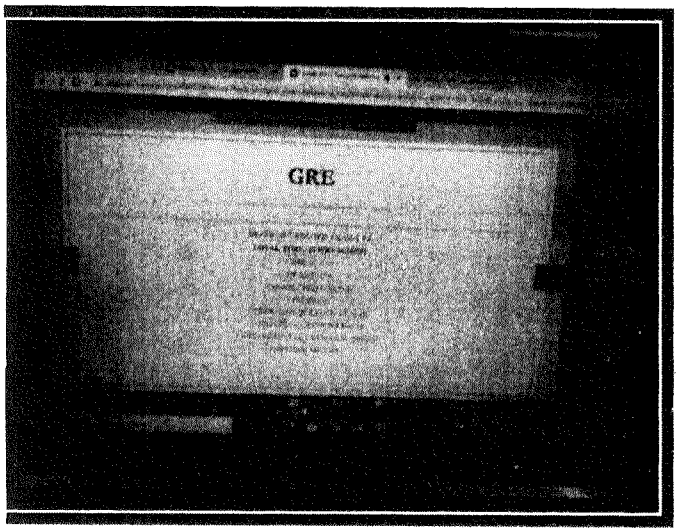
Time:- 10:00 AM to 11:00 AM **Date: 10 Jan, 2022**

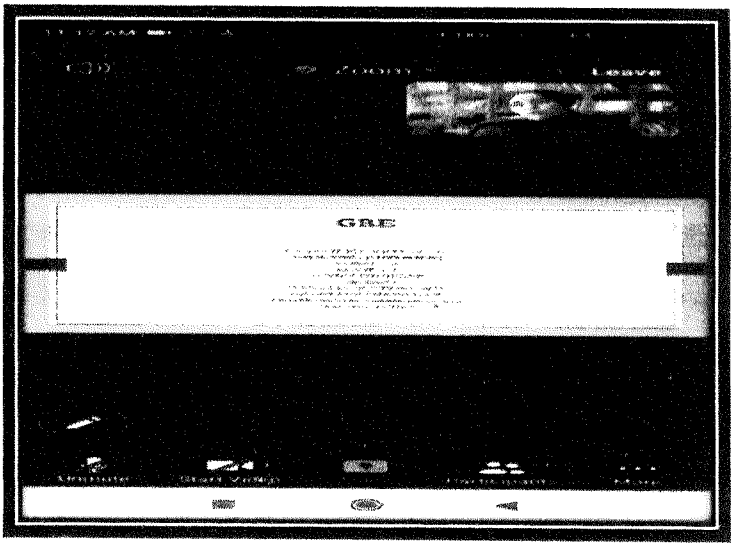
Mode of Session- Zoom Meet (Zoom Id:- 2880593606)

Resource Person: Mr. NILESH JAIN AND DR. SWATI JAIN (Chairpersons Swati Jain Academy Indore)









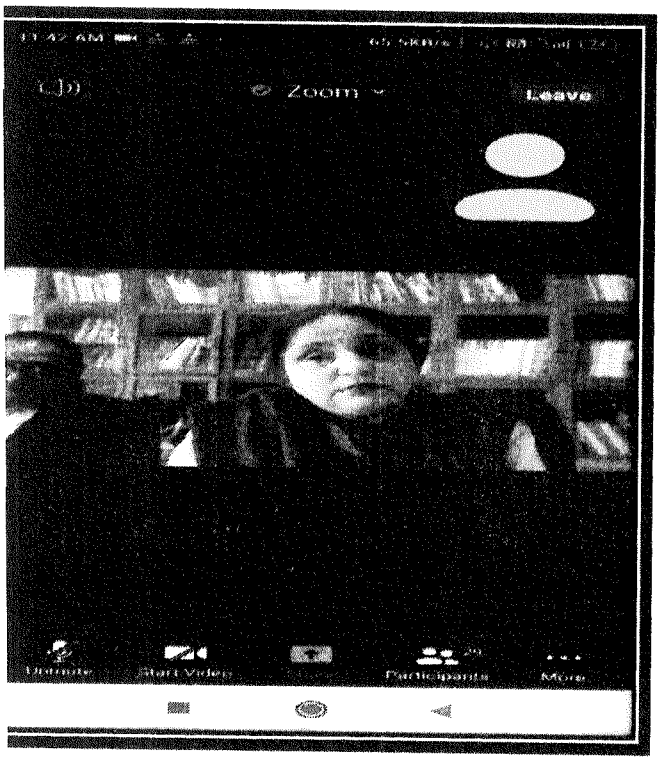
β) Various Agriculture Courses, Program countries wise.

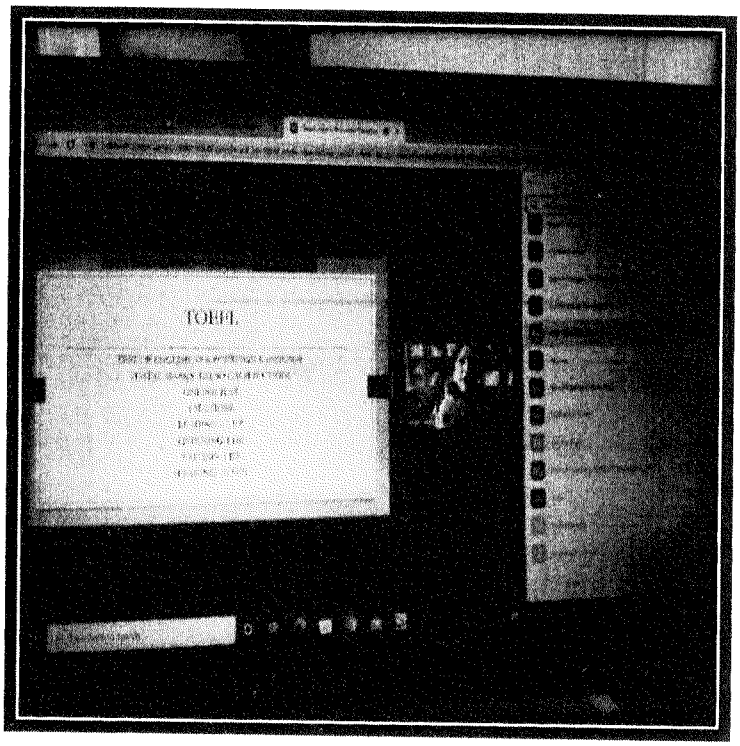
Lecture 2: Various Agriculture Courses, Program countries wise.

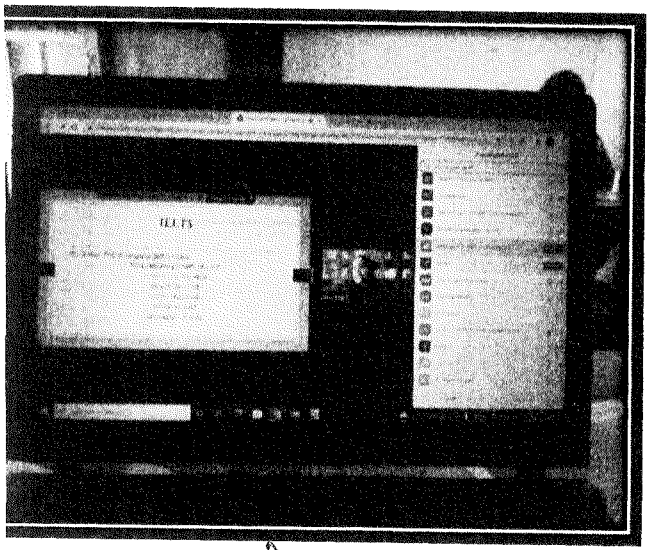
Time:- 11:00 AM to 12:00 AM **Date: 10 Jan, 2022**

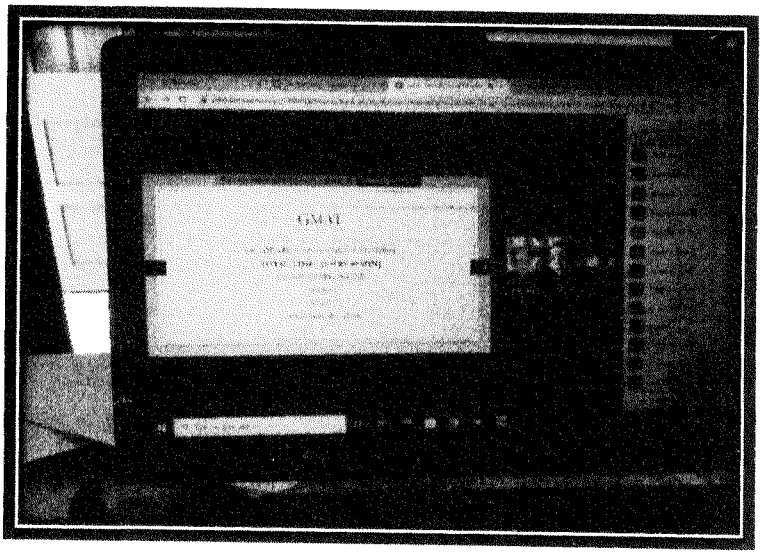
Mode of Session- Zoom Meet (Zoom Id:- 2880593606)

Resource Person: Mr. NILESH JAIN AND DR. SWATI JAIN (Chairpersons Swati Jain Academy Indore)









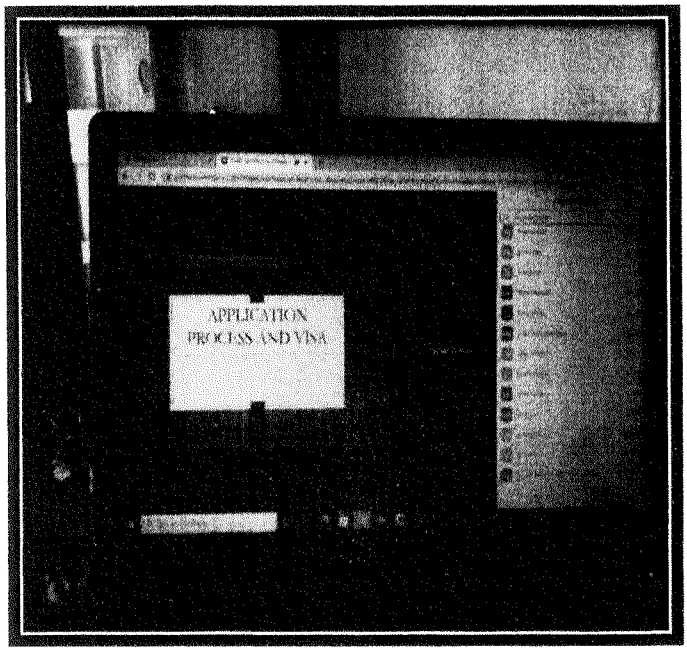
C) Application process

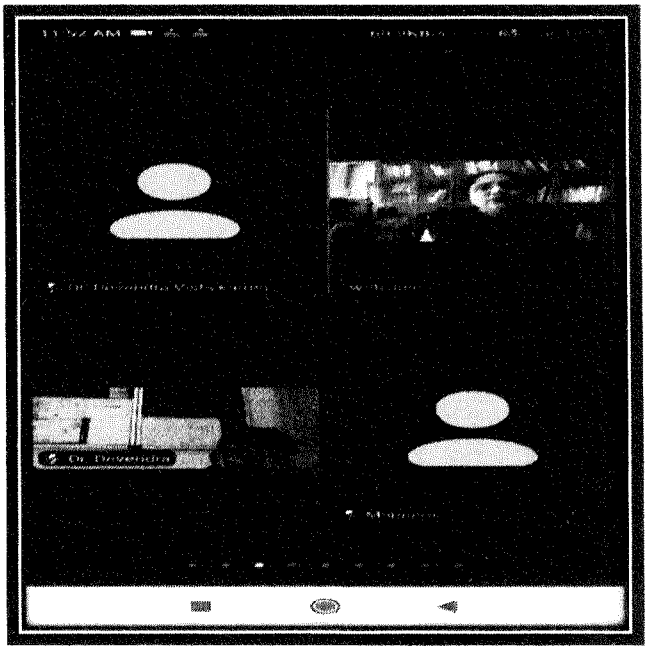
Lecture 3: Application process **Time:- 02:00 PM to 03:00 PM**

