

Week- 6 - Peach cultivation

Objective:

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

INTRODUCTION

Taxonomical details

Order = Rosales Family = Rosaceae Sub-family = Prunoideae Genus = Prunus Sub genus = Amygdalus Species = persica Basic chromosome = 8 Somatic number =16	
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Introduction:

- Peach along with its smooth-skin mutant, the nectarine, is a temperate juicy fruit of excellent appearance and quality.
- It comes to the market early in the season, particularly the low chilling peaches and growers get remunerative prices due to non availability of other fresh fruits in the market.
- It has high nutritive value being rich in protein, essential amino acids, minerals and vitamins.
- Peaches originated in China, where its culture dates back to 3000 years. Although it is not exactly known that how and when the peach reached in India but it is opined that some traders might have carried over the stones of peaches from China to Kashmir.
- Peaches were introduced by Mr. Alexander Coultts in Himachal Pradesh in 1870. Later on, its cultivation was initiated in mid hills of Himachal Pradesh on the advice of an American Horticulturist Prof. R W Hodgson.
- Some low chilling varieties of peach were also introduced at Punjab Agricultural University, Ludhiana during 1968 from California.

AREA AND PRODUCTION

- Peach is basically a temperate zone plant and its commercial production is confined between the latitude of 30 and 40° N and S, although it is now grown almost all over the world.
- The major peach producing countries are Italy, USA, Spain, China, France, Greece and Japan.
- In India, peach is grown on a commercial scale in mid hills of Himachal Pradesh, Jammu and Kashmir, Uttarakhand, as well as in a limited scale in north-eastern states.
- In Himachal Pradesh, peaches are commercially grown in Rajgarh area of District Sirmour, which is also known as peach bowl of India.
- Low chill varieties of peaches are commercially grown in Punjab, Haryana and Eastern U.P.
- In India, peach occupies an area of 35531 hectares with a total production of 237921 MT (FAO, 2010-11). In Himachal Pradesh the area under this fruit is 5195 ha and production is 5162 MT (Annon. 2010).

Morphological characters of plant:

- Peach is a small to medium sized upright spreading, open topped deciduous tree.
- The trunk bark is dark brown, rough and young shoots are smooth and pinkish in colour.
- The leaves are simple, large, oblong lanceolate, glabrous above, pubescent beneath.
- Vegetative and flower buds are borne in the axil of leaves.
- Flower are numerous, sessile, white or pink appearing before leaves.
- The flower is of perigynous type as the perianth surrounds the pistil but is not fused to it.
- The floral configuration is : five sepals, five petals, 30 stamens and single ovary.
- Fruits are fuzzy with free or cling stone, however, the nectarines are fuzzless peaches.

Climate and Soil

- Peaches require humid climate with cold winter and dry summer.
 - It is moderately winter hardy and sensitive to low temperature injury. Swelling buds are injured at -6.5°C.
 - Sites free from early spring frost are more suitable as peaches bloom early in the season.
 - Peach needs about 500 to 800 hours of chilling during winter to break bud dormancy.
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ROOTSTOCKS AND PROPAGATION

Rootstocks

- Peach seedlings are generally used as rootstock, though plum, apricot and almond seedlings can also be used.
- Since wild species produce more vigorous and hardy seedlings than the cultivated varieties, thus wild peach seedlings are preferred in the hills.
- In the plains, seeds of Sharbati, Sufeda and wild apricot is used to grow the rootstock for peach propagation.
- Clonal rootstocks are precocious, size controlling, very productive and resistance to insect pests and diseases. Due to these plus points, clonal rootstocks are preferred over seedling rootstocks for raising nursery plants of these fruits.
- For peach, peach x almond hybrid GF677 clonal rootstock is commercially used. This rootstock is useful on alkaline soil due to resistance to chlorosis.
- The other important clonal rootstocks are Siberian C (cold hardy), St. Julien hybrid No.1 and 2 and Damas GF677 (resistant to water logging and alkaline soil), Nemagaurd and Shalil (nematode resistant).

Propagation

- Peach is commercially propagated through grafting or budding on seedling or clonal rootstocks.
 - For raising seedling rootstocks seeds of wild peach are used.
 - Before sowing, seed is first stratified at 4-5°C or below for 10-12 weeks in the moist sand.
 - Pre-sowing treatment of seed with certain agro-chemicals and plant bio-regulators viz; thiourea (0.5%), GA (200ppm) or BA (100ppm) not only reduce the stratification period required and enhance seed germination but also improves the seedling growth.
 - The stratified seeds are sown in well-prepared beds about 5 cm deep and 15 cm apart at a row spacing of 20cm.
 - Seed beds are mulched with 6-10 cm thick dry grass and light irrigation is must after sowing to avoid desiccation of seeds.
 - Seed start germinating in March and the seedling become graftable in one year.
 - The clonal rootstocks are multiplied through mound and trench layering.
 - The commercial methods of propagating peach are tongue or cleft grafting and T budding.
 - In the hills, tongue grafting during February and T budding during May- June are recommended.
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- In plains, grafting is performed during November-January and budding during April-June and in September.

