Week- 10: Cultivation of almond

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 thinning, harvesting and post-harvest management of almond.

INTRODUCTION

Taxonomical classification

Order	=	Rosales
Family	=	Rosaceae
Sub-family	=	Prunoideae
Genus	=	Prunus
Species	=	amygdalus

Basic chromosome number = 8
Somatic chromosome number= 16

Introduction

- Almond is an important temperate fruit with widespread popularity for its kernels throughout the world.
- It is a native to central Asian mountain areas (India, Iran and Pakistan).
- Apart from raw consumption as an edible kernel of the drupe, it has also industrial applications as a major ingredient in many manufactured products.
- The kernels are rich source of fat (54%), proteins (19%) minerals and vitamins.
- Its oil called badam roghan is considered to have high nutritional, medicinal and industrial value.
- Almond oil is used in confectionary and also for pharmaceutical and cosmetic preparation.
- Kernels after blanching, roasting, frying and salting are very delicious and in great demand.
- Green almond kernels are also consumed in the milky stage.

Area and Production:

- Almond is cultivated mainly in regions situated between 360 and 450 N latitude.
- The major almond producing countries are USA (48500MT) and Spain(21700MT), which account for about 50 per cent of the total world almond production. Other leading almond producing countries are Italy (119000MT), Iran (76000MT) Syria (67000MT), Morocco(66000MT), Greece(35000MT) and Turkey (34000MT).
- In the world it occupies and area of …….. ha and production is 144737 MT(1999-2000).

- In India, almond cultivation is confined mainly to Jammu and Kashmir, high hills of Himachal Pradesh and Uttarakhand.
- The state of Jammu Kashmir is the major almond producing state in the country.
- Tthe area under almond cultivation is 18000 ha and the production was 9700 MT in Jammu and Kashmir, where as in HP the area is 5610 ha and the production is 1345MT (Annon, 2009-10).
- In Himachal Pradesh almond are cultivated in Shimla, Mandi, Kinaaur, Chamba, Kangra and Sirmaur districts.

Morhological characters:-

- The cultivated almond is a tree of medium height , branches are glabrous and one –year-old shoots are pale green to reddish brown in colour.
- Flowers usually develop laterally on short spurs and have 1-5 flower buds, flower is perigynous with a single ovary enclosed in the floral cup that bears 30-40 stamens.
- Flowers are hermaphrodite with white or pink petals, 5 sepals a single and unicarpel pistil which usually contain 2 ovules.

Varieties :-

- Almost all cultivars of almond are self sterile and require pollinizer. Even a few cultivars like IXL and Non Pareil are cross sterile.

Recommended varieties for different states of India

Varieties for J & K :- Makhdoom, Parbat, Waris, Shalimar, Afghanistan Seedling, IXL, Merced and Non Pareil.

Himachal Pradesh
High and mid hills :- Merced, Non Pareil, IXL.
Valley areas:- :- Drake, Katha, Peerless, Ne Plus Ultra.
Dry temperate zone :- Ne Plus –Ultra, Texas, IXL

- The almonds of seedling origin are classified in four groups viz. (i)paper shelled, (ii)soft shelled, (iii) semi- soft shelled and (iv) hard shelled.

Climate and soil :-

- Among the various temperate nut and dry fruits, almond is the most exacting in its climatic requirement, favorable environmental conditions are essential for success in the cultivation of almond.
- Among the various climatic factor, cool climate during winters plays a important role in flowering and regular sprouting in spring.
- The chilling requirement for normal bud sprouting depends on the cultivars and are relatively low, ranging from 200 to 700 hours below 7.20C.

- However, for successful cultivation, almond require cool winter, frost free spring and warm dry summers.
- The limiting factor in almond cultivation is the spring frost, especially during full bloom or fruit set.
- The tolerance to low temperature during bloom depends upon cultivars, Non Pareil and Ne Plus Ultra are highly tolerant to low temperature.
- South facing slopes are considered the best for almond growing.
- Rains during spring and summer cause blossom and fruit infection by brown and green rot organisms, while foggy and rainy weather during summer result in brown strains on the shells (due to stagmini blight) of ripening nuts.
- Almond can be grown on all type of soils, but well drained loamy soils having pH of 5.5 to 6.8 are most suitable for its cultivation.

PROPAGATION AND CULTURAL PRACTICES

Rootstocks and propagation:-
A. Seedling rootstocks

- In India seedlings of bitter almond, wild peach and behmi (Prunus mira) are used as a rootstock. Almond seedling rootstock from the bitter or sweet cultivars are used because of longevity and tolerance to drought, lime soils and iron chlorosis
- In winter climate and irrigated areas peach seedling are used.