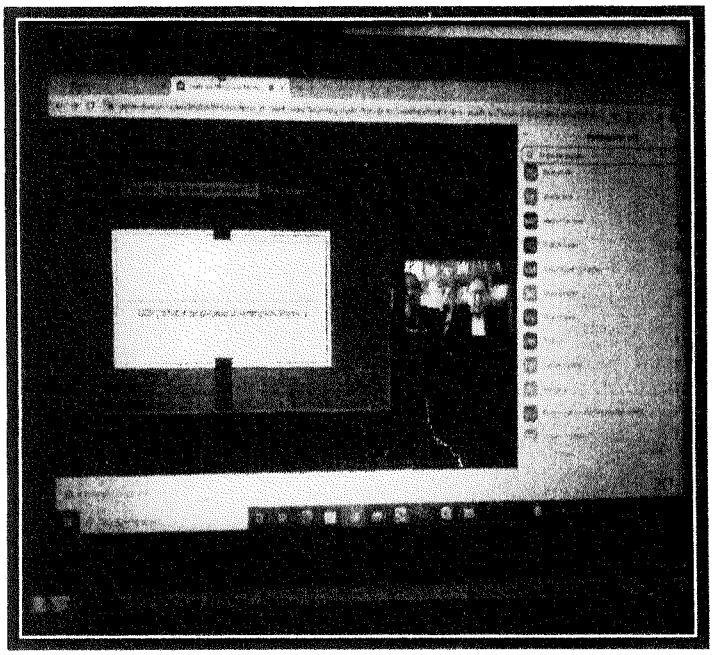
Date: 10 Jan, 2022

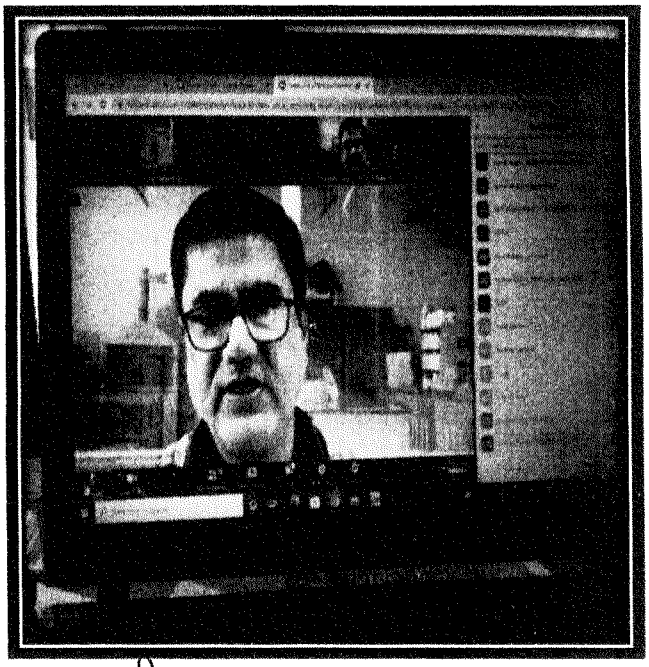
Mode of Session- Zoom Meet (Zoom Id:- 2880593606)

Resource Person: Mr. NILESH JAIN AND DR. SWATI JAIN (Chairpersons Swati Jain Academy Indore)









NAHEP

Webinar on

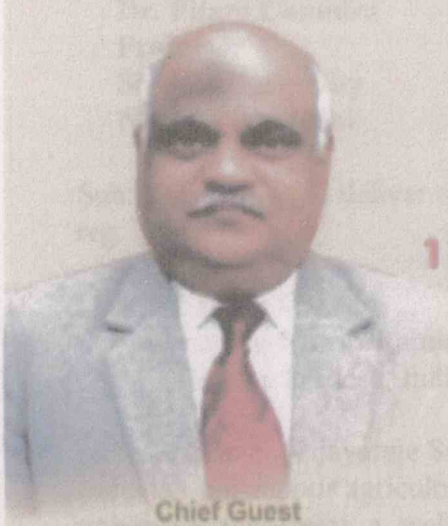
आज़ादी का अमृत महोत्सव

"URBAN FARMING For YOUNG ENTREPRENURSHIP"

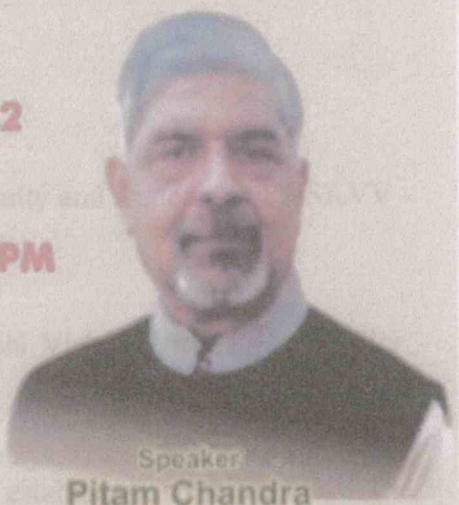
आज़ादी का अमृत महोत्सव

FRIDAY, JANUARY 21, 2022

Time
11:00 AM to 01:00 PM



Chief Guest
Prof. S.K. Rao
Vice Chancellor, RVSKVV Gwalior



Speaker
Pitam Chandra
Professor (SET), Sharda University
Ex. Professor (Food Engineering), NIFTEM
Former Director, ICAR-CIAE, Bhopal
Former ADG (PE), ICAR, NEW Delhi

Organizing Secretary : Dr. S.K. Sharma, Dr. Akhilesh Singh, Dr. Sudheer Bhadauria
Co organizing Secretary : Dr. Avinash Tomar, Mr. Shiv Kumar Bhadauriya,
: Dr. Swatantra Kumar Sahu, Dr. Narendra Vasure

REGISTRATION LINK : https://bit.ly/3GkqvZW

JOIN THE WEBINAR ON FOLLOWING LINK: https://bit.ly/3nmn0e3

Institutional Development Plan
National Agricultural Higher Education Project
Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya,
Gwalior-474 002 (M.P.)



