

## Week - 9: Cultivation of cherry

### **Objective:**

In this lecture the students will be made familiar with area and production , climatic and soil requirements, varieties, rootstocks and propagation, training and pruning, manure and fertilizers application, after care, irrigation, fruit cracking, harvesting and post-harvest management of cherry.

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## INTRODUCTION

### Taxonomical classification

Order	=		Rosales
Family	=		Rosaceae
Genus	=		Prunus
Sub	genus	=	Cerasus
Species	=		avium
Basic	chromosome	=	8
Somatic number	=16		

### Introduction:

- Cherries occupy an important position among temperate fruits all over the world.
- The cultivated cherries are divided into two main group i.e. sweet cherries ( Prunus avium) and sour cherries (P.cerasus).
- The sweet cherry is mainly used for table purpose and sour cherries for processing.
- Cherries are rich in protein, sugar, potassium, calcium, iron and zinc.
- Sweet cherries are believed to have originated between in area between black and Caspian sea in Southern Europe.
- The earliest records indicate that it was first domesticated in Greece around 300 BC. It spread to Italy from Greece where it was established as a fruit crop by 37 BC. Early settler's brought seeds to North America and part of South America.
- In India, it was introduced by british settler's in Kashmir, Kullu and Shimla hills during pre –independence era.

### Area and production:

- The cherries are extensively grown in all the temperate countries.
- The leading cherry producing countries area USSR, USA, West Germany, Italy and France.
- In the world, it is grown in 381482 ha and fruit production is 2196537 MT (FAO,2009-10).
- In India, it occupies an an area of 3264 ha with a production of 12690 MT and is extensively grown in the state of Jammu and Kashmir, in area of 1110 ha with a production of 605MT and in HP in an area of 453 ha and production is 419 MT (Annon., 2009-10).

### Morphological Characters:

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- Sweet cherry is a tall tree, branches are erect, leaves are large, thin, pubescent beneath and serrated.
- The petioles are long having two or more swollen glands.
- The fruit is cordate in shape, has deep cavity and apex is rounded or pointed
- The floral buds are borne on 2 year old shoot or at the base of 1 year old shoot and found only on lateral, simple flower buds.
- Flowers are white in colour and have 5 petals, numerous stamens, single style and an ovary with a single carpel containing two ovules.
- The fruit colour of cherry varies with varieties and may be yellow, red or purplish black.
- The texture of the flesh is tender or firm, sweet and yellow or red or dark purple in colour.
- On the bases of flesh, sweet cherries have been divide into two pomological groups : Heart Group and Bigarreau Group.
- The Heart cherry varieties. have soft and tender flesh and heart shaped fruits. The fruit colour varies from dark with reddish juice to light coloured with colour less juice.
- The Bigarreau Group of cherries is usually roundish. The colour of fruit and juice also varies from dark red to light red.

## **CLIMATE AND SOIL**

- Sweet cherry requires cool climate.
  - It is grown successfully in areas between 2,000 and 2,700m above mean sea-level, requiring 1,000-1,500hr chilling period during winters.
  - Cherry blossom is very sensitive to spring frost; therefore frost-free sites of hill slope and valley areas with and an drainage of cold air are preferred.
  - Since southern and south –western aspects are warmer, they should not be selected for cultivation at lower elevations.
  - Generally, North-East or North-West aspects are most suitable for cherry cultivation.
  - An annual rainfall of 100-120 cm, well-distributed throughout the year is desirable but high rainfall during flowering results in heavy blossom wilt.
  - At the time of fruit ripening heavy rains causes fruit cracking. Therefore, weather should be dry at the time of fruit ripening and locations having early on set of monsoon should be avoided.
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- A well-drained deep sandy loam soil with pH 6.5-7.0, which can hold, moisture during summer are most suitable.
- The cherry plant is very sensitive to water logging and therefore so heavy soil should be avoided.

## **VARIETIES:**

- About 120 varieties are available in germplasm repository. Most of them belong to sweet cherry group. All varieties are divided into 2 groups.

### **1.Heart Group**

Fruit is heart-shaped having soft and tender flesh. Colour of fruit varies from dark with reddish juice to light coloured with colorless juice. Red Heart, Black Heart are important varieties of this group.

