

## HORTICULTURE

- Fruits and vegetables are also recognized as **protective foods**.
- **Vitamin B2(Thiamine)**-Loss of sensitivity of skin, paralysis, enlargement of heart, loss of appetite
- **Vitamin B2 (Riboflavin)** required for growth and health of the skin abundantly present in pomegranate.
- Deficiency of phosphorus leads to bleeding of gums.
- Fruits and vegetables which contain, CHO's are called '**Energy Foods**'.
- Fruits and Vegetables also supply roughages (Cellulose and pectin's) – prevents constipation.
  - Tree fruits
    - Deciduous - Pome fruits – sycykebt Eg: Apple, Pears
    - Drupe fruits (Stone fruits) Eg: Peach, Plum
    - Ever green fruits. Eg: Mango, Sapota, Citrus, Papaya
- Small fruits – Eg: Grape, raspberry, black berry.
- Nut fruits – Eg: Coconut, almond.
- Vine crops – Cucumber, pumpkin, squash.
- Cole crops – Cabbage, Cauliflower.
- Salads – Lettuce, Coriander.
- Perennials – Asparagus, drumstick.
- Greens – Spinach, Palak.
- **Arboriculture – Raising of perennial trees for shade (or) avenue. Eg: Eucalyptus, Casuarina.**
- Fruit technology – Processing and preservation of fruits.
- **High temperature in tomato wilt result in blossom end rot; in lettuce tip – burn and “Bolting of onion”.**
- **More common form of killing by freezing – Intracellular ice formation.**

- Root injury when the soil temperature drops below – 100C to – 150C.
- Immaturity of the tissues is the chief factor associate with early winter injury.
- **Plant which are unable to stand low temperature even for a single night are called “Tender plants”.**
- Rest period – Unfavorable conditions with in the plant.
- Dormant period – Unfavorable conditions in environment.
- The influence of light intensity is due largely to its effects on “Photosynthesis”.
- **Blue light** – Normal leaves and stem stunted growth.
- **Blue + Red** – Photosynthesis.
- **Red** – elongation of plant parts.
- Length of the day controls the time when “Protein synthesis” takes place.
- Fruits that mature during rainy season contain less Sugar and more acid.
- **Citrus suffered in black cotton soils from ‘die-back disease’ in Vodlapudi orange.**
- **Sandy loam soils of Telangana – Chalka soils**
- **Peaty soils are suited for growing spices and plantation crops.**
- **The beneficial effect of wind break is felt a distance equal to three times its height.**
- **There should be a spacing of 12 m between the row of windbreak and the first orchard row.**
- **The angle branches make with the main trunk is known as “Crotch”.**
- Planting should be preferably in the afternoon rather than in the morning.
- Arrangement of plants in the orchard is known as “**Layout**”.
- Trees grown at the centre of the square – **Filler tree.**

• **Hexagonal (or) Septule system** is based on the “equilateral triangles” this system accommodate about **15% more plants** per unit area **than the square system**.

Cultivation is possible in three directions =  $2 \times \frac{3}{4} a^2$

- **In quincunx system double the number of plants of square system**
- The perpetuation of plants is called “**Propagation**”.
- **Viviparous seed – Chow – Chow.**
- The period of rest during which certain favorable physiological changes occur in seed after harvest to the embryo to germinate is called “**After ripening**”.
- Seed coats impermeable to water – **Clover, alfa alfa.**
- Seed coats impermeable to oxygen – **Xanthium.**
- **Stratification – Moist chilling, temperature – 0 – 100<sup>0</sup>c**
- Nucellar embryony – Citrus.
- Polyembryony – Jamun, Mango.
- Graftage – The art of joining two plant parts – roots and stem.
  - a. Grafting – A piece of stem with more than one bud.
  - b. Budding – A single bud is used.
- Swollen base of stem – corm. Eg: Colocasia, Banana.
- Shoot suckers – Banana, Pineapple, Suckers – lateral branch that develop.
- Root suckers – Guava, Curryleaf from the underground portion of the stem.
- **Stolon – An aerial horizontally growing shoot which on contact with the soil strike roots.**  
**Eg: Jasmine, Cynodon dactylon.**
- Runner – Strawgerry, Oxalis.
- Offset – Agave, Pineapple, Waterhyacinth.
- Crowns – Pineapple
- Bulbils – Liliium – Acrial stem bulblets.
- Slips – Stem pieces with 3-4 nodes. Eg: Chrysanthemum slips.

- **Rootage:** In cuttage the roots are induced in the detached portion of plants where
  - as in layer age roots are induced on plants parts when they are intact with the parent plants.
- A layered stem is known as “layer”.
  1. Tip layering – Eg: Strawberries.
  2. Simple layering – Jasmine
  3. Compound layering – Phelodendron – branch is alternately covered and exposed along with its length.
  4. Mound layering – Mango, Guava.
- **The best season to take cutting is from middle of July to middle of February.**
- **In graftage the upper part is termed as “Scion” and the lower part is termed as “rootstock”. The new plant obtained as a result is called “Stion”.The process is procuring and scion is pecured scion.**
- The root stock is selected on the basis of the influence on the ‘Scion’.
- The shoots of mother tree from which the buds are used as scion material is known as ‘**bud wood**’.
- **Top working** is the practice of grafting on established trees which involves the removal of most of their branch system. **To re - juvinate old unproductive tree.**
- A scion is grafted over the already grafted shoot is known as “Doubleworking . It is done to temper the influence of the rootstock.
- “Bridge grafting” is a form of repair grafting and is used in cases in which the root system of the tree has not been damaged but where there is injury to the

bark of the trunk.