Timestamp	Email	Title (Dr./Mr./ Mrs./Ms.)	Name	Mobile No. (Whatapp No.	College/Institute/Organiza	Class & Year		Designation	Gender	Category	Are your attending the Lecture?
1/17/2022 10:15:57	dhanoraharlom@gmail.co	Mr.	Harlom Dhanora	8224077032	College Of Agriculture Gw	BSc.Ag.3rd year		Student	Male	OBC	Maybe
1/17/2022 10:17:20	jagannath,anakpur@gmail	Mr. Jagannath Yadav	Jagannath Yadav	8966628370	College of agriculture Gw	3rd year		Student	Male	OBC	Yes
1/17/2022 10:17:48	shreemeena15@gmail.co	Ms.	Shrikunwar	6260047885	College of agriculture Gw	Ph.D scholar		Ph.D. Scholar	Female	OBC	Yes
1/17/2022 10:18:04	ranjanrewar98@gmail.co	Ms.	Tanya Ranjan	9608132740	Sage University Indore	4th		Student	Female	GEN	Yes
1/17/2022 10:20:03	vishvendradhaked4@gm	Mr	Vishvendra Dhaked	09001752753	Rvskvv	3rd year		Student	Male	OBC	Yes
1/17/2022 10:20:49	yuvrajjoshi712@gmail.co	Mr	Raj joshi	9893810109	College of agriculture kha	3rd sem 2nd year		Student	Male	GEN	Yes
1/17/2022 10:21:14	bheemsingh10may@gma	Mr.	Bheem S ngh Jatav	7389185720	College of Agriculture Gw	B.Sc Ag.4th year		Student	Male	SC	Yes
1/17/2022 10:25:57	Saklendchalve2@gmail.c	Mr saklen	Mo saklen	9691716720	RVSKVV COA GWALIOR	BSC(ag) 3rd year		Student	Male	OBC	Yes
1/17/2022 10:31:42	nikitapatidar604@gmail.c	Ms	Nikita patidar	7723880036	College of agriculture Ind	3rd year		Student	Female	OBC	Yes
1/17/2022 10:32:11	shreyanshu16032@gmail	Mr.	Shreyanshu Lade	942 304 8617	NIFTEM	2ND YEAR		Student	Male	SC	Yes
1/17/2022 10:32:56	ap3244934@gmail.com	Mr.	Ankit Patel	7089549599	RVSKVV Gwalior M.P.	B.sc. 3rd year		Student	Male	OBC	Mayoc
1/17/2022 10:45:52	arvindratkg91@gmail.com	Mr.	Arvindrd Ahirwar	786937919	coa gwalior	3rd year		Student	Male	SC	Yes
1/17/2022 10:46:21	Sourabh Parihar	Mr	Sourabh Parihar	9174814834	Bm college of agriculture	2nd year end 2020bacch		Student	Male	OBC	Yes
1/17/2022 10:47:46	radharajpoot2019@gmail	Ms. '	Radha Rajpoot	9826754947	Bm college of Agriculture	2nd year 1sem sem.		Student	Female	OBC	Yes
1/17/2022 10:47:48	Sahuharjendra405@gmai	Mr.	Harjendra sahu	7697375593	CoA: Gwalior	Bsc ag 3rd year		Student	Male	OBC	Yes
1/17/2022 10:53:12	gajalpachori390@gmail.c	Ms.	Gajal Pachori	9425726438	College of Agriculture Gw	Bsc ag 4th year		Student	Female	GEN	Yes
1/17/2022 11:00:23	Ram980808@gmail.com	Mr.	Ram Patel	9174174471	College of agriculture kha	2nd year 1st sem		Student	Male	OBC	Yes
1/17/2022 11:09:40	29bhagwatpandre@gmail	Mr.	Bhagwat Prasad Pandre	07697024787	Krishi vigyan kendra Shal		2011	Faculty/Scientist	Male	ST	Yes
1/17/2022 11:13:13	arvinddhakad4456@gmai	Mr.	Arvind Sekwara	7440554308	K.N.K College of Horticult	B.Sc 2nd year		Student	Male	OBC	Yes
1/17/2022 11:14:42	ayush15052002@gmail.c	Mr	Ayush Amratiya	6262710660	Knk college of Horticultur	2 nd year		Student	Male	OBC	Maybe
1/17/2022 11:14:51	rssharmaa@gmail.com	Mr.	RADHESHYAM SHARMA	+919826252084	JNKVV JABALPUR		2002	Other	Male	GEN	Yes
1/17/2022 11:16:11	shubhamsp6376300@gm	Mr	Shubham patel	8959491852	Bm college of agriculture	3rd year		Student	Male	OBC	Yes
1/17/2022 11:18:19	Rajkumarrathore1483@g	Mr.	Rajkumar rathore	7300181601	B.m.College of agriculture	3rd year		Student	Male	OBC	Maybe
1/17/2022 11:18:20	03072000ashvin@gmail.c	Mr	ASHVIN DHANGAR	9057426734	Bm college of agriculture	2nd year		Student	Male	OBC	Yes
1/17/2022 11:21:10	Kuldeep2000devda@gma	Mr.	Kuldeep devda	7400825837	BMC Khandwa	3rd year		Student	Male	OBC	Yes
1/17/2022 11:45:49	harepatel1999@gmail.co	Mr.	Harekrishna patel	9630287227	Bm college of agriculture	B.Sc (Hons) Ag 2nd year		Student	Male	OBC	Yes
1/17/2022 11:52:34	rajendrajhagar@gmail.co	Mr.	Rajendra Patel	8869933251	College of agriculture, RV	PhD final year		Ph.D. Scholar	Male	OBC	Yes
1/17/2022 12:16:41	drreenarawat23@gmail.c	Dr	Reena Rawat	6260754729	RVSKVV, GWALIOR			Ph.D. Scholar	Female	ST	Yes
1/17/2022 12:16:57	nikhil.sharma0632@gmai	Mr	Nikhil Sharma	9179280813	Knk college of horticulture	2020-21		Student	Male	GEN	Yes
1/17/2022 12:41:06	rathorerajverdhan@gmail	Mr.	Rajverdhan Singh Rathor	6263211173	Bhagvant rao mandloi col	2nd year		Student	Male	GEN	Yes
1/17/2022 14:37:23	rekharawat5166@gmail.c	Ms	Rekha Rawat	8770767428	BM College of Agriculture	2nd year (1st semester)		Student	Female	ST	Yes
1/17/2022 14:39:28	bamniyarupa999@gmail.c	Ms.	Radha	9131093056	Bm. College of agriculture	Second year		Student	Female	ST	Yes
1/17/2022 15:11:15	girjesh.gau@gmail.com	Dr.	Girjesh Kumar Sharma	9340699290	Directorate of Research S	Scientist		Faculty/Scientist	Male	GEN	Yes
1/17/2022 15:14:50	martandsharma21@gmai	Mr.	Martande Sharma	8959919909	CoA Gwalior RVSKVV	BSC Ag 3rd yr.		Student	Male	GEN	Yes
1/17/2022 15:24:19	tirunimapawar@gmail.cor	Ms	Tirunima patle	8819950033	RVSKVV GWALIOR	PhD final		Ph.D. Scholar	Prefer not to say	GEN	Yes
1/17/2022 20:17:51	nehadhakad229@gmail.c	Ms .Neha dhakad	Neha dhakad	7777883327	KNK college of horticultur	2year & 3rd sem		Student	Female	OBC	Yes
1/17/2022 20:59:18	Priyankashivgwl99@gma	Ms.	Priyanka shivhare	8821846570	B. M. College of agricultu	Third semester & second		Student	Female	OBC	Yes
1/18/2022 0:38:40	umashankarbagri3@gmai	Mr.	UMA SHANKAR BAGRI	9575481019	R. V. S. K. V. V. GWALIOF	Ph. D. 3rd year		Ph.D. Scholar	Male	SC	Yes
1/18/2022 7:54:21	shubhamsingh0734@gm	Mr.	Shubham Singh	8120576641	CoA, RVSKVV, Gwalior, M	PhD 2nd Year		Ph.D. Scholar	Male	GEN	Yes
1/18/2022 10:20:35	stukeshwar7@gmail.com	Mr.	TUKESHWAR	9713803332	College of Horticulture an	Bsc.Horticulture		Student	Male	OBC	Yes
1/19/2022 14:44:01	ranaagrineer123@rediffm	Er Brij Mohan Rana	Er Brij Mohan Rana	7780950385	Department of Agriculture	Jammu		Other	Male		
1/19/2022 14:57:53	shreemeena15@gmail.co	Ms	Shrikunwar	6260047885	College of agriculture Gw	PhD scholar		Ph.D. Scholar	Female	OBC	Yes
1/19/2022 16:05:22	bajnathpatel42@gmail.cc	Mr	Bajnath Patel	8889455192	KNK College of Horticultu	2year		Student	Male	OBC	Yes
1/19/2022 16:05:30	kavitasolanki949@gmail.c	Ms	Kavita Solanki	8085192123	RAK college of agriculture	Bsc agriculture 2nd year		Student	Female	ST	Yes
1/19/2022 16:28:38	hkhapediya@gmail.com	Dr	Hiralal Khapediya	9009711172	College of Agriculture Ind	No		Faculty/Scientist	Male	ST	Yes
1/19/2022 16:49:18	nagkhiromani@gmail.com	Mr	Khiromani Nag	8435347570	IGKV	PhD		Ph.D. Scholar	Male	ST	Maybe
1/19/2022 17:02:19	joshireena14@gmail.com	Dr.	Dr. Reena Joshi	8979665852	College of Forestry, Ranichauri, Tehri Garhwal-2491			Faculty/Scientist	Female	GEN	Yes
1/19/2022 17:06:33	gddhakad001@gmail.com	Mr.	Gokul Dhanora	9111689656	College of Agriculture Ind	2nd year		Student	Male	OBC	Yes
1/19/2022 17:13:00	prachi2580chouhan@gm	Ms.	Prachi Chouhan	8305172592	College of agricultural gw	Second year first semeste		Student	Female	OBC	No
1/19/2022 17:27:41	Jadonavi88@gmail.com	Mr.	Arvind kumar singh	7415586706	College of agriculture gwalior			Ph.D. Scholar	Male	GEN	Yes
1/19/2022 18:25:35	anilsatapathy9@gmail.cor	Mr	Anil satapathy	09099920084	masabi agri-tech		2021	Other	Male	GEN	Yes
1/19/2022 18:47:45	arvinder2075@gmail.com	Dr	Arvinder Kaur	9977027137	Krishi Vigyan Kendra, Gw		2022	Faculty/Scientist	Female	GEN	Yes
1/19/2022 19:22:30	ykskvk@gmail.com	Dr.	Yogendra Kumar Shukla	9926312029	Krishi Vigyan Kendra Khandwa			Faculty/Scientist	Male	GEN	Yes
1/19/2022 19:39:31	dirhortfor@rediffmail.con	Dr.	Dinesh Kumar Jain	9425511228	RVSKVV/KVK Barwani mp		2022	Faculty/Scientist	Male	GEN	Yes
1/19/2022 20:47:49	padamsingh522jatav@gm	Mr.	Padam Singh Jatav	6269664801	College of Agriculture Gw	B.Sc (Hon.) Ag.		Student	Male	SC	Yes
1/19/2022 20:48:06	erajiv12@gmail.com	Dr	Rajiv Kumar Singh	09424564926	KVK, Khargone			Faculty/Scientist	Male	GEN	Yes
1/19/2022 20:49:35	richapyasi97@gmail.com	Dr	Richa Pyasi	7479754722	College of Agriculture Gw	Faculty		Faculty/Scientist	Female	GEN	Yes
1/19/2022 20:58:28	hargobind855@gmail.con	Mr	Hargobind Singh	7889952221	Thapar University	Pass out		Student	Male	GEN	Yes
1/19/2022 21:52:47	dk6391334@gmail.com	Mr.	DEVENDRA KUMAR	9057765301	BBAU Lucknow			Student	Male	SC	Yes
1/19/2022 22:31:27	birendra.pandey75@gma	Mr.	Birendra Pandey	8871958493	College of Horticulture Ma	M.Sc.Ag Horticulture		Student	Male	GEN	Yes
1/19/2022 22:51:58	mou11momtaguc@gmail.	Mrs	Kshama Koparde	07337734917	Forest Research Institute,	MSc II		Student	Female	OBC	Yes