### **2. Bigarreau group**

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Fruit roundish, colour of fruit and juice varies from dark to light red. Sam, Summit, Sue, Sunbrust, Lapins, Compact Stella and hybrid (13-17-40) are new promising varieties.

**Table 1. Recommended varieties of sweet cherry for different states**

State	Varieties
Jammu and Kashmir	Black Heart, Early Purple Black Heart, Guigne Noir Gross Lucenta, Guigne Noir Hative, Guigne Pour ova Precece, Bigarreau Napoleon and Bigarreau Noir Gross
Himachal Pradesh	Black Tartarian, Bing, Napoleon White, Sam, Sue, Stella, Van, Lambert, Black Republican, Pink Early, Black Heart , Early Rivers, Sunbrust, Dero-nero II and Merchant
Uttar Pradesh	Bedford Prolific, Black Heart and Governor's Wood



**Plate 6. Black Heart**



**Plate 7. Bing**



**Plate 8. Stella**

## ROOTSTOCKS AND PROPAGATION

Cherry is propagated by grafting on seedling as well as on clonal rootstocks.

### 1. Seedling rootstock

Seedling rootstocks of cherry are paja (*Prunus cerasoides*), bird cherry (*Prunus paddum*), mahaleb and mazzard.

### 2. Clonal rootstocks

- Clonal rootstocks are commercially recommended for raising its plants as trees on paja show symptoms of delayed incompatibility.
- Clonal rootstocks are Colt, Giesela, Charger, SL64 and Mazzard F 12/1.
- Colt is semi-dwarf, compatible with almost all varieties of sweet cherry, has good anchorage, and is tolerant to gummosis, crown-rot, moderately resistant to stem-pitting virus and bacterial canker but susceptible to oak-root fungus.
- Mazzard F 12/1 is semi-vigorous and difficult-to root rootstock.

## Propagation of seedling rootstocks

- Seeds of paja do not require chilling treatment to break dormancy. It has now been discouraged as rootstock due to delayed in ompatibility, although most of earlier plantation existed on paja rootstock only.
- Seeds of mahaleb and mazzard require stratification before sowing..
- Seeds are soaked in 500 ppm GA3 for about 24hr, then they are stratified by placing between the layers of sand in a cool place at 2 -4oC for 80-120 days for mahaleb and 120-50 days for mazzard to break seed dormancy.
- During stratification, the medium is kept moist.
- As the embryonic root comes out from seed coat, these are transplanted 6cm deep and 10-15 cm apart in rows spaced at 20-25 cm in nursery beds.
- The nursery beds are mulched with 10-15 cm thick hay and irrigated lightly.
- Mulch material is removed when seedlings attain 5-6 cm height.
- The nursery should be regularly watered and kept free from weeds. The seedlings attain graftable size in a year.

## Propagation of Clonal rootstock

- Mound layering or trench layering is the common method of clonal rootstock multiplication.
- The stool beds are established during December by planting healthy mother plants 30-45 cm apart in row spaced at 60-70 cm.
- Before new growth starts, the mother plants are cut back to 2.5 cm above the ground level.
- New shoots develop on the stub in the spring. When the shoots are 25-30 cm long, their bases are covered with a mound of soil or saw-dust, building the mound to a height of 20-25 cm as the shoots grow during spring.
- The suckers are ringed at the base and then covered with soil to encourage rooting.
- In difficult-to-root Mazzard F12/1 root stock, IBA (7,500 ppm) is applied to the ringed portion of the shoots during summer.
- The shoots are separated in winter and then lined out in the nursery beds.
- If the suckers are well-rooted and more than 0.8 cm in diameter, they are grafted in the spring, otherwise they are kept in the bed for a year to produce strong plants for grafting.
- Colt rootstock is easy to root and can also be multiplied through cuttings.
- Hardwood cuttings of 30-45 cm length and of pencil thickness are taken in February.
- Cuttings are treated with IBA (2,500ppm) for 10 seconds and planted in nursery beds for rooting.
- Rooted cuttings are lined out in December and grafted with scion variety in March.

## Propagation of scion:

- Cherry plants are propagated mainly through grafting.
  - Tongue grafting during February-March is recommended, which gives a bud-take of more than 90%.
  - For grafting, the scion wood is collected during winter when the buds are dormant.
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- Scion wood is packed in moss grass and then wrapped in moist gunny bags.
- These packed bundles of scion wood are stored at 2-4 C till these are used for grafting.

