

Week- 8 Cultivation of plum

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 plum.

INTRODUCTION

Taxonomical details

Order = Rosales

Family = Rosaceae

Sub-family = Prunoideae

Genus = Prunus

Sub genus = Prunophora

Species = salicina and domestica

Basic chromosome number = 8

INTRODUCTION

- Plum is an important temperate fruit, which is used as fresh as well as in preserved form.
- It is next to the peaches in economic importance amongst the stone fruits.
- It requires certain period of chilling during winters to break dormancy, thus cultivated in areas where winters are cool.
- Fruits are rich source of minerals, vitamins, sugars and organic acids in addition to protein, fat and carbohydrates.
- The types of plums with high sugar content above 18% are known as prunes which can be dried with pit
- In India, plum was introduced by Alexander Coultts in 1870 in Himachal Pradesh.
- After evaluation, only Japanese plum has been recommended for commercial cultivation in mid hills of the temperate region of north-western Himalayas.
- Some low chilling varieties of plum were also introduced at Punjab Agriculture University, Ludhiana.

AREA AND PRODUCTION

- Plum are grown in the temperate zone of all the countries of the world.
- The main plums and prunes producing countries of the world are Africa, Algeria, Morocco. South Africa, North and Central America.
- In India these fruits are grown on a commercial scale in mid hills of Himachal Pradesh, Jammu and Kashmir, Uttarakhand, but on limited scale in north-eastern states.
- In Himachal Pradesh, plums are mainly grown in Solan, Sirmour, Shimla. Mandi districts.
- Low chill varieties are also grown in Punjab, Haryana and Eastern U.P. The area under plum in our country is 14000 ha. and annual production is 57143 MT (FAO,2010-11).

Morphological characters :

- Tree medium to large, upright growth and deciduous.
 - Leaves alternate, serrate, sharp pointed , medium sized and glabrous.
 - Flowers are produced three in a bud on one year shoot or on spur.
 - Flowers perfect, solitary or raceme, sepals 5, petals 5, usually white , stamens numerous, perigynous, pistil 1 with elongated styles, 2 ovuled and fruit drupe usually single seeded.
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Climate and Soil

- Plum requires varying types of climate and is grown from subtropical plains to the temperate high hills
- The European type of plums require temperate climate and are grown in high hills at an elevation of 1300-2000 m a m s l. It requires about 800-1000 hrs of chilling below 7°C during winter to break rest period.
- Japanese plum requires 100-800 hrs chilling, which is met in mid hill areas located at an elevation of 1000-1600 m a m s l.
- Plums can be grown in areas where winters are cold and summers are hot. Cold, wet and windy weather during bloom is detrimental for good fruit set as spring frost injury causes damage to bloom.
- A northern slope is preferred particularly for Japanese plum, which tend to delay the bloom period and thus avoid early frost injury.
- Plum requires 90- 110 cm well distributed rainfall throughout the year.
- Prolonged drought during fruit growth and development and excessive rains during fruit maturity hamper fruit quality..
- Although plum can grow on a wide range of soils, yet, deep, fertile and well-drained loamy soils with a pH of 5.5-6.5 are most suitable.
- The soil should be free from hard pan, water logging and excessive salts.
- Very heavy or light soils are not suitable.
- The Japanese plums do well on average soils having high pH.

SPECIES AND VARIETIES

- The cultivated plums belong to two species

(1) *Prunus domestica* (European plum): It is a hybrid of diploid myrobalan plum (*Prunus cerasifera*) and tetraploid black thorn (*Prunus spinosa*). It is hexaploid. Fruits are larger in size than Japanese plum. Fruit is oval or round having both yellow and green ground colour and also both red and blue skin colour. The cultivated varieties of European plum is classified in to three main groups:

(a) Prunes:- Fruit is oval in shape with bulging ventral side and compressed bilaterally. It is blue or purple in colour , high in sugar content which makes them suitable for drying without removal of pit. All prunes are plums but all plums are not prunes. Varieties are Italian prunes, Giant prune, President.

(b) Reineclaude and green gage plum:- This is hybrid of *Prunus domestica* with *Prunus insititia* . Fruit is greenish yellow in colour and round in shape having yellow skin and flesh.. Important varieties are Golden Drop, Green gage, Golden transparent,

(c) Lombard plum:- The colour of fruit is purplish red. Varieties are Lombard, Victoria.

(2.) *Prunus salicina* (Japanese plum):- Originated in china but introduced in Japan from where it is disseminated around the world. Plant is more vigorous, productive, precocious and resistant to diseases than European plum. The fruits are large and heart shaped with pronounced apex.. A few cultivars are oblate or round.