Timestamp	Email	Title (Dr./Mr./ Mrs./Ms.)	Name	Mobile No. (Whatapp No.	College/Institute/Organize	Class & Year	Designation	Gender	Category	Are your attending the Lecture?
1/19/2022 23:02:21	rashmishukla_khw@rediffmail.com	Dr	Rashmi Shukla	9977176654	K v k khandwa		Faculty/Scientist	Female	GEN	Yes
1/19/2022 23:32:27	satyamkumbhar25@gmail.com	Mr	Satyam Jotram Kumbhar	7030567405	College of agricultural ent	Final year B-TECH	Student	Male	OBC	Yes
1/19/2022 23:52:24	malia3429@gmail.com	Dr.	Suraj Mali	7809181748	College of Agriculture (SKRAU), Mandawa and Colle		Faculty/Scientist	Male	OBC	Yes
1/20/2022 0:48:21	dharvendrasingh56@gmail.com	Dr	Dharvendra Singh	9907402225	R VSKVV KVK Manawar		2022 Faculty/Scientist	Male	GEN	Yes
1/20/2022 7:39:31	sandeep2011iari@gmail.com	Dr	Sandeep Kumar	7065250610	ICAR-IARI, NEW DELHI		Faculty/Scientist	Male	OBC	Yes
1/20/2022 8:27:07	ramkumardewangan900@gmail.com	Mr.	Ram Kumar Dewangan	9977575941	Indira Gandhi Agriculture University Raipur		Ph.D. Scholar	Male	OBC	Yes
1/20/2022 10:45:41	dinesh.dwivedi@icar.gov.in	Er	D K Dwivedi	09977719221	KVK, ICAR- CIAE, Bhopal		Other	Male	GEN	Yes
1/20/2022 11:28:21		Mr	Rajesh Verma	9425190930	Deptt. Of Agriculture, Jam	Distt. Agriculture Officer E	Other	Male	GEN	Yes
1/20/2022 12:36:04	Kvkburhanpur@rediffmail.com	Mrs	Megha Vibhute	8817454047	KVK Burhanpur	2021-22	Faculty/Scientist	Female	OBC	Yes
1/20/2022 13:38:50	debashtomar315@gmail.com	Mr.	Debesh Singh	8839078769	RVSKVV KVK-Morena		Other	Male	GEN	Yes
1/20/2022 15:07:22	udaywalsamriddhi1234@gmail.com	Ms.	Samriddhi Udaywal	+917999978516	College of Agriculture, Ind	B.Sc .Ag 3rd year	Student	Female	OBC	Yes
1/20/2022 16:12:52	debashtomar315@gmail.com	Mr.	Debesh Singh	8839078769	RVSKVV, KVK-Morena		Faculty/Scientist	Male	GEN	Yes
1/20/2022 17:06:04	poonambhadouriya90@gmail.com	Ms.	Poonam bhadouriya	9039984967	RVSKVV college of agricu	PhD final year	Ph.D. Scholar	Female	OBC	Yes
1/20/2022 17:22:02	raghuvanshimona110@gmail.com	Mrs.	mona raghuvanshi	9340691717	R.V.S.K.V.V	Ph.d final	Ph.D. Scholar	Female	GEN	Yes
1/20/2022 17:23:14	raghuvanshimona110@gmail.com	Mrs.	mona raghuvanshi	9340691717	R.V.S.K.V.V	ph.d final	Ph.D. Scholar	Female	GEN	Yes
1/20/2022 18:29:29	rekhatiwari69841@Gmail.com	Dr	Rekha Tiwari	7828816892	Krishi Vigyan Kendra (RVSKVV), Ujjain		Faculty/Scientist	Female	GEN	Yes
1/20/2022 21:27:45	kharearchana1986@gmail.com	Smt. Archana Khare	Archana Khare	8109091033	RVSKVV KVK MORENA	10 years	Faculty/Scientist	Female	GEN	Yes
1/21/2022 8:55:54	a.k.yadav9887849756@gmail.com	Mr.	Ashok kumar yadav	9887849756	RAK College of agriculture	M.sc. (Ag) Entomology	Student	Female	SC	Yes
1/21/2022 8:58:24	vikasmawada2002@gmail.com	Mr.	Vikash Mewada	9399137838	R.A.K. College of Agricult	2nd year	Student	Male	OBC	Yes
1/21/2022 8:58:55	ankitkanthiya575@gmail.com	Urban farming for young e	Ankit kanthiya	9399523304	RAK college of agriculture	Bsc 2nd year	Student	Male	OBC	Yes
1/21/2022 8:59:08	kkanhaiya6556@gmail.com	Mr.	Krishna Kanhaiya	7250304042	R.A.K.COLLEGE OF AGR	B.Sc AG 2nd Year	Student	Male	OBC	Yes
1/21/2022 9:01:10	aasitharathore7900@gmail.com	Ms.	Astha Rathore	8120055130	RAK COLLGE OF AGRIC	B.sc(Hon's), agriculture 3r	Student	Male	OBC	Yes
1/21/2022 9:06:32	panwarani1113@gmail.com	Mr.	Anil panwar	9174743206	Rafi Ahmad kidwai krishi v	Msc 1 year	Student	Female	OBC	Maybe
1/21/2022 9:09:32	prad.psolanki999@gmail.com	Mr.	Prad.p solanki	7223841087	RAK college of agriculture	3rd year 2 sem.	Student	Male	OBC	Yes
1/21/2022 9:10:32	komalydv0141@gmail.com	Ms.	KOMAL YADAV	9770484298	RAK COA SEHORE	B.Sc.(Hons.)Ag.3rd Year	Student	Male	OBC	Maybe
1/21/2022 9:11:41	vinodsisodiya690@gmail.com	Urban farming for young i	Vinod sisodiya	9302182569	RAK college of agriculture	Second year	Student	Female	ST	Yes
1/21/2022 9:26:21	pjain9204@gmail.com	Ms	Priyanshi Jain	07821814599	R.A.K College of Agricult	3rd year	Student	Male	OBC	Yes
1/21/2022 9:38:23	Sanjayagriboys@gmail.com	Mr.	Sanjay Ahirwar	8253010152	Rak college of agriculture	Bsc(ag) second year	Student	Female	ST	Yes
1/21/2022 9:41:57	pankajkanase1997@gmail.com	Mr	Pankaj kanase	7049922158	College RAK COA Sehore	Bsc ag 2 nd year	Student	Male	GEN	Yes
1/21/2022 9:45:01	ppatidar01071999@gmail.com	Mr	Pawan Patidar	7049377519	R.A.K. College of Agricult	3rd year	Student	Male	SC	Yes
1/21/2022 9:45:38	Phalendrakumarbhasker@gmail.com	Mr.	Phalendra Kumar Bhaske	+917898185623	Rvskvv Rak college of ag	Msc final year	Student	Male	ST	Yes
1/21/2022 9:47:13	rishabhpatidar0001@gmail.com	Mr.	Rishabh Patidar	7999918004	RAK college of Agriculture	4th year	Student	Male	OBC	Yes
1/21/2022 9:54:09	shivamvasure2203@gmail.com	Mr	Shivam vasure	9301957947	R A K college of agriculture	B.sc ag hon. 2021	Student	Male	SC	Yes
1/21/2022 9:58:28	munnalalgirwalmunnalalg	Mr	Munnalal girwal	8827743608	B.M college of agriculture	2 year	Student	Male	OBC	Yes
1/21/2022 9:58:51	surywanshilucky@gmail.com	Mr. Lucky	Lucky	9516887885	B.M.college of agriculture	3rd year	Student	Male	SC	Yes
1/21/2022 9:59:26	satishrayatwar2000@gmail.com	Mr.	Satish Rayatwar	6267252908	BM College of agriculture	Bsc. Agriculture , 3rd year	Student	Male	ST	Yes
1/21/2022 9:59:28	Prakashpp122000@gmail.com	Mr.	Prakash patel	7610576298	B. M. College of agricultur	4th year	Student	Male	SC	Yes
1/21/2022 9:59:49	raghuvanshideeksha120@gmail.com	Ms.	Deeksha Raghuwanshi	9826424441	RAK college of agriculture	Third year second semest	Student	Male	OBC	Yes
1/21/2022 10:00:06	vijayverma9630168857@gmail.com	Mr.	Vijay verma	9630168857	B.m.college of agriculture	B.sc.(Hons.) agriculture 3r	Student	Female	GEN	Yes
1/21/2022 10:01:06	Ram980808@gmail.com	Mr.	Ram Patel	9174174471	College of agriculture kha	2nd year 1st sem	Student	Male	OBC	Yes
1/21/2022 10:06:36	Rajkumarrathore1463@gmail.com	Mr.	Rajkumar rathore	7300181601	B.m.College of agriculture	3rd year	Student	Male	OBC	Yes
1/21/2022 10:07:33	devenpatidar436@gmail.com	Prem chandra	Devendra patidar	7987246742	BM college of agriculture	4th year	Student	Male	OBC	Yes
1/21/2022 10:07:49	chouhanpankaj440@gmail.com	Mr.	Pankaj Chouhan	8878654073	B M College of Agriculture	4th year	Student	Male	OBC	Yes
1/21/2022 10:10:45	sarvagya.shukla90@gmail.com	Mr.	Sarvagya Shukla	8720852819	R.A.K. College of Agricult	B.Sc.(hons.) Agriculture 2	Student	Male	ST	Yes
1/21/2022 10:13:31	sharmilagehlod787@gmail.com	Ms.	Sharmila Gehlod	7879254628	Rak college of Sehore	B.sc (agri.) 2nd year	Student	Male	GEN	Yes
1/21/2022 10:14:38	Pawankokandha@gmail.com	Mr.	Pawan kokandha	7566619868	College	3rd year second sem	Student	Female	ST	Yes
1/21/2022 10:17:29	gyansingh10795@gmail.com	Mr.	Gyansingh Tad	8349745161	Coa khandwa	3 rd year	Student	Male	ST	Yes
1/21/2022 10:17:59	rahulsingra,put2002@gmail.com	Mr	Rahul rajpoot	9301763324	RAK college of agriculture	Bsc ag 2nd year	Student	Male	ST	Yes
1/21/2022 10:18:21	roj2011@gmail.com	Dr	Dr R C JAIN	+9826449874	RAK College of Agriculture	Sehore,MP	Student	Male	GEN	Yes
1/21/2022 10:21:01	laxminagar118@gmail.com	Ms.	Laxmi Nagar	9301641982	RAK College of Agricultur	Bsc ag 2 nd year	Faculty/Scientist	Male	GEN	Yes
1/21/2022 10:21:47	nandinisawle2020@gmail.com	Ms.	Nandini sawle	8085326685	B.m. clg of agriculture	khs 3rd year	Student	Female	OBC	Yes
1/21/2022 10:26:17	patelshivam1200@gmail.com	Mr.	Shivam patel	9753756409	BM College of agriculture	Bsc. ag (II-YEAR)	Student	Female	SC	Yes
1/21/2022 10:29:07	nancy.rathore100@gmail.com	Ms	Nancy Rathore	96443 60676	Rak college of Agriculture	2 year	Student	Male	OBC	Yes
1/21/2022 10:29:56	vikaspagri@gmail.com	Mr.	Vikas padha	7006218740	Agriculture production and		2022 Other	Female	OBC	Yes
1/21/2022 10:31:52	yoyalukey175@gmail.com	mr	YOYAL UIKEY	06260877985	RAK COLLAGE OF AGRI	2nd year	Student	Male	GEN	Yes
1/21/2022 10:32:32	hsmantrathod430@gmail.com	Mr.	Hamant Rathod	7069944596	B.M. COLLEGE OF AGRI	B.sc (Ag.) IV year	Student	Male	ST	Yes
1/21/2022 10:34:33	rp12912rj@gmail.com	Mr.	Raj Patel	7987845355	College (B.M. College of A	4th year (final year)	Student	Male	OBC	Yes
1/21/2022 10:36:17	123rohitsulya@gmail.com	Mr	Rohit Sulya	7354726879	RAK Agriculture college s	3rd year	Student	Male	OBC	Yes
1/21/2022 10:40:06	Patidarprachi490@gmail.com	Ms.	Prachi patidar	8103070945	B.M. College of Agricultur	2nd year	Student	Male	ST	Yes
1/21/2022 10:40:07	bhaydiyaramesh222@gmail.com	Mr	Ramesh bhaydiya	8720895063	Coa khandwa	4th year	Student	Female	OBC	Maybe
1/21/2022 10:47:14	Rathoresaniya4@gmail.com	Ms	Saniya rathore	8103812860	Rak college of agriculture	Bsc(hons) ag. 2nd year	Student	Male	ST	Yes
								Female	OBC	Yes