- The influence of root stock is more in magnitude as compared to the influence of scion as stock.

- **Precocity: from planting to flowering period – early bearing nature.**

- Effect of root stock on the vigour of the scion on precocity on productivity and yield.
- The major influence of the scion on the rootstock is on the vigour of the stock.

- Graft incompatibility Eg: Apple on pear; Sweet orange on wood apple.

1. **Trans located incompatibility:** This due to the movement of toxic materials through phloem. This is can not be overcome even by inserting an intermediate stock.

2. **Localized incompatibility:** This may be due to repulsive action of stock and scion. This can be overcome by inserting an intermediate stock.

- “Training” is a treatment given to the young plants to get a suitable (or) desirable shape and a strong frame work systems of training.

1. **Close centered system – Strong crotches.**

2. **Open centre system – Weak crotches.**

3. **Modified leader system – practiced in citrus. It is the best system.**

In training branches should arise on the main trunk alternately at intervals of at least **15cm**.

- **Removal of unwanted, surplus annual growth, dead, dried and diseased wood of the plants is “Pruning”.**

- Fruits born an current flush. Eg: Ber, phalsa and grapes.

Method of pruning:

1. **Thinning out:** When a shoot is removed entirely from the jinception.

2. **Heading back:** When a branch is cut almost to the base, leaving a few inches at

stump, carrying few buds, it is referred as “Heading back”.

3. **Pollarding** – Mere cutting back of the shoots to reduce in the height of the tree is “Pollarding”.

4. **Training** – Cutting the growth of the twig.

5. **Pinching (Tipping)** – Removal of the tip of the shoot. This is practiced in marigold and chillies at the time of transplanting.

6. **Disbudding** – Nipping (or) rubbing.

7. **Deblossoming** – Removal of surplus flowers practiced in alternate bearers take Mango, Apple etc.

- In deciduous trees pruning can be done before the termination of dormancy.

- In evergreen, pruning should be carried out just before the start of active growth (or) after the harvest of the crops.

- Trees on light soils flower earlier than those on heavy soils.

- An accumulation of carbohydrates is essential for flower formation.

- **Bahar treatment is given to produce flowers. This is mainly practiced in citrus (Santra) in Nagpur area.**

- Ringing: The bark is removed in the form of a ring from small branches. Ringing is practiced in grape and deciduous fruits in Europe.

- Smudging: Un oxidized hydrocarbons like acetylene and ethylene often induce flowerbud formation. Smudging is a practice based on this principle.

- Rumani prefers Himayuddin polles

- Waves of fruit drop

I. wave (post – setting drop) – This drop is natural and beneficial to the plant. It is a necessary evil.

II. Wave (Summer (or) June drop) – due to high temperature shedding (thinning) helps

the remaining fruits on the tree of increase in size.

III. Wave (Pre-harvest drop) – Cause heavy losses.

- Late rains may prolong the vegetative growth and delay (or) reduce flowering as in

Mango. It can be remedied by drying out the soil by deep ploughing and probably by

artificial inhibition of growth by growth inhibitors (Cycocel B9).

- **The phenomenon in which an asexual reproduction process occur in place of the normal**

**sexual reproduction – Apomixis.**

- **A narrow croatch can be widened by pruning the branch to an outer bud.**

- Light intensity refers to the concentration of light waves.

- The quality of the light refers to the length of wave.

- For cold storage mature fruits while for waxing ripening and immature fruits are

harvested for smoke ripening.

- Colour of seeds is a guide of maturity in pears and in certain apples.

- **“Penetrometer” measure firmness as an index of maturity.**

- **Acidity and as tringency gradually disappear during ripening.**

- Aroma and taste together constitutes the favour. The aroma is cause by the formation of ester.

- **During the time of ripening the rate of respiration reaches a peak and then decline. This**

**peak is referred as “Climteric”.**

**Eg: Banana, Mango.**

- **‘Avocado’ ripen only after harvest and also ‘Panchavarnam’ Mango variety.**

- **Ca carbide pellets placed for uniform yellow colour development also causes loss**

**brightness of colour.**

- **“Ethrel” is the ripening hormone most commonly employed for artificial ripening of**

## **fruits.**

- Pre cooling is done to make the fruits to acclimatize for the low in cold storage chamber.
- **Brown heart: When CO<sub>2</sub> increases in the storage atmosphere.**
- Hot dry winds at blossoming time prevents “Pollen germination”.
- The fruits of sweet orange are juicy and thin skinned if sour orange is used as a root stock.
- Exposing of fruits to gamma ray – Irradiation.
- Toughening of the skin in citrus fruits for loss susceptibility to injury is called as “**Qualiting**”.
- The storage malady that occurs when immature fruits are stored in “Browning”.
- **In Bryophillum propagation through “leaf cutting”.**
- **pH for horticultural crop – 6 – 7.**
- The plant with slender and succulent stems to support in except position are vines.