### **Planting and planting density**

- In India, cherry cultivation is confined to hilly areas on sloppy lands so the planting is done on contour or terrace system. However, in valley areas, square system of layout is recommended for the establishment of an orchard.
- The planting distance depends upon the soil fertility and the rootstock used.
- A spacing of 6m x 6m is recommended for plants raised on seedling rootstock in Himachal Pradesh.
- For semi-dwarfing rootstock like colt, spacing can be reduced to 4.5 x 4.5 m.
- Pits of 1m x 1m x 1m size are dug and filled with a mixture of 35-40 kg farmyard manure and half kg super phosphate one month before planting.
- The pits are filled at last up to 15 cm above the ground level.
- The best time of planting is December-January.

### **Pollination**

- Since most of the cherry varieties are self-incompatible as well as cross-incompatible therefore compatibility of varieties is required for cross-pollination.
  - There are many cross-incompatible groups and cross compatible varieties within a group should be planted in the orchard for proper fruit set.
  - Care should be taken to see that not only their flowering period overlaps, but they also do not have the same sterility alleles.
  - The varieties which have the same sterility alleles if planted together will not set fruit and require at least one other variety having different sterility allele for better fruit set.
  - The universal donor varieties like Stella, Vista, Vic, Seneca and Vega are good cherries as pollinizer to planted with any variety to get good fruit set provided their flowering period overlaps.
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**Table.2. Incompatibility groups of some important varieties of sweet cherry**

Group	Variety	Sterility allele
I	Bedford Prolific, Black Downton, Black Eagle , Black Tartarian and Early Rivers	S <sub>1</sub> S <sub>2</sub>
II	Bigarreau Schrecken, Black Elton, Black Heart, Clauster Black Victoria Black Waterloo, Merton Bigarreau and Van	S <sub>1</sub> S <sub>3</sub>
III	Bigarreau Napoleon, Emperor Francis, Bing, Lambert and Star	S <sub>3</sub> S <sub>4</sub>
IV	Kentish Bigarreau, White Bigarreau, Sue, Victor, Merton Heart and velvet	S <sub>2</sub> S <sub>3</sub>
V	Bohemian Black, Late Black and Turkey Heart	S <sub>3</sub> S <sub>5</sub>
VI	Elton Heart, Governor Wood and Early Amber	S <sub>3</sub> S <sub>6</sub>
VII	Hedelfingen Monstreuse Mezel, Black Republican and Vic	S <sub>4</sub> S <sub>5</sub>
VIII	Noir de Schmidt, Peggy Rivers, Schmidt and Giant	S <sub>2</sub> S <sub>5</sub>
IX	Red Turk, Black Giant and Ursula Rivers	S <sub>1</sub> S <sub>4</sub>
O	Stella, Vista, Vega and Seneca	Universal donors

- For good pollination, planting should be done in such a manner that plants of one variety adjoins the other in the planting arrangement (Table 3.)

**Table.3. Different planting plans for an effective pollination**

(a) Planting plan for fully compatible cultivars of groups VI, VII and IX where A is an important common cultivar

A	A	A	A	A	A	A	A	A	A	A	Proportion of plants (%)
B	C	B	C	B	C	B	C	B	C		
A	A	A	A	A	A	A	A	A	A	A	A=60
A	A	A	A	A	A	A	A	A	A	A	B=20
B	C	B	C	B	C	B	C	B	C		C=20

(b) Planting plan for fully compatible cultivars of groups VI, VII and IX where A is less an important common cultivar

A	B	A	B	A	B	A	B	A	B	Proportion of plants (%)
B	C	B	C	B	C	B	C	B	C	
A	B	A	B	A	B	A	B	A	B	A=40
C	A	C	A	C	A	C	A	C	A	B=40
A	B	A	B	A	B	A	B	A	B	

(c) Planting plan for partially compatible cultivars of groups I, II and III

A	B	C	A	B	A	B	C	A	Proportion of plants (%)
B	C	A	B	C	B	C	A	B	
C	A	B	C	A	C	A	B	C	A=34
A	B	C	A	B	A	B	C	A	B=34
B	C	A	B	C	B	C	A	B	C=21