B. Clonal rootstocks

- The clonal rootstocks like GF 677, GF 557, Marianna 2624, Myrobalan 2032 and Marianna GF 8/1 are being used world over.

Propagation:

- Bitter or sweet almonds seeds are sown either directly in the nursery beds during December or stratified in the moist sand for 50-60 days and then sown the nursery beds.
- The pencil thickness seedling are grafted with tongue grafting method in Feb – March or budded with T method in May.

Planting

- One-year- old grafted or budded plants having good growth and well developed root system are planted in a square, contour or terrace system at a spacing of 5x5 meter depending upon the rootstocks and soil fertility.
- The planting should be done in December – January.
- Since almond is a highly cross pollinated crops, thus every third row should be planted with a pollinizer variety to provide 33 % pollinizer.

Training and pruning

- Almond plants are generally trained with open centre system.
- After planting, the plant is headed back 70-80 cm above the ground level.
- In the summer 3-4 well spaced branches on trunk in different direction are selected while other unwanted branches are pinched off.
- The lowest branch should be selected not below 0.6 m from the ground level.
- If these branches are not selected during summer than they must be selected during dormant pruning.
- The primary scaffolds (3-4) developing within 10-15 cm from the top will form the tree crotch.
- After selecting the primary branches the leader is removed and primary branches are headed back to ½ to 1/3 of the growth.
- Summer pruning is carried out 2-3 times in order to retain shoots for main branches and to eliminate unwanted branches and water sprouts.
- The summer pruning should also be carried out in the second year to form the secondary framework scaffold.
- In the third year dormant pruning, 2-3 secondary branches on each main branches are selected.
- The shoots growing inward and interfering with the main branches are pruned off.
- Almond bears fruits mostly on spurs which remain fruitful for about 5 years and these spurs should be renewed by regular pruning after 3-4 years.
- Pruning should be done in such a manner that one fifth of fruiting wood is removed every year .
- Unwanted water sprouts and suckers should be removed .
- Trees with less than 10-12 years of age should make 22-25 cm annual growth and older trees should produce 15 cm of new shoot growth each year, therefore. pruning is done by heading back of new shoots and thinning out of unwanted shoots.

Manuring and fertilizers :-

- Almond is a heavy feeder and thus requires proper fertilization.
- The application of manure and fertilizer depends upon the soil fertility and age of tree proper fertilization schedule is formulated after leaf and soil analysis.
- The manure and fertilizer schedule recommended for bearing almond trees of 7 years or more years old are 50-60 kg FYM, 500g N, 350g P2O5 700 g K2O per plant.
- FYM along with full dose of P2O5 and K2O are applied in Dec- Jan and half dose N one month before flowering and remaining half after one month of first application.

Irrigation :-

- Irrigation is most important practice to improve the growth and yields of almond trees because summer rainfall is insufficient in the areas where almonds are grown.
- Almond trees should be irrigated at weekly intervals during April, May and June.

Orchard soil management :-

- Sod culture plus mulching of basin area is the best soil management system for almond orchard.
- The ground should be cultivated to a depth of 10-15 cm during winter and repeated in spring.
- After cultivation 10-15 cm dry grass or black alkathene mulch is used on the basin for weed control and moisture conservation.
- The weeds can also be controlled with the application of weedicides like glyphosate or or paraquat.

Pollination

- Most of the cultivars are self unfruitful and require cross pollination for good fruit set.
- Only a few varieties like Drake and Dhaber are self pollinated and capable of setting fruits with their own pollen.
- It has been observed that in even in self fruitful cvs. Cross pollination increases fruit set.
- In almond all the cultivars are not cross compatible usually two pollinizer varieties, possibly of commercial importance are used, one flowering slightly before and the other just after the main cultivars.
- Good pollination can be achieved by single row of the main cultivar and pollinizer.
- Pollination is mainly done by honey bees usually 4-5 colonies/ha are placed for effective pollination.

Harvesting and post harvest management :-

- Almond can be harvested green or dry. Nuts of thin shelled variety are also harvested at the green stage for direct consumption..
- Almonds are ready for harvesting when they change from green to yellowish with cracks or when splitting at suture starts from pedicel end.
- For dry nuts the harvesting is done from August to October
- Nuts are harvested by knocking the limbs with long wooden poles. The polythene sheet should be spread beneath the tree prior to harvesting.
- The nuts should be placed in a shady place for dehulling where these can be dried as well.
- The yield of 10-12 quintals/ ha of shelled almonds are obtained.