## **MANGO**

**Krishna is the leading district in Mango production in Andhra Pradesh.**

Mango: *Mangifera indica* F: Anacardiaceae 2n = 40

- Ripe mango is rich source of vitamin A and C.
- Baneshan – leading commercial variety – Susceptible to mangohoppers.

Rumani – Attractive commercial table variety.

Neelum – Suitable for long distant transport

**Alphonso – Leading commercial variety of Maharashtra.**

- Cherakurasam – Suitable for cultivation in drylands.
- Polyembryonic varieties – Bappakai, Goa, Bellary, Salem, Nilexwar dwarf.

Neelaeshan – Neelum X Baneshan.

Neeludin – Neelum X Himauddin

Neelgoa – Neelum X Yerramulgoa



- Swarna – Jahangir – Chinnasuvarna rekha X Jahangir  
A.U. Rumani – Mulgoa X Rumani  
Mallika – Neelum X Dashahari – by IARI.
- Table and juicy variety – Chinnasuvarna rekha  
Early variety – Rajamani,  
Late variety – Mulgoa.  
Off season variety – Neelum., Banglora.  
Pickle variety – Acharpasand, Tellagulabi.  
Variety for preservation Baneshan, Banglore.
- Mulgoa is monoembryolic in India and is poly embryonic in “Florida” (USA).
- Sufficient heat during the ripening of the fruit.
- In “Kanyakumari” mango fruits are obtained all round the year.
- **In arching of approach grafting is the principle method of propagation followed by “Vineer grafting”.**
- **“Kalepadi” variety is dwarfing stock and wild mango variety called “Ulima” (Ceylon) a prolific root stock.**
- Spreading variety – Peter.
- **Mango can withstand deficiency of “Phosphorus” but not “Potash”.**
- **“Dashahari” produce high percentage of perfect flowers.**
- Neelum and Banglore are regular varieties.
- Malformation affects the vegetative shoot is called “Bunchy top”.
- “Bhadran” variety of Uttar Pradesh is resistant and free from the Malformation.

### **BANANA**

Banana: *Musa paradisiaca* F: Musaceae

Adams fig, Apple of paradise.

- **Heart – male bud.**
- **Fruits are called “Fingers”.**
- Poovan (Chekkarakeli) – good keeping quality.
- Amruthapani – best table variety.

- Tella Chakkarakeli – best of banana in circars.
- Basrai – Immune to panama wilt but suffer from bunchy top of disease.
- Nendran – It is a dual purpose variety of great importance in Kerala.
- Hill bananas : 1. Virupakashi – Perennial bananas  
2. Srimalai
- **Banana is propagated vegetatively through suckers and Rhizomes.**
- Removal of dry leaves is called “Trashing”.
- **Banana fruits develop “parthenocarpically” (seedless fruits).**
- **Removal of male bud of the inflorescence give 15% increase in yield.**
- Cutting of the pseudostem on a little above the ground “**Mattocking**”.
- Basrai – Immune to panama wilt and good.
- Poovan - Resistant to panama wilt and good keeping quality.

#### **CITRUS: F: Rutaceae**

- The special feature of citrus fruits is the presence of “**juice sacks**”.
  - Three generas: 1. Citrus 2. Fortunella 3. Poncirus.
- Sweet orange – citrus sinensis; Acid lime – C. aurentifolia  
Lemon – C. limon; Mandarina - C. reticulata.  
Rough lemon – C. jambheri; Vadlapudi orange (kichilli) – C. maodras patna.

Trifoliate orange – Poncirus trifoliate; grape fruit – C. paradisi.

- **USA biggest produce of citrus.**
- Florida produces 90% of the grape fruit in the world.
- Oranges grown in different parts of India are of two species.
  1. Sweet orange
  2. Mandarin orange.
- Varieties of sweet orange – Sathgudi, Mosambi, Batavian.
- The mandarin group includes all types of loose Jacket oranges commonly called “Santhra”.
  1. Sathgudi – Known as Chini.
  2. Batavion – Yellow and green stripes due to “basketting” – pumello is the only

monoembryonic.

- Exotic variety – Valencia late – Late variety – prolific bearer.

## **II. Mandarins:-**

1. Nagpur santhra: Finest of all mandarins.

2. Agency kamala: Variety from grown in Andhra Pradesh.

Exotic variety Kinnow – a hybrid resistant to sun burn with richer juice.

- **The only variety grown lime is called “Kagzi lime”.**

- Tahiti – lime is seedless.

- Rangpur lime is a hybrid between Mandarin and rough lemon.

- Seedless variety of lemon – Melta, Lucknow; Italian.

- **Acid lime can stand heavy rains and resistant to high water level.**

- **Vegetative propagation is shield budding (or) T. budding.**

- **“Mandarins” are largely propagated by seed all over the country except Nagpur santhra**

which is the only budded variety.

- The most commonly used stocks for sweet orange and mandarins are Jamberi (Rough lemon) and Karna Khatta.