Timestamp	Email	Title (Dr./Mr./ Mrs./Ms.)	Name	Mobile No. (Whatapp No.	College/Institute/Organiza	Class & Year	Designation	Gender	Category	Are your attending the Lecture?
1/21/2022 10:48:32	kumar0330@gmail.com	MR.	TEKESHVAR	9669837586	R. A. K COLLEGE, SEHC	2020-21	Student	Male	SC	Yes
1/21/2022 10:48:51	mohitmeena0102@gmail.	Mr.	Mohit meena	7566745120	College	4th year	Student	Male	OBC	Maybe
1/21/2022 10:49:24	jitendrachouhan010791@	Mr.	Jitendra Singh Chouhan	9039685329	B.m. college of agriculture	4year	Student	Male	ST	
1/21/2022 10:50:25	rohitp69588@gmail.com	Student	Rohit parte	6263389608	Bm college of agriculture	3rd year	Student	Male	ST	Yes
1/21/2022 10:50:30	malviyashalu275@gmail.c	Ms.shalu malviya	Shalu malviya	8815297511	Rak sehore	2 year	Student	Female	SC	Yes
1/21/2022 10:51:55	tcjraa,ecr@gmail.com	Mr.	Ajeet patidar	8878212473	B.M college of Agriculture	4 year	Student	Male	OBC	Yes
1/21/2022 10:53:42	sapnarathod2408@gmail.	Ms	Sapna Rathod	8223028509	Bm college of ag khandwa	4th year 1st semester	Student	Female	OBC	Yes
1/21/2022 10:53:58	mahore1999shivani@gm	Ms	Shivani Mahore	7999213425	B M COLLEGE of Agricult	4	Student	Female	SC	Yes
1/21/2022 10:54:06	goyal75vishal@gmail.com	Mr	Vishal	9622572426	Sub Division Agriculture Officer Dharmari		Other	Male	GEN	Yes
1/21/2022 10:54:18	meenakoshigarhwal@gm	Pitam chandra	Meenakshi Garhwal	09399827345	College of agriculture, ind	7th sem 4th year	Student	Female	SC	Yes
1/21/2022 10:54:22	bhuvanasribanoth221@gi	Ms.	Banavath Bhuvana Sri	9391095827	RVSKVV GWALIOR	3rd year	Student	Female	ST	Yes
1/21/2022 10:54:41	Priyankashivgwl99@gmai	Ms.	Priyanka shivhare	8821846570	B. M. College of agricultu	Third semester & second	Student	Female	OBC	Yes
1/21/2022 10:54:52	geetusingh82950@gmail.	Ms.	Geeta	7745995442	AKS University Satna	B.Sc. Agriculture(hons)	Student	Female	ST	Yes
1/21/2022 10:55:04	sagrah786@gmail.com	Ms	Agrahdeep Shrivastava	8720061403	College of Agriculture gw	Bsc(Ag) third year	Student	Male	GEN	Yes
1/21/2022 10:56:16	patidarabhishek827@gm	Mr.	Abhishek Patidar	9179502028	College of Agriculture, Ind	4th Year	Student	Male	OBC	Yes
1/21/2022 10:57:29	pminakshi70@gmail.com	Mrs.	Minakshi	9754240945	B.M.Coklege of agriculture	4th	Student	Female	OBC	Maybe
1/21/2022 11:00:47	devendravbh@gmail.com	Dr.	Devendra Vishvkarma	+918516909190			Faculty/Scientist	Male	OBC	Yes
1/21/2022 11:00:55	dhatrawal987@gmail.com	Mr	Giriraj Choudhary	9987697885	College oh agriculture ind	M.sc. 1st year	Student	Male	OBC	Maybe
1/21/2022 11:01:41	anuradhagoel88@gmail.c	Dr..	Anuradha Goel	+918319592518	Unemployed Since Septe	Faculty	Faculty/Scientist	Female	GEN	Maybe
1/21/2022 11:02:17	ilishreerathore.12345@gr	Ms.	Ilishree Rathore	8349182057	Bhagwantrao mandloi Col	2nd year 1st semester	Student	Female	OBC	Yes
1/21/2022 11:02:19	DINESHNITHARWAL8@g	Mr	Dinesh Kumar Nitharwal	07062570002	A D GROUP	2022	Student	Male	OBC	Yes
1/21/2022 11:02:33	kalpana02gour2003@gm	Miss	Kalpana gour	8085006720	RAK college of agriculture	2nd year ,3rd semester	Student	Female	OBC	Yes
1/21/2022 11:02:47	rs734158@gmail.com	Mr.	Rahul solanki	6265750221	R.A.K COLLEGE OF AGF	2nd year	Student	Male	ST	Yes
1/21/2022 11:02:52	sukhdevkhande99@gmai	Mr.	Sukhdev	6264396747	B.M.college of agriculture	Bsc Ag.3rd year	Student	Male	SC	Yes
1/21/2022 11:02:52	rajnandani.patidar2002@g	Ms.	Rajnandani Patidar	8103086195	B. M. College of Agricultu	2nd year	Student	Female	OBC	Yes
1/21/2022 11:03:19	aditidangode@gmail.com	Ms.	Aditi Dangode	6959450122	Bm College of agriculture	2nd year	Student	Female	ST	Yes
1/21/2022 11:03:27	bamniyarupa999@gmail.c	Ms.	Radha	9131093056	Bm College of agriculture	Second year	Student	Female	ST	Yes
1/21/2022 11:03:31	aayushjain94558@gma	Mr.	Ayush Jain	8269763097	RAK College of Agricultur	B.Sc Ag. (2nd Year)	Student	Male	GEN	Yes
1/21/2022 11:03:35	raju0senani@gmail.com	Mr	Raju senani	97702557491	R. A. k college of agricult	B. Sc (hons) 2nd year	Student	Male	ST	Yes
1/21/2022 11:03:44	djabhishek13852843@gm	Mr	Abhishek Kumar	+918530106933	Shivalik institute of profes	B.sc Agriculture 4th year	Student	Male	OBC	Yes
1/21/2022 11:04:01	saykusolanki@gmail.com	Ms.	Sayku Solanki	8458986541	Bm college of agriculture	2 year	Student	Female	ST	Yes
1/21/2022 11:04:11	yogitadhakad121@gmail.	Mrs.	Yogita dhakad	7725801645	B.m. college of agriculture	2nd year	Student	Female	OBC	Yes
1/21/2022 11:04:21	poojamahada684@gmail.	Ms	Pooja Mahada	6232495265	B.M. college of Agriculture	2year	Student	Female	ST	Yes
1/21/2022 11:04:49	rekharawat5165@gmail.c	Ms	Rekha Rawat	8770767428	BM College of Agriculture	Bsc 2nd year 1st semeste	Student	Female	ST	Yes
1/21/2022 11:04:51	abhishekvaskel98@gmail	Mr.	Abhishek	9644532795	R. A.K. College of agricult	M.Sc.Ag Final	Student	Male	ST	Yes
1/21/2022 11:06:01	Joshiayushi43@gmail.cor	Ms.	Ayushi joshi	9131084937	Bm college of agriculture	4 year	Student	Prefer not to say	GEN	Yes
1/21/2022 11:06:53	Poojamehada684@gmail	Ms	Pooja Mehada	6232495265	B.M. college of Agriculture	2year	Student	Female	ST	Yes
1/21/2022 11:07:05	Saini .88919@gmail .com	Ms	Suman Saini	7697200568	KNK . College of Horticult	Bsc 2nd year	Student	Female	SC	Yes
1/21/2022 11:07:15	Patidarprachi490@gmail.	Ms.	Prachi Patidar	8103070945	B.M. college of Agriculture	2nd year	Student	Female	OBC	Yes
1/21/2022 11:07:22	staillar@gmail.com	Mrs	Shivani Taillar	09691950120	RVSKVV	2nd year 1st semester	Student	Female	SC	Yes
1/21/2022 11:07:44	pawankushwah12@gma	Mr.	Pawan kushwah	9981155156	BM College of agriculture	2nd year 1sem	Student	Male	OBC	Yes
1/21/2022 11:10:29	shrutitomar2205@gmail.c	Ms	Shruti Tomar	6261785226	R.A.K. college of agricult	2nd year 1sem	Student	Female	GEN	Yes
1/21/2022 11:11:59	lokendrapandya111p@gm	Mr.	Lokendra pandya	9691604879	College of agriculture ind	4th year	Student	Male	GEN	Yes
1/21/2022 11:11:59	sufiyasehore2@gmail.cor	Ms.	Sufiya	9752819732	RAK College of Agricultur	B.sc.(Hons.) Agriculture 3	Student	Female	OBC	Yes
1/21/2022 11:12:16	Surps202@gmail.com	Ms.	Surbhi acharya	8349588419	K.N.K college of horticult	2nd year	Student	Female	GEN	Yes
1/21/2022 11:12:22	rahulpathak2550@gmail.c	Mr	Rahul pathak	9109608643	College	2nd year	Student	Male	SC	Yes
1/21/2022 11:12:24	Vimlesh Shakya	Ms.	Vimlesh Shakya	9826203127	R.A.K. College of agricult	Ag. B.Sc. 3 rd year	Student	Female	SC	Yes
1/21/2022 11:16:12	jyotisirsate021@gmail.cor	Miss	Jyoti Sirsate	8959116191	BM COA KHANDWA	4th year	Student	Female	ST	Yes
1/21/2022 11:18:00	Jayeshlongre495@gmail.	Mr.jayesh longre	Jayesh Longre	9131106785	College of Agriculture ind	B.Sc(hons)Ag.2nd year 1s	Student	Male	SC	Yes
1/21/2022 11:18:48	dhakadrakhi0808@gmail.	Ms.	Rakhi dhakad	6261671429	College	3rd year	Student	Female	OBC	Yes
1/21/2022 11:20:12	dhakadrakhi0808@gmail.	Ms.	Rakhi dhakad	6261671429	College	3rd year	Student	Female	OBC	Yes
1/21/2022 11:20:56	mahore1999shivani@gm	Ms	Shivani Mahore	7999213425	B M College of Agriculture	4	Student	Female	SC	Yes
1/21/2022 11:21:06	sandeep12mis@gmail.cor	Mr.	Sandeep patidar	9111139971	College	4th year	Student	Female	OBC	Maybe
1/21/2022 11:21:27	rewapatiyogita@gmail.cor	Ms	Yogita Rewapati	9516836761	Institute	4 th year	Student	Female	OBC	Maybe
1/21/2022 11:22:19	renukabirla1234@gmail.c	Ms.	Renuka birla	9754913481	College	3rd year	Student	Female	OBC	Yes
1/21/2022 11:22:32	shivanimalakar212000@g	Ms	Shivani malakar	8889562411	Bm college of agriculture	Bsc.ag 3rd year	Student	Female	OBC	Yes
1/21/2022 11:22:51	mohitayyar5@gmail.com	Mr.	Mohit kumar	7057690126	COA agriculture, khandwa	4th year	Student	Male	SC	Yes
1/21/2022 11:29:37	chouhankishan572@gma	Pitam Chandra	Kishan Chouhan	7489637203	Bm college of agriculture	4 th year	Student	Male	SC	Yes
1/21/2022 11:31:10	Shalinginare7@gmail.cor	Ms.	Shalini ginare	9340093163	College of agriculture kha	4th yr	Student	Female	ST	Yes
1/21/2022 11:32:04	rp745029@gmail.com	Rohit	Rohit patel	7722980298	Bm college of agriculture,	4th year	Student	Male	OBC	No
1/21/2022 11:32:19	dharmendra0baghel@gma	Mr.	Dahrmendra baghel	7697760930	B.m.college of Ag. Khand	4th	Student	Male	ST	Yes