(3.) *Prunus insititia*:- This is a small fruited European plum, hexaploid and grows wild in

Europe and Western Asia. Plums of the species are known as Damson and Mirabelles. Fruit are small and purple (damson) yellow (mirabelles). Plant small and compact and form excellent hedge rows.

European plum cultivar

California Blue, Washington, French Prunes, Early Italian, Stanley, Grand Duke, Victoria, Damson.

Japanese plum Cultivar

Beauty, Methley, Santa Rosa, Kelsey, Mariposa, Satsuma, Burbank Red Beaut, Fronteir

Table 2. Manurial and fertilizer schedule recommended for plum in different states

State	FYM(kg/tree)	N (kg/tree)	P (kg/tree)	K (kg/tree)
HP	60	500	250	700
Punjab	36	180	90	720
Uttranchal	-	300	500	300
Arunachal Pradesh	50	300	210	210
Tamilnadu	30	250	1000	1000
Haryana	35	540	190	540



Plate 3. Frontier



Plate 4. Santa Rosa

ROOTSTOCKS AND PROPAGATION

Rootstocks and propagation

- **Seedling rootstocks:** The plum grown mostly on plum rootstocks though seedling of peach, apricot and almond can be used. In India plum is propagated mainly on seedlings of wild apricot (Chuli)
- **Clonal Rootstocks for plum:** Myrobalan B, Myrobalan 29C, Mariana GF 8/1, Mariana 2624, Mariana 8-6. Mariana 9-25, Pixy, St. Julien A, GF-667

Propagation

Rootstock :

- Plums are propagated vegetatively by budding and grafting on rootstocks.
- These can also be propagated by hard wood cutting and by leafy soft wood cuttings under intermittent misting. Cuttings taken from hard wood and semi hard wood treated with IBA (2000-5000ppm) for better rooting..
- For raising the seedlings, the seeds of wild apricot are stratified under alternate layers of moist sand for 45 to 50 days at temp 3-5°C to break the rest.
- The stratified seeds are sown in nursery beds 6-10 cm deep in row 25-30cm apart with a distance of 10-15 cm from seed to seed.
- The seedling attain graftable size in a year
- In Punjab, own rooted plants of Kala Amritsari are generally used for planting.
- Clonal rootstocks of plum are multiplied commercially by layering.
- It has been observed that most of clonal rootstocks of plum are difficult to root. Application of 2500ppm IBA to stool shoot helps to improve rooting.
- Clonal rootstocks are also propagated by hardwood cuttings. The hardwood cutting should be taken during dormant season and dipped in 2500ppm IBA solution for 30 seconds. Then these cutting are planted in mist propagation chamber for rooting.

Propagation of scion

- Seedling as well as clonal rootstocks which are 0.8 to 1.2 cm in thickness are grafted in February with tongue and cleft method of grafting.
- The seedling which do not attain graftable size in February, they should be budded with T- and chip methods of budding in June- July.
- For grafting the scion wood should be collected from healthy, disease free, true to variety trees during January . The scion wood is collected from one year old shoots. They are packed in moist sphagnum moss, which are properly labeled for variety. These bundles of scion wood are stored in cold storage or buried deep in the soil at shady place till grafting is done.
- The best time of grafting of these fruits are February in lower elevation and in March at higher elevations.
- Chip budding can also be done in March, July and September..

PLANTING AND PLANTING DENSITY

- Planting of plum is done December -January when the plant is in dormant conditions.
 - Before planting, site of an orchard should be properly cleared off the bushes and weeds. It is advisable to plough the plantation area.
 - In hilly area, terraces should be kept inwards to facilitate soil conservation.
 - The orchard area should be properly laid out about two month before planting. In sloppy land, layout of an orchard should be done with contour or terrace system , while in flat land square system is followed.
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- The planting distance varies according to the varieties, rootstocks and fertility of soils. Plums are generally planted at a distance of 6 m x 6 m.
- In high density plantation , the plum plants raised on semi-dwarfing clonal rootstocks should be planted at 4m x4m distance.
- Pits of 1 m x1 m x 1 m size are dug in October – November . Pits should be filled with fertile top soils mixed with 40 kg of well rotten FYM and 1kg of single super Phosphate.
- To avoid any damage from insects, the pits are drenched with 10 litres of chlorpyriphos (4ml/L)solution. The graft union should be kept 10-15 cm above the ground level at the time of planting to avoid any scion rooting.
- Young plants should be watered regularly and basin area is mulched with 15 cm thick dry grass.