- Karna Khatta is satisfactory root stock for grape fruit, Trifoliate orange – hardest root

stock – dwarfing rootstock for sweet orange.

Rangapur lime used as stock for mosambi in Bombay region.

- For “Napur santhra” sweet lime is satisfactory stock.

- **Acid lime is commonly propagated by seed all over the country because the seeds.**

**exhibit a high percentage of polyembryony.**

- Cultivation of solanaceous vegetables as inter crop may be avoided as this may

encourage the development of nematodes which may cause root damage.

1. Angam season – September – February 80% of total annual yield.

2. Gairangam – July – September 15% of total yield.

3. Edagaru – March – May

**GRAPE:-** Vitis vinifera F: vitaceae

- Largest produced fruit of the world.

- “Raisins” varieties are better dried and preserved.
- \_\_\_\_\_ - Delphinidin
- **Banglore blue is a hybrid between V. labrusca X V. vinifera**  
(American grape) (European grapes)

• Commercial classes of grapes :

1. Table grapes - Arab – E – Shahi, Selection No.-7
2. Rasin grapes - Thompson seedless, Kishmish
3. Wine grapes - Carigune, Gross column
4. Sweet juice grapes - Banglore blue “Gulabi”

- Canning group – Thomson seedless. Canner.
- **Grape is commercially propagated through ‘hardwood cutting’.**
- **To avoid aphid problem it is propagated through ‘budding’.**

### **Region Training Method**

1. Bombay -Deccan region - Single stake system
2. Punjab and Haryana - Kniffin system
3. Banglore region Madhurai region Hyderabad - Pandal over head system arbour system

- In single stake system live stocks of erithrina indica are used to support the vines.
- Cardon system similar to kniffin system with the arms spreading in one direction only.
- Inflorescence is opposite to leaf.
- **Spur – A portion of the cane (or) ripened shoot left behind on the plant after pruning.**
- Fruit branches are borne only on one fresh wood called “fruiting spur” of the current season.

### **1. Summer (or) April pruning – Back pruning.**

Only a single bud left at regular intervals of the canes and these new develop into new shoots. Such buds give the foundation for the new crop and are known as

“Foundation spurs”.

### **2. Winter pruning (or) October pruning – Forward pruning 8-10 buds left.**

- During through the cut surface called “Bleeding”.

**Guava:** *Psidium gujava* F: Myrtaceae

- Drink in case of guava called “Guava nectar”.
- Alahabad safeda – It is the most famous variety.
- Kohir – Popular variety of Telangana.
- Seedless variety: Nagpur seedless. 2. Saharanpur seedless.
- Hybrids – Safed jam – Allahabad safed X Kohoir

**Kohir safeda – Kohir X Allahabad safeda**

- **Developed at RARS; anantharajpet – Red fleshed X Saharanpur seedless.**

- Bending the upright branches horizontally giving a drooping position. This method of training is called “Bending”.

- Flowering:

1. **February – Ambe bahar – Insipid**
2. **June - Mrig bahar – Excellent quality.**
3. **October - Hasthe bahar – Chance crop.**

- **The stopping of irrigation and thus making the plant to undergo and consolidate their food reserves in their branches is called “Bahar treatment”.**

**SAPOTA:** (Chiku) *Achras sapota* F: Sapotaceae

- Important : Commercial product – **gutta percha (chicklet)** – Which is the base for **chewing gum.**

Variety 1. Cricket ball, Dwarapudi, Pala, Banglore – grown in circars  
Kirthabatti – egg shape

Kalipatti – leading variety of Bombay.

Baramasi – Year round cropping variety.

- **Propagation – seeds, air layering (It is not used because of granulation is problem).**

- The root stocks commonly used.

1. *Mimosops hexandra* (Khirnee).
2. *Madhuka latifolia* (Bassia)

**PAPAYA:-** Carica papaya F: Caricaceae Origin – Mexico (Tropical America)

Varieties : Washington

- **CO-1 – Selection made in Coimbatore. Good for papain collection.**
- Solo: It produces plants with only female and perfect flowers.
- **Propagated through seeds.**
- **One male plant for a group of 10 female plants (1:10).**
- CO-2 is an improved. Strain from Coimbatore exclusively for “Papain”.
- Selection – 7 produced on

**PINE APPLE:-** Ananas casmosus F: Bromeliaceae

3 types 1. Cayenne group : Kew, Gaint kew.

2. Queen group : Queen – High suckers bearing ability.

3. Spanish group : Red Mauritius, yellow Mauritius.

- Crops can tolerate partial shade.
- “Kew” is the leading commercial variety.
- Mauritius is a mid season variety
- **Propagations through suckers, slips (or) crowns.**

**POMEGRANATE:-** Punica granatum F: Punicaceae

- **The juice is useful for patients suffering from “leprosy”.**
- The edible part of pomegranate is the juicy out growth of the seed called the “Aril”.

Variety

- Alandi (Hard seeded variety); Dholka – Westindies.

In South India – Papershell, Masket red.

- **Seed propagation is common also through hard wood stem cuttings.**
- **Boron deficiency cause cracking of fruits.**
- **The Mrig bahar crop is more susceptible to fruit cracking.**
- Tree begins fruiting in the fourth year.