Timestamp	Email	Title (Dr./Mr./ Mrs./Ms.)	Name	Mobile No. (Whatapp No.	College/Institute/Organize	Class & Year		Designation	Gender	Category	Are your attending the Lecure?
1/21/2022 11:33:21	sumitkheda420@gmail.cc	Mr.	Sumit kheda	9630666254	B.M.college of Agriculture	4th year		Student	Male	SC	Yes
1/21/2022 11:34:34	lochishakuntlasingh@gm	Ms	Sakuntila Singroul	9753136205	College	Bsc Second year third ser		Student	Female	OBC	Yes
1/21/2022 11:36:32	vandnaalawe@gmail.com	Ms.	Vandana Alawe	9926037470	B.M.college of agriculture	B.sc. ag. 4th year		Student	Female	ST	Yes
1/21/2022 11:37:25	sy899726@gmail.com	Mr	Shubham yadav	8839745775	College	4m year		Student	Male	OBC	Yes
1/21/2022 11:37:57	vishnupatidar051@gmail.	Mr.	Vishnu Patidar	9174960839	B.M. college of Agriculture	Bsc ag 4th year		Student	Male	OBC	Yes
1/21/2022 11:38:14	prakashverma9516@gma	Mr.	Prakash verma	9616111418	Khandwa	4 rth year		Student	Male	ST	Yes
1/21/2022 11:38:27	tanusisodiya85@gmail.co	Ms	Tanu sisodiya	8718094799	RAK college of Agriculture	Second year		Student	Female	GEN	Yes
1/21/2022 11:38:39	swatigurjar1704@gmail.c	Dr. Pitam Chandra	Swati Patil	9713542767	B.M. College of Agricultur	4th year		Student	Female	OBC	Yes
1/21/2022 11:39:00	shubhamkushwah708@g	Mr	Shubham kushwah	7470926575	BM College of agriculture	4th year		Student	Male	OBC	Yes
1/21/2022 11:41:14	kamalkharte1@gmail.com	Mrs.	Kamal kharte	9009924888	BM College of agriculture	4th year bsc ag		Student	Male	ST	Yes
1/21/2022 11:47:05	gomaatarum@gmail.com	Mr	CHEJARLA ANJANEYUL	9494930850	HECVERT			Student	Male	OBC	Yes
1/21/2022 11:47:14	gayatrikirade@gmail.com	Ms.	Gayatri kirade	7772022247	RAK College of Agricultur	3rd year		Student	Female	ST	Yes
1/21/2022 11:48:36	sarikapatel47606@gmail.	Ms.	Sarika patel	7746931627	B. M. College of agricultur	B. Sc. Agriculture, 4th ye		Student	Female	OBC	Yes
1/21/2022 11:49:56	ssdhakare1986@gmail.cc	Sarvendra Singh	Sarvendra Singh	9549653481	DBRAU Agra	Research Scholar Phd		Ph.D. Scholar	Male	GEN	Yes
1/21/2022 11:56:31	shubhamsingh271098@g	Mrs.	Shubhamsingh	7354135595	B.m college of agriculture	3 year		Student	Male	GEN	Yes
1/21/2022 11:57:34	dkdc160@gmail.com	Mr	Deepak chouhan	8889506169	Bm college of agriculture	4 th year		Student	Male	ST	Yes
1/21/2022 11:58:27	misskratikasaini@gmail.c	Ms.	Kratika saini	08989119368	College	4th		Student	Female	OBC	Yes
1/21/2022 11:59:54	ankitapandeykvk@gmail.c	Mrs	Ankita pandey	9111811703	Krishi vigyan Kendra dew		2022	Faculty/Scientist	Female	GEN	Yes
1/21/2022 12:00:59	ankitapandeykvk@gmail.c	Mrs	Ankita pandey	9111811703	Krishi vigyan Kendra dew		2022	Faculty/Scientist	Female	GEN	Yes
1/21/2022 12:11:36	vaishalisamakar1999@gr	Ms.	Vaishali Samakar	9171282921	RVSKVV College of Agric	B.Sc(Ag) 4th year		Student	Female	SC	Yes
1/21/2022 12:14:35	sanjeev.khajuria@gmail.c	Mr.	Sanjeev Khajuria	9501763388	Directorate of Agriculture - Jammu			Other	Male	GEN	Yes
1/21/2022 12:31:54	gayatri_84@ymail.com	Dr.	Dr. Gayatri Wfe Mahendra	+919575036055	Krishi Vigyan Kendra,Shajapur			Faculty/Scientist	Female	SC	Yes
1/21/2022 12:32:15	malviyat238@gmail.com	Mr	Tulsi Malviya	7892932751	Bm college of agriculture	3rd		Student	Female	OBC	Yes
1/21/2022 12:33:36	chetnabansal01@gmail.c	Ms.	Chetna Bansal	9179131065	R.A.K. College Of Agricult	B.sc ag 3rd year		Student	Female	OBC	Yes
1/21/2022 12:37:16	satarkarrahul@gmail.com	MR	Rahul Satarker	9826936777	Organization			Faculty/Scientist	Male	GEN	Yes
1/21/2022 12:42:13	Solankihemlata2020@gm	Ms	Hemlata Solanki	9755208001	B. M. College of agricultur	4th year		Student	Female	ST	Yes
1/21/2022 12:47:08	Sagarpatidar88@gmail.cc	Mr.	Sagar Patidar	7000052127	B. M. COLLEGE OF AGR	Msc plant pathology		Student	Male	OBC	Yes
1/21/2022 14:05:26	omyadav2015ktp@gmail.	Mr.	Om Prakash Yadav	+919013147722	Sagra Organic Products Enterprises			Other	Male	OBC	Yes
1/21/2022 14:07:25	saroj23001987@gmail.co	Mrs.	Saroj Yadav	8384959627	Sagra Organic Products Enterprises			Other	Female	OBC	Yes
1/21/2022 14:28:10	amar13032000@gmail.cc	Mr.	Amar Singh	8770613032	College of Agriculture,Indo	B.Sc(Ag) 3rd year		Student	Male	GEN	Yes
1/21/2022 15:16:01	dhansinghmandloi@gmai	Mr.	D. S. Mandloi	9827536457	KVK, Dhar			Faculty/Scientist	Male	ST	Yes
1/21/2022 21:26:22	raghuwanshisatish617@g	Mr.	Satish Raghuwanshi	9754556263	R.AK.	2nd year		Student	Male	GEN	Mayoe
1/22/2022 11:43:17	sumankalsi92@ymail.cor	Mr.	SUMANT KALSI	9149927522	Agriculture Department Udhampur			Other	Male	OBC	Yes

National Webinar

ON

Soil Health: Role of Microorganisms and Soil Organic Matter

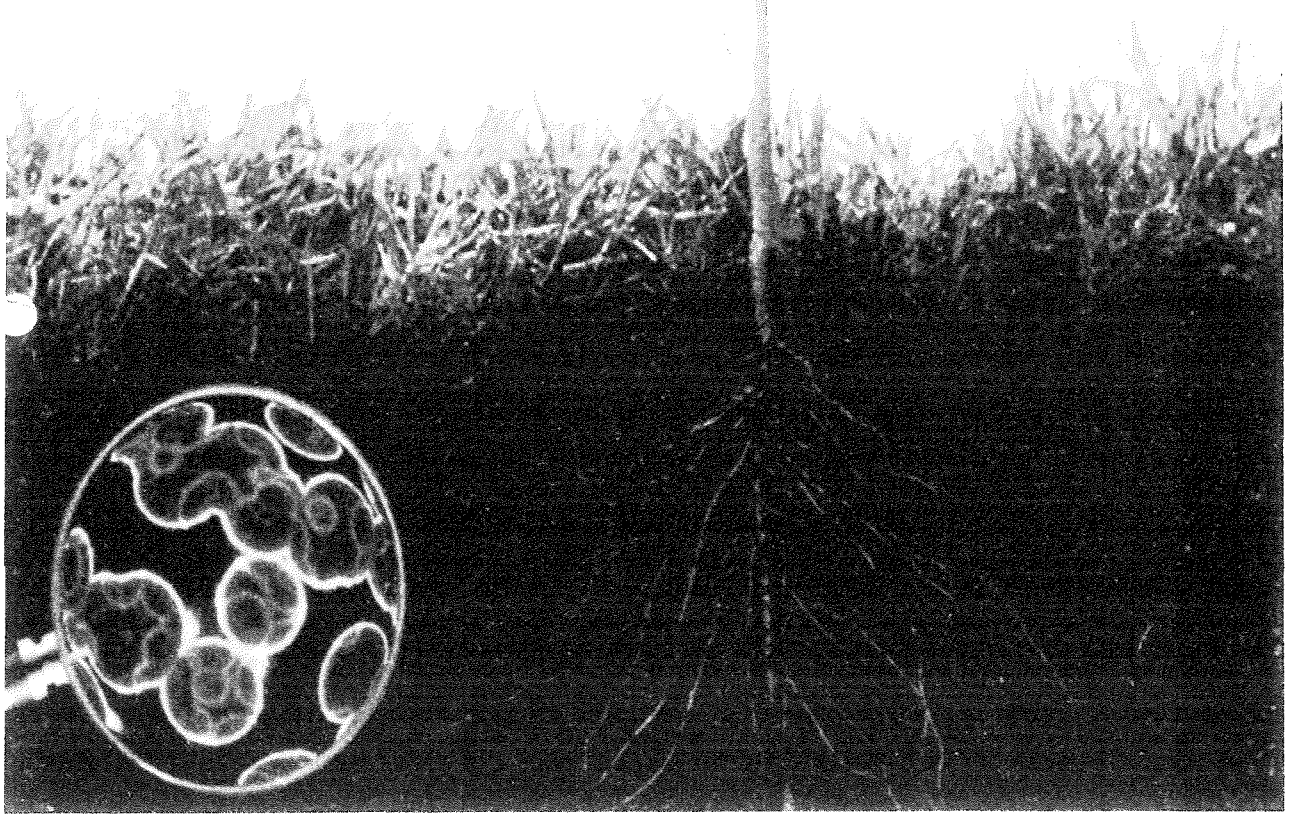
Organized by :

IDP-NAHEP-RVSKVV-Gwalior,
RAK College of Agriculture, Sehore

On 06, July 2020 at 10:00 AM to 1:30 PM

Registration Link: **https://forms.gle/Jxnw36dXQZ5ur6Gv9**

Last date for registration : **03 July, 2020**





Patron

PROF. S.K. RAO

Hon'ble Vice Chancellor
RVSKVV, Gwalior (MP)

Co-Patron	Dr. Mirdula Billore DFA , RVSKVV, Gwalior & Principal investigator, IDP - NAHEP - RVSKVV
Chairman	Dr. M.P. Jain, Director Research Services, RVSKVV, Gwalior
Co-chairman	Dr. A.K. Singh, Director Instructions, RVSKVV, Gwalior Dr. A.K. Singh
Convenor	Dr. S.N. Upadhyay, Director Extension Services, Gwalior
	Dr. H.D. Verma, Dean, RAK CoA, Sehore
Co-Convenor	Dr. S. R. Ramgiry, ADR, RAK CoA Sehore
	Dr. S.K. Trivedi, Professor & Head, Soil Science, RVSKVV, Gwalior
	Dr. S.C. Gupta, Principal Scientist & Head CoA Sehore
Organizing Secretary	Dr. R.C. Jain, Principal Scientist, Soil Science, RAK CoA, Sehore
	Dr. S.K. Sharma, Professor & Head, Soil Science, CoA, Indore
	Dr. Shashi S. Yadav, Scientist (Soil Science), CoA, Gwalior
	Dr. Akhilesh Singh, Co-PI, IDP-NAHEP-RVSKVV-Gwalior
Co-organizing secretary	Dr. M.D. Vyas, Principal Scientist Agronomy, RAK CoA, Sehore
	Dr. Sudhir Bhadauria, Nodal, IDP-NAHEP-RVSKVV-Gwalior
	Ku. Nimisha Jain, Ph.D. Scholar, RVSKVV, Gwalior
Rapporteur	Dr. Ekta Joshi, CoA, Gwalior
	Dr. S.C. Shrivastava, RVSKVV, Gwalior