## CULTURAL PRACTICES

### Training

- Cherry trees are trained on modified leader systems.
- Plants are headed back at about 60-80 cm at the time of planting.
- The central leader is retained and 3-5 wide-angled branches, 20-25 cm apart spirally around the tree are selected in first dormant pruning.
- The lowest branch should be 40-60 cm above the ground level.
- The selected scaffold branches are headed back to minimum and only one-fourth of the growth is pruned off.
- In second dormant pruning, 3-4 well-spaced main branches are selected whose one-fourth growth is pruned off and on each main scaffold well-spaced 3-4 secondary branches are selected.
- After 3-4 years, central leader is headed back and lateral branches are allowed to grow, resulting in the development of strong and moderately spreading tree.

### Pruning

- Cherry plants require more corrective pruning rather than too much heading back of the branches.
- Bearing trees need some pruning to keep the centre of the tree open. The top is kept fairly low, to generate new growth.
- Pruning is restricted to eliminating the dead, diseased and intercrossing branches.
- Fruits are borne laterally on spurs of one-year-old shoot. The average productive life of fruiting spurs is 10-12 years, requiring less super renewal pruning.

### Manuring and fertilization

- Cherry requires all the essential nutrients for better growth and quality fruits. Since fruit development and vegetative growth occurs simultaneously, it has high demand for mineral nutrients.
- The amount of manure and fertilizer to be applied is influenced by the age or size of tree, soil types and fertility, cultural practices and anticipated fruit yield.

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### **Manuring and fertilization**

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- The amount of manure and fertilizer to be applied is influenced by the age or size of tree, soil types and fertility, cultural practices and anticipated fruit yield.
- Farmyard manure should be applied in December along with a full dose of super phosphate and muriate of potash.
- Half dose of N is applied in spring before flowering and the other half dose of N is applied in spring before flowering and the other half one month later.
- Fertilizers are broadcast in tree basin about 30 cm away from the tree trunk.

### **Aftercare**

- Cherry orchards are maintained under permanent sod with a clean basin management.
- The basins are kept clean by hand-weeding or using weedicides.
- Application of Diuron 4kg/ha as pre-emergence and Paraquat (0.5%) as post-emergence are recommended to suppress the growth of weeds for 4-5 months.
- Mulching tree basin in April with 10-15 cm thick hay also helps control weeds and conserves soil moisture.
- Green manuring crops-bean, pea, red clover and white clover-can also be grown in tree basins to improve soil texture and fertility.

### **Irrigation**

- Due to sloppy lands and non-availability of irrigation water, cherry is grown under rain fed conditions in our country.
- The distribution of rainfall throughout the year is uneven and owing to less rainfall during April-May, the plantations should be irrigated frequently.
- Irrigating cherry trees at weekly intervals during fruit growth and development is recommended for better fruit size and quality.

### **Fruit cracking**

- Fruit cracking is a serious problem in cherry, which causes 50 to 80 per cent losses.
  - Sweet cherry cultivars differ in the susceptibility in cracking because of differences in the rate of water absorption and capacity for expansion of the peripheral tissues to accommodate the increased fruit volume that results when water is absorbed.
  - The cultivars with a rapid rate of absorption and a low capacity for expansion tend to be immune.
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- Any treatment that decreases the rate of water absorption or increases the capacity of fruit tissues to stretch without rupturing reduces the amount of cracking.
- Spray of calcium chloride at 300g per 100 litre water or GA3 at 2000 ppm or NAA 10 ppm at 25-30 days before harvest checks fruit cracking.

## **MATURITY INDICES, HARVESTING AND POST-HARVEST MANAGEMENT**

- The yield and quality of cherry is appreciably affected by the stage of maturity at which fruits are harvested.
  - Early-picking results in flat fruits with less yield as cherries usually develop rapidly in the last few days before maturity is reached.
  - Harvesting of over-ripe fruits results in loss of weight, volume and quality.
  - Colour development, TSS and flavour are the best standards for judging the optimum time of harvesting.
  - Fresh fruits are picked with stem when the surface colour changes from green to red.
  - The fruits are packed in boxes lined with paper. Generally, 1 kg cartboard boxes are used for packing now a days.
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