**FIG: -** Ficus carica F: Moraceae

- **They stimulate blood production and are useful for preventing acute anemia.**

- **At the apex of the fig is a small opening known as “eye”.**

Varieties:

1. Caprifig (Wild fig) – both male and female flowers. **Short style female flowers are adopted for the laying of egg by fig wasp** (Blastopl age).

2. Smyrna fig.

3. Common fig – Capable of developing without pollination.

- Poona – The variety belong to common fig (or) Adriatic fig type. It is bell shaped variety.

- **Propagated by hard wood stem cutting.**

**PHALSA:** *Grewia subinaequalis* (Bush phalsa) F:

Tiliaceae

*G. asiatica* (Tree phalsa)

- **Phalsa is grown mostly from seeds.**

**BER:** *Ziziphus jujube* F: Rhamnaceae

- Propagation of superior varieties by “Shield budding”.

- “Dodhia and Banarsi” varieties are commonly cultivated in Rayalaseema.

- Dodhia variety is said to be resistant to fruitfly attack.

**Jack fruit** : - *Artocarpus heterophyllus* F: Moraceae O:

India

- It gives the largest fruit, which are borne on leafless stalks arising from the trunk.

- Male and female flowers of jack are borne in separate drooping “catkins”.

- Variety: Rudrakshi, Singapore (or) Ceylonjack.

- Carambola: *Averhoa carambola* F: Oxalidaceae.

- Some fruits the fruit is used as a substitute for tamarind in cooking.

- Passian fruit : *Passiflora edulis* F: passifloraceae

- Variety : yellow variety, Purple variety.

**Amla** : *Anola*, Indian gooseberry: *phyllanthus emblica* (or)

*Emblica officinalis*

F : Euphorbiaceae

**Jamun:** Indian black berry : syzygium cumini F:

Myrtaceae

**Apple:** Malus sylvestris F: rosaceae

- Variety 1. Diploids – (self fruitful) - Red delicious, Yellow delicious, Jonathan.
- 2. Triploids – (self unfruitful) – Baldwin, Beauty of both, Cox’s orange pippin.
- “Ambri Kashmiri” is indigenous to Kashmir valley.
- The **presence of lime in the soil is good for apple cultivation.**
- Generally propagated by budding (or) grafting.
- “Malling ix” dwarfing root stock in popular.
- The tree should be trained to modified leader system.
- Some apple trees bear fruit on short crooked growth called as “Spurs”.

**Pear:** Pyrus communis (French pear) (or) European pear – persistent calyx.

F : Rosaceae. P. pyrifolia oriental pear.

- Most of variety are self unfruitful.
- Variety : 1. Bagu gosha – Excellent canning variety.
- 2. Gost baghu – Better keeping quality – Longest variety in Kashmir.
- Nashpati – self fruitful.
- Propagation by “Shield budding”.
- To produce **dwarf pear, trees. Quince ‘C’ rootstock is used.**
- Intermediate root stock – old home.

**Peach:** prunus persica F: Rosaceae

- All variety are self fruitful, except the variety “**J.H. Hale**” which is **male sterile.**
- 1. Elberta – wider climatic adoptability.
- 2. Alexander.
- Propagated by “Shield budding” plum is the better rootstock.

**Plum:** Prunus domestica (European plum)

P. Salicina (Japanese plum) F: rosaceae

- Variety : Santarosa, Victoria.
- Propagation by shield budding.
- Wild apricot (Zardalu) is better root stock.



**Apricot:** Prunus armeniaca F: Rosaceae

- The wild apricot called “Zardalu”.

**Cherry:** Prunus avium F: Rosaceae

- Sweet cherry used as dessert.
- Sour cherry – P. Cerasus used for cooking and canning.

Bits: -

- Hydrophilic colloids are derived from proteins.
- Non climacteric fruit – citrus, apple.
- A mild injury caused to the vessels to stimulate resting buds – Notching.
- Two (or) more buds if developed of the same node of a fruit tree the buds are called “accessory” buds.
- While planting cutting in the nursery bed root polarity has to be maintained.
- **Pollen supply – polliniser.**
- It is very important with root cutting to maintain polarity.

**Tomato :** Lycopersicon esculentum F: Solanaceae O:

Mexican regions of tropical America.

- **Determinate type terminate in a flower bud and called ‘self topping’ (or) self pruning.**

Eg: Pusa early dwarf; CO – 1.

- Indeterminate types terminate in a vegetative bud and often requires staking.

Eg: Pusa ruby, Best of all Sioux.

- Intermediate – Semi dwarf.

Eg: S – 120, Roma.

Small fruited Tomato – L. pimpinellifolium

- **Tomato has a yellow pigment – “carotene” and red pigment “Lycopene”.**

- **Varieties by IARI.**

- Pusa ruby – Sioux X Improved meeruti X Red cloud.
- SL – 120 : A nematode resistant variety.