Pollination and Fruit Set

- Most native American plums are self unfruitful and need pollinizers be inter planted in the orchard. The partial self fruitful cultivars such as Santa Rosa and Beauty are also benefited in fruit set with the pollinizers.
- The European plum in view of the fruit set are categorized in to self fruitful varieties in which 30% of the flowers set fruit and self unfruitful varieties in which 1.5 to 2% of the flowers set fruits which need pollinizer.
- For proper pollination and to obtain good harvest, at least every third tree in every third row, a pollinizer should be planted with the strong beehives per acre.
- In case, the cultivars produce little or no pollen, a pollinizer branch should be grafted on every tree.

CULTURAL PRACTICES

Training and Pruning

- Plums are generally trained on the open center system or to modified central leader system depending upon the varietal growth habits.
- The varieties with spreading habits of growth as in Japanese plum should he trained to open center system.
- In HP open center system is followed irrespective of variety. However, in the plains, where plenty of sunlight is available, trees should be trained in the form of modified central leader system with 4-5 scaffold branches

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 5 scaffold branches which are well spaced and have wide angle should be selected and remaining branches are removed. The Central leader is also completely removed.
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- The selected branches are headed back to $\frac{1}{4}$ 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 branch leaders at different heights and prevent over crowding when the tree is mature.
- In the following years the head should be fully formed and selection of secondary branches are completed.

Pruning

- In plums, thinning and heading back of shoots are two basic components of pruning.
- Most of plum varieties bear on spurs on two years old wood. The life span of these spurs is 5-6 years. It is necessary to prune for some spur renewal each season .
- The extent of pruning is done such a way to induce an annual shoot growth of 25-50 cm.
- In bearing plum trees, 25-30 percent thinning of shoots and 50-75 per cent heading back of shoots is suggested for proper fruiting.
- At the time of pruning , dead ,diseased and broken branches should be pruned off.

Nutrition

- Plum requires adequate amount of nutrients for better growth and quality fruits.
- Application of manures and fertilizers depend upon soil fertility, type of soil, topography, age of tree, cultural practices and crop load.
- The requirement of fertilizers varies from region to region.
- 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 a month later.

Irrigation

- Plum is mostly grown under rain fed conditions. However, in order to produce a fruits of good fruit size and better quality irrigation is essential.
- Various methods of irrigation are adopted to irrigate plum orchards but in hills basin and drip irrigation methods are more popular and are widely used and recommended.
- After fruit setting, the plum trees are irrigated at weekly intervals and 6 to 8 irrigations are recommended for higher production of quality fruits in Santa Rosa plum.

Orchard floor management and Weed management

- In plum orchard, sod culture and mulching of tree basin area with hay mulch or black alkathene mulch is the most common method of orchard floor management.
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- During pre-bearing stage, intercropping with leguminous and vegetable is also practiced in orchards planted in flat and less sloppy land.
- The weed removal manually is one of the practices employed in the orchards besides inter cultivation and cover crop growing. In rainy seasons, the weeds in plum orchard is controlled with the post-emergence sprays of glyphosate at the rate of 800 ml/ hectare.

Crop regulation and Quality improvement

- Generally plum tends to bear heavy crops and bear under sized fruits of low-quality, thinning therefore, is necessary to increase the fruit size and uniformity in colour of fruit and to stimulate flower initiation for the regulation of next year's crop.
- Various methods viz; hand, mechanically and use of chemicals are used but chemical thinning has superiority with respect to thinning cost, fruit size and quality. NAA at 20 to 40 ppm sprayed after petal fall resulted in good fruit thinning.

Maturity, Harvesting and Yield

- It has been observed that plum usually ripen unevenly over the tree. Fruits, therefore, are harvested in two or three pickings and it is very important to find out the exact stage of picking when they are mature.
- Among various indices of maturity, most commonly used are flesh firmness 5.9 ± 0.45 kg, days from full bloom (94 ± 3), TSS 13.5-14.5 and TSS acidity ratio 1.2: 1.5.
- The fruits are harvested with stalk intact avoiding any skin injury.
- Fruits are very delicate and perishable, therefore picking baskets should be lined with soft material on the inner surface.
- Immediately after plucking the fruits should be kept under the shade of the tree to remove field heat.

Grading and Packing

- To obtain high price in the market the grading of the fruits is done to have uniform size and better quality. The packing and grading standards of the plum are:

Storage and Marketing

- Plum being perishable have very short shelf life.
 - In India work in HP has revealed that plum can be stored for 1 to 2 weeks at 0°C with 80-90% humidity.
 - The CA storage has been practiced overseas by maintaining 2-3% oxygen and 2-8% CO₂ and the fruits can be retained for a duration of 2-3 months.
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