Planting/ Planting Density:

- The plantation operation is carried out in the winter season.
- Before planting, the site of an orchard should be leveled, bushes and weeds are cut down and proper planning of layout is adopted.
- In plains, square system of planting is common, while in hills layout of an orchard is done with contour and terrace system.
- Pits of 1 x 1 x 1 m at a distance of 4.5 m in hills and 6.5 m in the plains, are dug in the month of September – October, which are refilled with soil and 40-50 kg of well rotten Farm Yard Manure and 1 kg single super phosphate.
- In high density planting, the spacing is reduced to 3x 3 m. and 5 x 1 m in tatura trellis (2000 trees /ha).

TRAINING AND PRUNING

Training

- Pruning of young plants for developing frame work in initial 3-4 years of planting is termed as training.
- Training is mainly done to give a proper shape and to build a strong framework of trees.
- Another benefit is to utilize the available space and sun light to the maximum extent for the production of quality fruits.
- Peach is generally trained in the form of open center. However, in the plain area where plenty of sunlight is available, trees are trained on modified central leader system with 4-5 scaffold branches.
- In high density, peach are trained with tatura trellis system .

Open Centre System

- After planting, the plant is cut back to 40-60 cm above the ground level.
 - During the growing season, about 3 to 6 laterals, in addition to the central leader are produced on the tree.
 - In the first winter pruning, 3 to 4 scaffold branches which are well located and have wide angle should be selected and remaining unwanted branches are removed.
 - The central leader is also completely removed. The selected branches are headed back to $\frac{1}{4}$ to $\frac{1}{2}$ of the growth.
 - During the second dormant pruning, 2-3 secondary branches are selected on the primary branches.
 - The major consideration in selecting secondary branches should be their location so that after pruning, the tips of primary and secondary leaders are about 30-40 cm apart from each other.
 - The height of secondary branches is staggered in different years by pruning all branch leader more severely. The vertical ones are pruned more severely. This will produce
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branch leaders at different heights and prevent overcrowding when the tree is mature. In the following years, the head should be fully formed and selection of secondary branches are completed.

Tatura trellis system

- In high density planting, this system of training of plants is very popular being very yield efficient. Trees are planted at a spacing of 5x1m or 6x1m.
- At the time of planting, one year old plant is headed back to 20 cm above the ground level.
- In next growing season two limbs or branches are selected in opposite directions and these branches are trained across the inter row space at an angle of 60 degree from the horizontal, forming V-shaped canopy.
- The canopy is supported by a permanent trellis constructed of high tensile galvanized steel fence posts.
- The secondary branches are developed along each primary branches forming fruiting canopy.

Pruning

- The main objective of pruning is to maintain balance between vegetative growth and fruiting.
- Bearing peach require heavy and regular pruning because it bear fruits laterally on the previous season growth.
- It is known, once a growth has fruited will never bear again in its life. Therefore, pruning is done to remove the unproductive parts which in turn will form new fruiting branches in the following season.
- In peach pruning, thinning and heading back of shoots are two basic components. Pruning should be done so as to produce 30-70 cm of growth under subtropical conditions and 25-30 cm under mid hills, annually, which is sufficient for optimum fruit production,
- For good quality fruit production, 40-50 per cent of thinning out and 75% heading back of shoots is suggested under mid hills conditions.
- At the time of pruning , dead ,diseased and broken branches should be pruned off.

CULTURAL PRACTICES

Orchard Floor management

- In the initial years of plantation, the intercrops like peas, beans, tomato, cabbage, cauliflower and ginger are grown in the vacant area in between the trees but not in basin area. Besides these, some green manuring crops like bean, peas and gram should be grown which helps in improving soil texture and nutrient status.
 - In bearing orchard, the basin area of trees should be kept clean either by manual weeding or use of weedicides.
 - Sod grasses like white clover, red clover, orchard grass and rye grass are grown in the vacant area between the trees.
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- Basins are mulched with 10 cm thick dry grass mulch or black alkathene mulch The mulching helps to conserve soil moisture and efficiently control the weeds in the basin area.

Manure and fertilizers

- Nutritional requirement of peaches is comparatively higher than other stone fruits because it bears on one years growth making the production of annual growth imperative for fruit production. Recoupelement of the wood removal every year in pruning is also necessary.
- Fertilizers are therefore applied every year. A large number of factors like the type of soil, its fertility, climate, cultivar, planting density, shoot growth and irrigation facilities determine the amount of fertilizers to be applied.

Table 2. Manuring/ fertilizer schedule for peach tree /year in different states.

State	FYM (kg/tree)	N (kg/tree)	P (kg/tree)	K (kg/tree)
HP	40	500	250	700
Punjab	26	500	200	600
UP	25	300	500	300
Arunachal Pradesh	50	350	210	210
Haryana	35	540	180	540

Table 3. The manure and fertilizer schedule for peach in HP.