- Pusa red plum – escaletum X Pimpinellifolium
- Roma – for processing.
- F1 hybrids – Pusa ruby X Best of all.
- **Boron – to prevent fruit cracking; Zinc for higher ascorbic acid content.**
- A period of drought followed by a sudden heavy watering during the fruiting period may cause “cracking of fruits”. Boron deficiency also cause “cracking of fruits”.
- **Extraction of seeds.**
  1. **Fermentation method.**
  2. **Acid (or) alkali method – Avoid discolouration – Acid method is quick and more commonly used.**
- **Intermediate deficiency of soil moisture and deficiency of calcium may cause “blossom end rot”.**
- **“Sioux” is resistant to growth cracks.**
- **“Catface” is an advanced stage of “blossom end rot”.**
- **Root – knot nematode is a common problem in “light red loams”.**
- CO-3 (Maruthum) is a mutant variety.

**Brinjal:** Solanum melongene F: Solanaceae O: India

- **“White brinjal” is said to be good for “diabetic patients”.**
- Based on the length of the style four types of flowers.
  1. Long style
  2. Medium style.
  3. Pseudo style.
  4. True (or) short style.
- Long and Medium – Swollen ovary – fertile.
- **Pseudo and short – rudimentary ovary – do not set into fruits.**
- **S. auriculatum was found immune to little leaf virus.**

Variety:

Pusa purple long – Ratooning variety.

Pusa purple round – Rest to shoot borer

Pusa purple cluster – Rest to bacterial wilt.

- Bagyamathi – A.P.A.U. variety.

Akra kusumakar; Arka nauaneeth – Hybrid = IHR22-1-2-1 X supreme.

Pusa purple long X Hyderpur – Pusa anmol – F1 hybrid.

**Chilli:** - *Capsicum annum*

Bellpeper: *C. fruitscens* O: Peru

- **Alkaloid – Capsicin; Red pigment – Capsathin.**
- Variety: Sindhuri, N.P. 46A, Pusa jwala – root to mosaic and leaf curl.
- Kiran – Rest. To thrips.
- Male sterility was observed in G2 – strain at lam; Guntur.

**Bhendi (Okra):** *Abelmoschus esculentus* F:

Malvaceae O: South Africa

- **The extract obtained from the plant by seeking in water is used as a clarifier in the manufacture of jaggery.**
  - **Fibre formation in the pod from 5th to 6th day of formation and a sudden increase in fibre content may be seen from 9th day.**
  - Variety: Selection – 1 – 1; highly rest. To yellow vein mosaic virus (YMV)
- Pusa – Sawani: Tolerant to YVMV  
Pusa – Makhmeli: Sus. To YVMV
- ***Abelmoschus manihot* – wild species immune to YVMV.**
  - **I.H.R.20-31 retain its tenderness upto 10th day.**

**CUCURBITS:** Summer vegetable, Monoecious, F:

Cucurbitaceae.

- **Dioecious cucurbits: Coccinia and pointed gourd.**
- **Fruit is “pepo”.**
- **Bitter principle – cucurbitacin (Mono glycoside).**
- **Gibberellic acid induces maleness.**

**CUCUMBER:** *cucumis sativus* O: India

- Variety : Japanese long green; Straight eight, Chine – IARI.

I.I.H.R.: Gemini excellent for salads.

- IARI recommended F1 hybrid – ‘Pusa samyog’.

- The fruit maturity in cucumber is judged by the size but not the age of the fruit.

- **Lower temperature causes “blemishes”.**

**PUMPKIN AND SQUASHES:** cucurbita moschata

- Variety: Akra suryamukhi – rest. To common pest of fruit fly Arka Chandan.

- IARI : F1 hybrid – Pusa alankar.

Gourds: O: India

- **Ash gourd when ripe is used for sweet meat known as “Petha and Pethamash cakes”.**

**1. Bitter gourd. 2. Bottle gourd are rich in Iron.**

- **Sponge and ridge gourd contain gelatinous principle “Luffein”.**

- **Ridge gourd variety “Satputia” is a “hermaphrodite”.**

- Pointed gourd and coccinia (Semi perennial vegetables)

**COCCINIA** – coccinia indica

- **Propagation through “Vine cutting” is the best method.**

- Chow – Chow: Perennial vine – Vivipary.

**MELONS:**

Round melon – citrullus vulgris O: India

Water melon varieties – IARI

1. New Hampshire midget – from U.S.A.

2. Ashaki yamato – Tetra ploid X diploids – seedless.

3. **Sugar baby.**

- **“Tetra 2” is a stable tetraploid variety.**

IIHR:

1. Arka jyoti: Hybrid between an American and Indian variety.

- Muskmelon and Snap melon when mature slips out easily from the vine leaving a circular

depression. This is known as “full slip stage”

**COLE CROPS:** F: cruciferae.

- Cole crops are developed from wild cliff cabbage known as “Cole worts”.

- Cabbage: Brassica oleracea variety Capitata

- **Edible portion – leaves covering a terminal bud is known as “Head”**

- Variety:

I. Round head types:

a. Golden acre b. Pride of India.

- **The cabbage varieties with large close head and wrinkled leaves are referred to as “Savoy cabbages”.**

- Pusa drum head (IARI) is a selection from Japanese variety “EC6774”.

- Sudden heavy irrigation after a long dry spell may cause “bursting of head”.

