

Week- 14: Walnut 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 walnut.

INTRODUCTION

Taxonomical classification

Family = Juglandaceae

Genus = Juglans

Species = regia

Basic chromosome = 16

INTRODUCTION

- Walnut is one of the important nut fruit of the world cultivated mostly in semi-cold regions.
- The wild seedling of walnut have been found in growing in vast regions right from the Carpathian mountains in Eastern Europe across Turkey, Iraq, Iran, Southern USSR and Afghanistan to the North-Western Himalayas.
- It is e believed to have originated in Iran and the areas surrounding it.
- The returning army of Alexander brought it to Europe from Iran.
- Almost all plant parts of walnut are utilized in one way or the other.
- The fruit has excellent flavor and is mainly consumed as a dry fruit being eaten for table purposes.
- The Kernels contains about 60-75% fat and oil, 16%carbohydrate, 15% Protein.
- Wood is used for making valuable furniture.

Area and production

- It is grown extensively in USA, China, France, Italy, Turkey, Poland, Yugoslavia, Rumania, Iran.
 - In India, it is grown in the state of Jammu and Kashmir, HP and Uttarakhand and occupies an area of 41840 ha. with a production of 32000 MT.
 - In HP the area under walnut is 46282 ha. and production is 1294MT (Annon., 2009-10).
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Climate and Soil:-

- Walnut is grown in successfully in all parts of the Himalayan region between the elevation of 1200 to 2150 m a m s l.
- The main climatic limitations for climatic limitations for walnuts are

- (a) Spring and fall frosts.
- (b) Extreme summer heat and
- (c) In- sufficient winter chilling.

- The plants can tolerate as low as -11°C during deep dormancy with out serious damage but as soon as growth commences after dormancy, the temperature even 2 or 3 $^{\circ}\text{C}$ below freezing point (0°C) kills leaves, shoots and flower thus resulting in crop failure.
- Like wise the plants which continue to grow till late during fall are subjected to serious foliage damage by frost.
- High temperature more than 38°C causes sun burning of hulls and shriveling of kernels resulting into blank nuts. The damage are further aggravated if the humidity is low and temperatures exceeds above 40°C .
- Persistently lower summer temperature is not favorable for proper filling of the nuts.
- The cool growing season delay harvest. Like other temperate fruits, walnut require certain amount of chilling period to break bud dormancy.
- In the absence of adequate chilling, the bud opening and blooming are irregular and delayed resulting in poor crop.
- The chilling requirement varies with the cultivars and ranges from 700 to 1500 hrs.
- Walnut do well in mild climate with moderate rainfall. An annual rainfall of about 80-90 cm, well distributed throughout the season. is considered sufficient for the cultivation of walnut.
- Walnut grows well on fertile, well drained sandy loam or silt loam soil with a depth of 5-6 feet.
- The soil pH should be 5.5 to 6.5.

Varieties

- The walnuts plantation in India are of seedling origin, however some cultivars introduced from USA and France are under test. The survey of walnut germplasm in the e states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand have resulted in identifying potential seedlings which have been released as cultivars.

Exotic varieties

Hartley, Payne, Franquette, Serr, Sunland, Chico, Vina, Howard, Chandler, Tehana, Tulari, Lara

Local selections

Gobind, Pratap selection, Solding selection, Kotkhai Selection, Kashmir budded, Wilson Wonder, Chakrata Selection, Sulaman and Hamdam.

PROPAGATION AND CANOPY MANAGEMENT

Rootstock and Propagation:-

- Walnut seedlings of *Juglans regia* are generally used as a rootstock for walnut in all over the world, however, in USA seeds of *J. hindsii*, Paradox (*J. hindsii* x *J. regia*) are used for raising seedling rootstocks.
- Traditionally, walnut in India is propagated by seed. Although sexual method is the most efficient and economical but not satisfactory, because the seedlings are highly variable, having long juvenile period, producing the nuts with inferior quality and with low shelling percentage.
- In India, r Persian walnut known as akhrot is most common source of seed.
- The seeds are stratified for 90-110 days at low temperature 4-5o C to break the seed dormancy.
- Various pre-sowing treatments with growth regulators, scarification and water soaking etc. not only reduce the stratification requirement and improve seed germination but also enhance seedling growth.
- Soaking of seed in 750- 1000ppm GA3 or 1000 ppm etherel solution for 24 hours after stratification is very effective in stimulating seed germination.
- The stratified seeds are sown in line 30cm apart at a distance of 15-20 cm and at a depth of 10-15 cm in Feburary – March.
- The nursery beds are covered with mulching and regular irrigation and weeding is done so that seedling become graftable or buddable in one year.