Age of tree (yr.)	FYM (kg)	N (g)	P ₂ O ₅ (g)	K ₂ O (g)
1	10	70	35	100
2	15	140	70	200
3	20	210	105	300
4	25	280	140	400
5	30	350	175	500
6	35	420	210	600
7 & above	40	500	250	700

- The farmyard manure along with full dose of P and K should be applied during December and January. Half dose of N is applied in spring before flowering and remaining half dose a month later.

Irrigation

- Irrigation is very essential for harvesting the peaches of better size and quality.
- A sufficient moisture in the soil before the emergence of leaves and flowers is required for proper fruit-set and growth.
- Frequent irrigations are needed during the fruit development. Lack of irrigation, particularly, during dry and hot summer result in fruit drop, reduced fruit size and quality.

- In the hills, at least two- three irrigations and in plains, weekly irrigation should be given during the fruit development period..
- In general, for quality fruit production irrigation at 80% of field capacity is recommended.
- Orchard soil management and weed management
- During initial 3-4 years after planting, the intercrops like peas, beans, tomato, cabbage, zinger and colocasia are grown in between the peach trees and basin area is mulched with hay or alkathene mulch.
- In fully grown trees, sod grasses are grown in vacant areas and basin area is mulched with suitable mulch materials.
- Weedicides like simazine and atrazin at 2.0 kg/ha, terbacil at 0.8 kg/ha as pre-emergence and paraquat at 4.0 litre/ha and glyphosate 4.32 kg/ha as post-emergence herbicide proved to be most effective to control the weeds in peach orchards.

Crop Regulation

- Heavy flowering and fruiting are the characteristics features of peach trees resulting in small sized, poor quality fruits and reduction of flowering in the subsequent season. Hence for production of quality fruits crop regulation through thinning is essential in peach.
- The criteria for fruit thinning in peach are based on leaf to fruit ratio, spacing between fruits per tree. Generally 30-40 leaves per fruit is the appropriate ratio.
- Application of Ethephon (300 ppm) at petal fall in July Elberta is recommended for optimum fruit thinning. However, in Redhaven peach, Ethephon (600ppm) 20-30 days after fruit set when the fruitlets are 20-25 cm in diameter, should be used for thinning.
- Hand thinning at 5-7.5 cm fruit spacing before pit hardening stage is equally effective.

Maturity, Harvesting . Storage and post- harvest management

- Harvesting of peaches at proper stage of maturity is essential as the post harvest quality and storage life of fruits are controlled by maturity.
- Various indices for judging fruit maturity used are days from full bloom, calendar dates, fruit size, firmness, pit discoloration, freeness of pit and change of ground colour.
- Days required from flowering to maturity vary in different cultivars varies from 78 to 127 days. Early season varieties like Flordasun takes 81 days, Alexander 86 days, mid season July Elberta 101 days and late season cv. Elberta takes 127 days from full bloom to harvest. Ground colour variation in conjunction with flesh firmness is one of the best maturity indices in peaches.
- Peach fruits do not mature uniformly and hence several pickings are needed during harvesting.
- Hand picking is the standard method for harvesting fruits.
- The picking containers are lined with cushion materials to avoid cuts and bruises.
- Immediately after harvesting, fruits are stored at a cool place or marketed. Pre-harvest application of calcium nitrate at the rate of 1.5 per cent increases storage life of peaches.

Storage

- Peaches have a shorter storage life than most other temperate fruits. The recommended cold storage conditions are 0-0.3°C and 85-90% relative humidity.
- In these conditions, free stone peaches and nectarines can be kept for two weeks and clingstone for 4 weeks.
- Pre cooled peaches can be stored for 28-36 days.
- In controlled atmosphere storage containing 5% CO₂ 1-2 % O₂ at 0°C peaches can be stored up to 42 days.
- The peaches came into bearing after 2 years of planting in the field. The economic bearing life of peach plant is about 20-30 years. The yielding capacity increases with the age of the plant.
- The average yield fully grown trees of different varieties varies from 50 to 125 kg in hills. In conventional plantation, 7-10 tones/ha and under high density with Tatura Trellis system of training about 23 tones per ha yield has obtained

Diseases

(1) Peach leaf curl aphid (*Brachycaudus helichrysi*) :

- This is most serious pest of peach. They also infest plum plants.
- The aphid sucks sap from the buds and sprouting foliage causing curling, yellowing and thickening of leaves.
- The activity of aphid is seen with the emergence of new growth during March .Floral buds also become weak and result in poor setting.

Control: The pest is controlled by spray of 0.025 % methyl demeton (200 ml metasystox 25 EC) or dimethoate 0.03% (200 ml Rogar 30 EC) in 200 litres of water 7-10 days before flowering. The spray should be repeated after 5 days.