- Seed production:-

1. Head intact method: only across cut is give to facilitate the emergence of the flower stalk.

2. Core intact method: Outside leaves are removed only the central portion is left.

3. Stump method: Head is removed and only the stump is left.

- The last two methods give higher yields of seed.

**CAULIFLOWER: B.O Variety: botrytis**

- Edible part – Curd.

Early variety – Pusa kathi

Mid season variety – Snowball, gaint snow ball, patna main crop.

Late variety – Snow ball -16.

- **Cole crops at high temperature regions produce “Sinigrin” compound which gives Bad odour.**

- Cauliflower crop often shows the deficiency of boron and Mo.

- **The curd is protected against sunscorch and yellowing by covering with outer leaves which is known as “Blanching”.**

- **Whiptail is caused due to the deficiency of ‘Mo’ in acidic soils.**

- **Browning is caused by boron.**

- **Deficiency of nitrogen cause “buttoning” (development of small curds).**

- **Planting of early varieties in the late season also cause.**

- **Blindness is due to low temperature.**

- The flowers open and develop into ‘Siliqua’.

Knol – Khol: B.O. Variety : gongylodes.

- Edible part – Knob (Enlarge stem)

- Variety : White Vienna; purple Vienna.

- Sprouting broccoli: B.O. variety: italic. Edible part – Head.

- Variety : Bronzino – A purple variety of the heading type.

- Brussels sprouts : B.O. Variety : gemmnifera

Edible part - sprouts

- Beans and Peas: F: leguminasea

- Peas are hardy Beans, warm weather except brood bean which is hardy plant.

- French bean: Phaseolus vulgaris O: South America.

- Three types **1. Dwarf bush type – day neutral plants**

  - 2. Semi pole (or) Runner type – Short day plants.**

  - 3. Pole type – long day plants.**

Jampa variety : littering habit.

- Variety : Pusa parvati – developed through ‘X’ ray irradiation contender; giant stringless.

- Deficiency of Ca and Mg result in lower protein content.

Cluster bean:- Cyamopsis tetragonolobus – warm crop.

- “Pusa mausami” variety is suitable for growing only as rainy season crop.

- Pusa sadabhar – Suitable for both summer and rainy season.

- Pusa naubahar

- Used for extraction of seed gum.

Dolichos bean: O: India.

- Variety : Pusa early prolific bean – Dolichos lab lab variety typicus

bean: D.L. lignosis

- DC 1428 cross between garden bean and field bean.

- It is called “Ardhanari” in Tamil.

Cowpea: *Vigna unguiculata*

Variety : Pusa phalguni

- Pusa barsati – Suitable for rainy season.
- Winged bean: *Psophocarpus tetragonalobus* (or) fox tail bean.

Broad bean : *vicia faba*

- Some people are allergic to the pollen of this plant.
- An illness some times fatal and known as “Favism” is caused.

**Pea:** *Pisum sativum*

- Asavgi.
- **NP-29 suitable for dehydration.**
- **Maturity of pea is tested with help of “Tenderometer”.**

Bulb crops: F: *Amaryllidaceae* – winter vegetables.

Onion: *Allium cepa* O: N.W. India.

- **Flowering shoot – scape.**
- **It has pungency due to the presence of “Allyl propyl disulphide”.**
- **Red colour is due to the presence of pigment – “Anthocyanin” and yellow colour in same variety due to the presence of another.**

- **Pigment – ‘quercetin’.**

- Variety: Pusa red – fairly resistant to onion thrips – IARI.
- Bellary bia, Bellary red, Poona red, Potna red – Local variety.

IIHR – Arka Kalyan; Arka Nikatan: Arka pragathi.

- **Physiological problem – Bolting.**

**Seed production: Bulb to seed method: seed to seed method for nucleus and foundation**

**seed production**

- Garlic: *Allium sativum*
- Smaller bulbs known as cloves.
- The typical flavor of garlic is due to the presence of chemical “Allicin” plus “Diallyl disulphide”.

- The local strains that are commonly grown are 1. Jawari gaddi 2. Rajella gaddi

- Leek: *Allium porrum*

- Leek is an bulb forming member of the onion family.

- Variety: “London flag and American flag”.

### **Tuber crops:**

- Potato: *Solanum tuberosum* F: Solanaceae O: South America.

- More than 50% from Uttar Pradesh.

- It is a ‘treasure house of carbohydrates’.

- It has the underground stem know as “Stolon”.

- Variety : CPRI – Simla.

1. Kufri chandramukhi – suitable for making chips.

2. Kufri Alankar

3. Kufri Jyothi – resistant to late blight.

Kufri Muthu – Immune to late blight and wart disease.

Kufri sheetman – frost resistant.

Kufri Chamalkar – Rest to early blight.

Kufri sindhuri – Rest to late blight and frost.

- **Potatoes stored at less than 00C suffer from interval breakdown of tissues known as**

- **“Black heart”.**

- Root tuber: Sweet potato. *Ipomea batatus* F: Convolvulaceae.

- Sweet potato is grown from “Sprouts”.

- **Vine cutting are generally used as propagation material.**

- It is one of the most drought resistant vegetable.