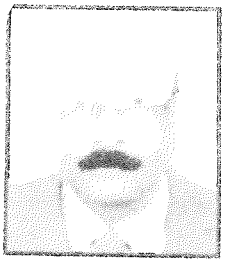
E CERTIFICATES SHALL BE AWARDED TO All REGISTERED PARTICIPANTS ATTENDING THE WEBINAR

Contact Person :

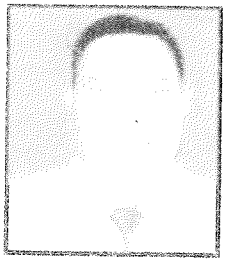
1. Dr. R.C. Jain (M) 9286449874 rcj2011@gmail.com
2. Dr. Akhilesh Singh (M) 8839363581 akhileshsingh01@gmail.com

ganized By: IDP-NAHEP-RVSKVV, Gwalior

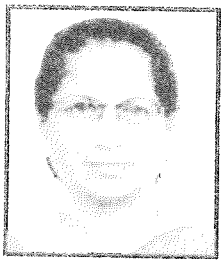
EMINENT SPEAKERS



Dr. D.L.N. Rao
Ph.D., FNAAS, FISSS
Ex-ICAR-Emeritus Scientist,
Project Coordinator (Retd)
(AICRP on BNF; AINP on
Soil Biodiversity Biofertilizers),
IISS, Bhopal,
Adjunct Professor, RVSKVV, Gwalior



Dr. A.K. Saxena
FNAAS, FIAMS
Director ICAR- NBAIM
Kusmaur, Mau



Dr. (Smt.) K Annapurna
Head
Division of Microbiology,
IARI Pusa, New Delhi



Dr Ramakrishnan Bala,
Professor
Division of Microbiology
ICAR-IARI, New Delhi



Dr Monoranjan Mohanty
Principal Scientist
(Soil Physics)
ICAR – IISS, Bhopal



Dr MP Sharma,
National Coordinator Soybean
Microbiology & Principal Scientist,
ICAR –IISR, Indore

Time (Hrs)	Topics	Speakers
10:00	Welcome	Dr. S.K. Sharma, Organizing Secretary
10:10	Inaugural Address	Dr. S.K. Rao, Vice Chancellor, RVSKVV, Gwalior
10:20	Chief Guest Remark	Prof. V.S. Tomar, Former V.C RVSKVV, Gwalior
[illegible]:00	Actinobacteria-Soil Health-Human Health Continuum	Dr. D.L.N. Rao ,Ph.D., FNAAS, FISSS, Ex-ICAR-Emeritus Scientist, Project Coordinator (Retd .) (AICRP on BNF; AINP on Soil Biodiversity Biofertilizers), IISS, Bhopal,
11:00	Bacterial Endophytes for Biofortification of Micronutrients in Crop Plants	Dr. A.K. Saxena, FNAAS, FIAMS, Director ICAR- NBAIM, Kusmaur, Mau
11:30	Legume-Rhizobium Symbiosis in Sustainable Agriculture-microbe to microbiome	Dr. (Smt.) K Annapurna, Head, Division of Microbiology, ICAR-IARI Pusa, New Delhi
12:00	Microbial Carbon Pump (MCP) and Contribution of Microorganisms for Carbon Sequestration in Agro-eco-system.	Dr. Ramakrishnan Bala, Professor, Division of Microbiology, ICAR-IARI, New Delhi
12:30	Prospects of AM Fungi in Sequestering Soil Carbon under Sustainable Agriculture	Dr. M.P. Sharma, National Coordinator Soybean Microbiology & Principal Scientist, ICAR--IISR, Indore
13:00	Conservation Agriculture and Soil Health : Case Study on Vertisols of Central India	Dr. Monoranjan Mohanty, Principal Scientist (Soil Physics) , ICAR – IISS, Bhopal
13:30	Vote of Thanks	Dr R C Jain, Organizing Secretary

"Improving the Visibility Indicators and Research Productivity of State Agricultural Universities"

Chief Guest

Prof. S. K. Rao
Vice Chancellor, RVSKVV Gwalior

Speaker

Dr. K. Veeranjaneyulu

Organizing secretary – Dr. S.K. Sharma, Dr. Akhilesh Singh, Dr. Sudheer Bhadauria

Co organizing Secretary- Dr. Avinash Tomar, Dr. Shiv Bhadauriya, Dr. Swatantra Kumar Sahu, Dr. Narendra Vasure,

27 January, 2022

Time 11:00 to 12:00 AM

JOIN THE WEBINAR ON FOLLOWING LINK:

https://bit.ly/3GXDW2o

Institutional Development Plan

National Agriculture Higher Education Project

Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya,

Gwalior, 474002(M.P.)

PAYMENT RECEIPT

Received from IDP, NAHEP, RVSKVV, Gwalior Rs. 4000 (Rupees four thousand only) for delivering a lecture on dated Jan 06, 2021 as expert in Online webinar on "Agro-forestry & its Ecosystem services".

Handa

PAID

Signature
Dr. A. K. Handa
CAFRI
Jhansi

LAMITA SHARMA

Webinar on

Agro-forestry & its Ecosystem Services

By

Dr. S.L. Swami	Dr. Nanita Berry	Dr. A. Arunachalam
Professor,	Scientist	Director
Deptt. of Forestry	Environmental Science	CAFRI
IGKV, Raipur	TFRI, Jabalpur	Jhansi

Date: January 06, 2021 **Time: 11:00 am to 4:00 pm**

Join the webinar on Google Meet via following link:
https://meet.google.com/zyx-dtty-xpr

PI: Dr. Sanjay Sharma
Co. PI: Dr. Akhilesh Singh
Coordinator: Dr. V. B. Singh

Nodal Officer (EVS): Dr. Amita Sharma
Co-coordinators: Dr. Shashi S Yadav
Dr. Ekta Joshi
Dr. Sudhir S. Bhadouria

RVSKVV, College of Agriculture, Gwalior (M. P.)

Webinar on

Agro-forestry & its Ecosystem Services

By

Dr. S.L. Swami
Professor,
Deptt. of Forestry
IGKV, Raipur

Dr. Nanita Berry
Scientist
Environmental Science
TFRI, Jabalpur

Dr. A. Arunachalam
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RVSKVV, College of Agriculture, Gwalior (M. P.)

Behind Jhawar Estate,
Mayur Nagar, Near Thatipur Square,
Gwalior (MP)
+91 900 – 947 – 78910
+ 91 722 – 301 – 1484
wingsgwl@gmail.com
www.educationatwings.com

Registration No: C/814527

Bill to
PI, IDP-NAHEP
RVSKVV,
Gwalior,
Madhya Pradesh

Invoice: *INV/2021/ONL-Seminar/0025*

Invoice Date: *27/01/2021*

SN	Service Description	Duration	Amount
1	Online Seminar: Scope of Study Abroad in Agriculture	1 Day	4000/-
Grand Total			**4000/-**

Amount in words: Four thousand only

We thank you for taking our services

Authorised Signatory

PAID

IDP-NAHEP, RVSKVV GWALIOR
ENTERED STOCK REGISTRAR
Permanent/Consumable
Page No. 12 Date 27/01/21
Account No. 4000

Dr. Shashi Yadav, co-cordinator

Online Workshop on "Scope for Overseas Education in Agriculture and Allied Sciences"

BY

Mr. Mandeep Singh (Wings Edu. Academy, Gwalior)

Mr. Prem Yadav (Senior Consultant, IAE Global)

Date:18 December 2020 Time: 11:00 AM to 2:00 PM

To Join the workshop Download the platform: Wings Edu from Play store

Coordinator: Dr. V.B. Singh

Co-coordinators: Dr. Shashi S. Yadav
Dr. Ekta Joshi
Dr. Sudhir S. Bhadouria

PI: Dr. Sanjay Sharma

Co. PI: Dr. Akhilesh Singh

RVSKVV, College of Agriculture, Gwalior (M.P.)

F/sc F/ST m/OBC M/sc m/ST
2 1 11 3 2

← Batch Name: Agriculture- Scope of Study Abroad

Scoreboard

	Rank	Student	Points Won/Played		Win points by challenging your friends!	How?
I	-	AASHISH PATIDAR	-/-	M	OBC ✓	
II	-	Aditi Shrivastava	-/-	F	Gen	
II	-	Agrahdeep shrivastava	-/-	M	Gen	
II	-	Ajay Bhalwara	-/-	M	Sc ✓	
II	-	Ajnaly Yadav	-/-	F	ST ✓	
	-	Akanksha	-/-	F	Gen	
III	-	Akansha gaur	-/-	F	OBC ✓	
	-	Akash	-/-	M		
	-	Akshay Kumar	-/-	M		
IV	-	Amisha chouhan	-/-	F	ST ✓	

	-	Ankit Patel -	-/-	
	-	Ankita Anupam	-/-	
	-	Anshul Patel -	-/-	
	-	Anupama	-/-	
	-	Atul Singh jadon -	-/-	
	-	Avinash-	-/-	
	-	Bheem Singh Jatav -	-/-	
	-	Chandrika Chaturvedi	-/-	
	-	Deepika mujalde	-/-	
	-	Deepika Nagar	-/-	
	-	Deepika Tiwari	-/-	
	-	Diksha Sharma	-/-	

(116)

RAJMATA VIJAYARAGE SCINDIA KRISHI VISHWA VIDYALAYA

Acct-14 Payment Advice No. CO2109232694 P.W. Form. III

CONTIGENT BILL

Bill No. 334 Date 07/01/2020

(For use in the offices of Heads of Department and other office)

DISTRICT Place: Gwalior	Detailed bill of Contingent Charges of the OFFICE OF THE, PI, RVSKVV, GWALIOR For the Month: December, 2020	Voucher No. ..... Dated..... List of payment of the Month of.....
	HEAD OF ACCOUNT Operational (ICAR) NAHEP – IDP, RVSKVV GWALIOR	IDP-NAHE,RVSKVV,GWALIOR VOUCHER No. 163 DATE. 07/01/21 C.B. PAGE No. 4/4
Number of Sub-Voucher	Description of charges with number and dates of Authority for all charges requiring special sanction	AMOUNT Rs. P.
	Payment to Swati Jain Academy, Education group, Indore for delivering online lecture on 11.12.2020 COA, Indore	3000=00
	Carried over.....	TOTAL = 3000=00 G.T. =

Note:-1.Detailed classification should be recorded prominently in RED INK in manuscript or by rubber stamp in the blank space provided at top.