CULTURAL PRACTICES

Manure and Fertilizers:-

- The walnut is grown as scattered trees and not in the form of well laid out regular plantation as such they are not fertilized.
 - Virtually no information is available on the fertilizer requirements, however, the walnut trees should be fertilized with ½ kg of 15:15:15 NPK fertilizer mixture/year/tree up to 16 years age.
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- The fertilizers dose is stabilized after 16years and full bearing tree should be fertilized with 8 Kg of NPK mixture along with 100 Kg FYM.
- The full dose of manure and fertilizer is applied during December – January

Orchard Soil management:-

- Sod plus clean basin management is the best orchard floor management in walnut.
- The basin area can also be mulched with dry grass to conserve moisture and to control weeds.

Irrigation:-

- Walnut trees require adequate moisture especially 5-6 weeks immediately following bloom. A water deficit prior to shell hardening result in small nuts and in mid summer results in stick tight hull.
- The critical periods for water requirement is from full bloom to shell cracking. Therefore, walnut tree should be irrigated at weekly intervals during the summer months for higher fruit production..

Pollination:-

- Winds plays an significant role in pollination and fruit set.
- Pollen of *Juglans regia* variety is capable of fertilizing the eggs of same variety and any other variety as well.
- In walnut dichogamy is the main problem, which is further aggravated by short period of both pollen viability and stigma receptivity.
- However, pollen germinate on stigma in 1-3 days after pollination. Pollen viability last for 100hours at 14-15oC and 55 hours at 22-25 oC, however above 25oC and humidity below 33% during pollination results in pollen sterility.
- Adverse weather conditions like snowfall, hail, frost and rain during flowering results in crop failure due to inadequate pollination.
- Improvement in pollination and fruit set can be made by (1) hanging of catkins of male flowers (2) planting of 3-4 varieties in the orchard.

Maturity and Harvesting:-

- Harvesting at proper maturity and subsequent handling of the produce are of prime importance. Any delay in picking after maturity of kernels, deteriorates the quality and increases the incidence of mould and pests.
 - The maturity indices are commonly used for determining the harvesting dates of walnut are cracking of hulls from nut and change in colour of packing tissues between the kernels.
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- When about 80% of the hulls have cracked from the nuts, it is a time of walnut picking.
- Secondly the proper maturity is also assessed by observing the packing tissue between and around the kernel halves which turn brown on maturity.
- Depending upon the climate, the harvesting is usually done after two weeks of browning.
- The kernel become dark if the further harvesting is delayed.
- The spray of ethephon 200-500 on kernel maturity advancing harvesting by 10 days, makes harvest of entire crop at a time and promotes hull splitting.
- Walnut is normally harvested from August to October.
- Maturity is earlier in lower altitudes but late at higher altitude.
- Walnut drop naturally over about one month period after splitting of hull in a natural way, while others are forced to drop down by splinting with long poles.
- The nuts should be gathered , hulled and dried immediately.
- The fallen nut are collected in huge heaps in the orchards and covered with wet leaves and grasses for hull fermentation taking about 10-15 days.
- Dehulling, washing and cleaning of nuts are done manually in India and mechanically in other advanced countries.
- Application of nuts in ethephon at 1500 ppm when hull are still on loosen the hull in 3-4 days.

Post- Harvest Management:-

- After cleaning, the nuts are dried with the help of drier at 32-30oC temperature till the moisture content in nut is about 8%.
 - The nuts can be dried in the sun for many days by spreading them on a canvass sheet or hand floor.
 - After drying the nuts are started the gunny bags in small ventilated rooms.
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