- Variety: Pusa Saffaid; Pusa lal, Pusa Sunhari – IARI. Rich in carotene.

- Local variety: Bhadrakali, Sanrat.

**Colocasia esculenta** : F: Araceae O: India

- **Acridity is due to the presence of needle like crystals of “calcium oxalate”.**

- Elephant foot yarm: *Amorphophallus compenulrtus*. F: Araceae.

- **“Gajendra” is important variety.**



- It is grown from small tuberous outgrowths on corm called as “Cormels”.

Tapioca (Cassava): *Manihot esculenta* F: Euphorbiaceae

- ‘H’ – Series, Srivisaka, Srisahya.
- Propagated by stem cutting.
- Yam (or) *Dioscorea*: *Dioscorea alata* F: Dioscoreaceae
- Its extract is used for treatment of “arthrities”.

Raddish- *Raphanus Sativus* - F: Cruciferae - Var: Rapid ret white, Pusa desi, Pusa Reshmi

Carrot - *Dacus carota* - Umbellifeceae -Pusa Kesar

Turnip - *Brassica rapa* - Cruciferae - Golden ball, Snow ball

Beetroot - *Beta vulgaris* - Chenopodiaceae - Calyx continues to grow after becomes corky and

completely, Covers the seeds. Third form of seed called as “Glom Rule”

Var: Crimson globe

- **The solvent “Benzene” is used for extraction of rose oil.**
- Rose gultmand is preferred for making “rose water”.

**Jasmine : *Jasminum* sps. F: Oleaceae**

*J. auricultum* – Mullai

*J. grandiflorum* – Jathimalli (or) Jaji malli – It is grown for its. Highly fragrant flowers.

*J. Sambac* – Gundu malli – commercially cultivated (or) ‘Arabian jasmine’.

- Jasmynes are propagated through cutting (or) by layering.
- **The essential oil of Jasmine is known in commerce as “Jasmine concrete”.**
- **The oil is extracted from Jasmine flowers by the solvent extraction process. “Petroleum ether” is used as the solvent.**
- **Jasmine concrete is purified by alcohol by means vaccum distillation to produce “Jasmine absolute”.**

Crossandra : *Crossandra infundibuliformis*

- Propagated by seeds. They lack sepals.
- Chrysanthemum: *Chrysanthemum* sp. F: Compositae
- “Autumn queen” in USA.
- National flower of Japan.
- Anemone – Flowers with a tubular central disc.
- Pompon – Very small flowers without any visible centers.
- For decoration and flower shows incured “Chrysanthemum” are used.
- Rooting is practiced.

**Marigold:** *Tagetes creeta* – African marigold (grown commercially for cut flowers)

I. Putula – French marigold – Variety: Gypsy.

- Roots and leaves have insecticidal properties.
- F1 hybrid – ‘Climase’.
- Single signet (*T. tenuifolia*) ideal for edgings and rock gardening.

**Tuberose :** *Polyanthus tuberosa* F: Amaryllidaceae

- Single flowered varieties are most fragments and are used for commercial cultivation.
- Dhavanam (*Artimisia*) – *Artimisia pollens*.
- All vegetables belong to “Angiosperms”.

**Bits:**

- Vegetable forcing garden concerned with the production of vegetables out of their normal season.
- Bitterground – *mimordica charantia*; Musk melon – *cucumis melo*.
- The ray florets are curved backwards and downwards in reflexed type of chrysanthemum.
- The inflorescence of tube rose – Spike, Propagated by Bulbs.
- Edible part of muskmelon – epicarp.
- The variety of Ashgard released by APAU – Shakti.
- Non – pungent chillies are commonly known as “Sweet pepper”.
- In peas wrinkled seeded varieties are more suitable for processing.
- Vegetable rich in protein – Peas.
- Oleri culture literally means “Pot herbs”.

- **Floating vegetable gardens are seen in “Dal” lake of Kashmir valley.**
- **For drying chillies are harvested at red ripe stage.**
- **Semi double type of Jasmine – Dontharamalli.**
- Exhaustion of carbohydrates results in irregular bearing in Mango crop.
- Bud fertility in grape is determined by dissecting the buds under microscope to assess the presence (or) absence of cluster primordia.
- ‘K’ element tends to reduce fruit cracking in Banana.
- “Pumello” is a monoembryonic citrus fruit.
- **Sitaphal plant is not eaten by goats due to the presence of “Anonains”.**
- Atemoya – Anonus squamosa X A. Cherimoya
- Amrapali – Dashari X Neelum (opposite to mallika) – For high density planting.**
- Manjeera – Neelum X Rumari.**
- Arkavathi – Black champa X Thompson seedless.
- Arka kanctan – Arab – E –Shai X Queen of vine gourds.
- Seed dormancy in sithaphal cause stone fruit formation.**
- Citrus sps. Resistant to frost – Trifoliate orange.
- **Best planting material in pine apple – ‘Slips’.**
- For earliest fruit grown by man is said to the Datepalm.
- **The fruit set in mango carried to maturity – 0.1%.**
- Thanges variety recommended for high density percentage – Amrapali.
- Wood apple – Feronia elephant.