2. Erasures are absolutely forbidden incorrect entries must be cancelled neatly in RED INK and the correct entry interlined. Each correction must be attested by the Drawing and Disbursing officer it is in the order for payment.

IDP-NAHEP (NATIONAL AGRICULTURE HIGHER EDUCATION PROJECT-INSTITUTIONAL DEVELOPMENT PROGRAM)

OPPORTUNITY FOR AGRICULTURE GRADUATE AND SCIENTISTS ABROAD

Conducted by Dr. Swati Jain Education Group, Indore

Friday, 11th December, 2020 from 11:00AM-12.30 PM IST

Join us on Zoom Id : 2880593606

Organized By

Dr. Ashok Krishna, Nodal Officer

Dr. Swati Barche, Co-cordinator

Dr. A. K. Badaya, Co-cordinator

College of Agriculture, Indore

(V)

Participation in NIRF and other recognized ranking like Shanghai Ranking,

QS Ranking Times Ranking etc

Submission of New Information

(Sharing for the first time)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

National Institutional Ranking Framework
Ministry of Education
Government of India

India Rankings 2024:Participated Institutes Agriculture and Allied Sectors

Institution list in alphabetical order

Back

Show 100 entries Search:

Name	City	State
Rajasthan University of Veterinary & Animal Sciences	Bikaner	Rajasthan
Rajiv Gandhi College of Veterinary & Animal Sciences	Puducherry	Pondicherry
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior	Gwalior	Madhya Pradesh
RAMA UNIVERSITY UTTAR PRADESH	Kanpur Nagar	Uttar Pradesh
Rani Lakshmi Bai Central Agricultural University	Jhansi	Uttar Pradesh
RIMT University	Mandi Gobindgarh	Punjab
RKDF University	Bhopal	Madhya Pradesh
RNB Global University	Bikaner	Rajasthan
SAGE University Indore	Indore	Madhya Pradesh
Sangam University	Bhilwara	Rajasthan
Sanjay Gandhi Institute of Dairy Technology, Patna	patna	Bihar
Sanskriti University	MATHURA	Uttar Pradesh
Sardar Vallabhbhai Patel University of Agriculture & Technology	Meerut	Uttar Pradesh
Sardarkrushinagar Dantiwada Agricultural University	Palanpur	Gujarat
Sher-e-Kashmir University of Agricultural Science and Technology of Jammu	Jammu	Jammu and Kashmir
Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir	Srinagar	Jammu and Kashmir
Shree Guru Gobind Singh Tricentenary University	Gurgaon	Haryana
Shri Guru Ram Rai University	Dehradun	Uttarakhand
Shri Sai Janvikas Pratishtan`s College of Agriculture,	Vaijapur	Maharashtra
SHRIRAM COLLEGE OF AGRICULTURAL ENGINEERING, PANIV	Malshiras	Maharashtra
Sri Guru Granth Sahib World University	Fatehgarh Sahib	Punjab
Sri Karan Narendra Agriculture University	JOBNER	Rajasthan
Sri Konda Laxman Telangana State Horticultural University	Hyderabad	Telangana
Sri Satya Sai University of Technology & Medical Sciences, Sehore	Sehore	Madhya Pradesh
Sri Venkateswara Veterinary University	Tirupati	Andhra Pradesh
Suresh Gyan Vihar University	Jaipur	Rajasthan
Tamil Nadu Agricultural University	Coimbatore	Tamil Nadu
Tamil Nadu Dr.J.Jayalalithaa Fisheries University	Nagapattinam	Tamil Nadu
Tamil Nadu Veterinary and Animal Sciences University	Chennai	Tamil Nadu
Tulas Institute	Dehradun	Uttarakhand
Udai Pratap College, Varanasi	Varanasi	Uttar Pradesh
University of Horticultural Sciences, Bagalkot	BAGALKOT	Karnataka
University of Agricultural Sciences	Bengaluru	Karnataka
University of Agricultural Sciences	Dharwad	Karnataka
University of Agricultural Sciences, Raichur	Raichur	Karnataka

(VI)

Any other quality audit recognized

by state, national or international agencies

(ISO Certification, NBA and such others)

(Submission of information with Relevant documents previously not enclosed)

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, GWALIOR (M.P.)

ISO 14001:2015

Certificate of Registration

This is to Certify That
Environmental Management System of

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWAVIDYALAYA

RACE COURSE ROAD, GWALIOR, MADHYA PRADESH - 474002,
INDIA

has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :

PROVIDING ADMINISTRATIVE SUPPORT FOR THE EDUCATION, RESEARCH AND EXTENSION ACTIVITIES FOR ENHANCING PRODUCTIVITY OPTIMIZATION OF PROFIT AND SUSTAINABILITY OF AGRICULTURE PRODUCTION SYSTEM.

Certificate No	: **24MEEST07**		
Initial Registration Date	: 18/05/2024	Issuance Date	: 18/05/2024
Date of Expiry	: 17/05/2027		
1st Surve. Due	: 18/04/2025	2nd Surve. Due	: 18/04/2026

DIRECTOR

EGAC Accredited
EMS Certification
CAB # 011805

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

Magnitude Management Services Pvt. Ltd.

Third Floor, A-60, Sector-2, Noida, Gautam Budh Nagar, U.P.-201301, India. ***e-mail:*** *info@mmscertification.com,* ***website:*** *www.mmscertification*

**Subject to Successful Surveillance Audit n case Surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal*
Certificate Verification: *Please Re-check the validity of certificate at http://www.mmscertification.com/activeclients.aspx or www.mmscertification.com at Active Cli*
Certificate is the property of Magnitude Management Services Pvt. Ltd. and shall be returned immediately when demanded.

ISO 9001:2015

Certificate of Registration

This is to Certify That
Quality Management System of

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWAVIDYALAYA

RACE COURSE ROAD, GWALIOR, MADHYA PRADESH - 474002, INDIA

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

PROVIDING ADMINISTRATIVE SUPPORT FOR THE EDUCATION, RESEARCH AND EXTENSION ACTIVITIES FOR ENHANCING PRODUCTIVITY OPTIMIZATION OF PROFIT AND SUSTAINABILITY OF AGRICULTURE PRODUCTION SYSTEM.

Certificate No	: **24MEQRG53**		
Initial Registration Date	: 15/04/2024	Issuance Date	: 15/04/2024
Date of Expiry	: 14/04/2027		
1st Surve. Due	: 15/03/2025	2nd Surve. Due	: 15/03/2026

DIRECTOR

EGAC Accredited
QMS Certification
CAB # 011805

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

Magnitude Management Services Pvt. Ltd.

Third Floor, A-60, Sector-2, Noida, Gautam Budh Nagar, U.P.-201301, India. e-mail: info@mmscertification.com, website: www.mmscertificati

**Subject to Successful Surveillance Audit n case Surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal*

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Certificate is the property of Magnitude Management Services Pvt. Ltd. and shall be returned immediately when demanded.

Certificate

ENERGY AUDIT

Academic Year 2022 - 2025

This is to certify that

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

Gwalior, Madhya Pradesh

has achieved the energy uses standards for the learning spaces with least impact on environment during the Green University Audit - 2022-25.

This Certificate is issued on the bases of Green University Audit Report 2022-25

GREEN MENTORS
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Special Consultative Status with the Economic and Social Council of United Nations from 2021
www.greenmentors.in

14-09-2024
Virendra Rawat
Director, Green Mentors

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GM/EYA/2024/061/E1

EARTH WATER AIR LIGHT SPACE

ENVIRONMENT AUDIT 2022-25

EDUCATION INNOVATION HYGIENE SPACE TRANSPORT

Certificate

This is to certify that

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

Gwalior, Madhya Pradesh

has achieved the global standards for environmental responsibility with academic accountability for the Universities during the Green University Audit - 2022-25

This Certificate is issued on the bases of Green University Audit Report 2022-25

GM/EA/2024/61/E

GREEN MENTORS
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In Association

GREEN MENTORS inc
New York | USA

14-09-2024
Virendra Rawat
Director, Green Mentors

ACCREDITATION CERTIFICATE

ACCREDITED GREEN UNIVERSITY

PLATINUM

2022-2025

EARTH WATER AIR LIGHT SPACE

EDUCATION INNOVATION HYGIENE SPACE TRANSPORT

This is to certify that

RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA

Gwalior, Madhya Pradesh

has successfully achieved the Accreditation Standards designed and defined by Green Mentors for Global Readiness in Ensuring Ecological Neutrality associated with Teaching and Learning practices, and now is Accredited as a

GREEN UNIVERSITY

in Platinum Ranking.

14-09-2024

Virendra Rawat
Director, Green Mentors

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New York | USA

GREEN MENTORS

GM/GA/2024/061/G1

This Certificate is issued on 14th September, 2024 & Valid till the Academic Year 2025

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
कृषि अनुसंधान भवन-II, पूसा, नई दिल्ली-110012
Krishi Anusandhan Bhawan-II, Pusa, New Delhi - 110 012
Website: www.icar.gov.in

F.No. Edn./EQR/1/41/2020-Accre. **Dated: 1st May, 2023**

Notification

As per the decision of the National Agricultural Education Accreditation Board (NAEAB) in its 33rd meeting held on March 29, 2023 regarding accreditation of the university/ programmes/ college, the approval of the Competent Authority of the Council is hereby conveyed that **Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior** have been granted accreditation for a period of five years with effect from **28/03/2021 to 27/03/2026.**

Further, the university/college needs to abide by the following requirements during the entire period of accreditation.

1. Self-Study Reports of all accredited programmes should be uploaded on university website with intimation of necessary link immediately.
2. University/college should annually upload intake data of students in all accredited degree programme(s), college-wise faculty positions on its website for information of stakeholders.
3. Student intake capacity of the accredited UG/PG/PhD degree programme(s) must be maintained during the accreditation period. Any increase in the student intake capacity during accreditation period without permission of the NAEAB will be liable to cancel the accreditation.
4. Strength of faculty/technical /supporting staff as listed in latest year of Self-Study Reports must be maintained by the university/college/programme.
5. A mid-term review will be conducted on actionable points (Annexure-II). The university is required to address the observations on actionable points in a time bound manner and submit Action Taken Report (ATR) accordingly.

Yours faithfully,

01/5/2023

(Rajesh Kumar Jha)
DS (Agril Edn. & NAHEP)

Encl: As Above:

Copy to:

1. The Vice-Chancellor Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Email: vcrvsaugwa@mp.gov.in / vc@rvskvv.net
2. The Office of the Chancellor, Government of Madhya Pradesh, Email: adcrajbhavan@mp.gov.in
3. The Chief Secretary, Government of Madhya Pradesh, Email:cs@mp.nic.in
4. The Principal Secretary, Government of Madhya Pradesh, Email: psagriculture@mp.gov.in
5. PSO to Secretary, DARE & DG, ICAR, Krishi Bhawan, New Delhi-01 for kind information.
6. . PPS to DDG, Agril Edn, KAB-II, Pusa Campus, New Delhi-12, for kind information.
7. Concerned file/Guard file