



Advances in Avocado Cultivation

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Avocado, one of the most nutritive fruits belongs to the family Lauraceae which is composed of 50 species. It is an evergreen tree found in tropical and subtropical areas. Cultivated species of avocado are native to Mexico, Central America and South America. There are three horticultural races of avocado that reflect the centre of origin i.e., the West Indian race native to West Indies (Central America and Northern part of South America), Guatemalan race and the Mexican race. It is an ancient fruit and constitutes part of the diet in the countries of origin.

Common name: Butter fruit

Botanical name: *Persea americana* L.

Nutritional benefits

The pulp of Avocado the so-called butter fruit, has a buttery consistency and the fruit has very high fat content (26.4 g/100g). As the sugar content is low, it can be recommended as a high energy food for diabetics. Avocados are a great source of vitamins C, E, K and B-6, as well as riboflavin, niacin, folate, pantothenic acid, magnesium and potassium. They also provide lutein, beta-carotene, and omega-3 fatty acids.

Climatic and soil requirements

Avocado trees of the West Indian race perform well in humid tropical climate, but the other two races viz., Mexican and Guatemalan fail to flower or set fruit in the tropics. On the other hand, the West Indian race sets little or no fruit in subtropical climate. In between Mexican and Guatemalan races, the Mexican race alone survives in regions where minimum winter temperatures goes to -0.5°C to 3.5°C . If proper race and cultivars are chosen, avocados can thrive and produce a good crop in climatic conditions ranging from true tropical to warmer parts of the temperate zone. Though avocados can be grown successfully in varying soil conditions, they are extremely sensitive to poor drainage and saline conditions. They will grow better in soils with pH ranging from 5-7.

Mexican Race: This group is characterized by small fruits weighing less than 250 g and ripening in 6-8 months after flowering. Oil content of the fruit is 30 per cent, the highest of all the three races.

Guatemalan Race: Fruits are fairly large each weighing upto 600g and ripen in 9-12 months after flowering. Oil content ranges from 8 – 15%.

West Indian Race: The fruits are medium sized and ripen in 9 months after flowering. The oil content of fruit is low, ranging from 3 – 10%.

Cultivars

Fuerte: It is the most popular cultivar of avocado. It is a hybrid of the Mexican and Guatemalan races. Fruits are pyriform, each weighing



between 225 and 450 g having 18 to 26 per cent oil. It is fairly resistant to cold, better suited to subtropics than tropical climate. It belongs to group B.

Hass: It originated as a seedling from the Guatemalan race. It matures much earlier than Fuerte. Fruits are medium sized, roundish and turn purple on ripening. This is also more suitable to subtropical climate. It belongs to group –A.



Pollock: A West Indian race bears large fruit that weights upto 1 kg or more having an oil content of 3-5 per cent suited to be grown in a tropical climate.

Purple: It belongs to the West Indian race. Fruits are pear-shaped, skin is deep crimson or maroon in colour. Suited to humid tropics.

Green: This belongs to the Guatemalan race. Fruits are large, oval, with yellowish green skin. It is suited to subtropical climate.

TKD 1: Developed at Horticultural Research Station, Thadiyankudisai of TNAU, Tamilnadu. The fruits are medium sized and round. Trees upright and semi spreading hence suited for high density planting. Yield 264kg / tree. Fruits are sweet TSS 8°brix, fat 23.8%, protein 1.35%.

Propagation and planting

Avocado is normally propagated by seeds. The viability period of avocado seed is very short (2-3 weeks), and can be improved by storing the seed in peat or sand at 5°C. Removal of the seed coat before sowing helps to speed up the germination. The seed can also be split lengthwise into 4-6 parts, leaving a piece of embryo on each.

Avocado can also be propagated vegetatively by cutting and grafting. The Mexican race is relatively easy rooting whereas, the West Indian race is quite difficult to root. The Guatemalan race is intermediate in rooting ability of cuttings. Cleft, whip and tongue grafting are the most successful methods.

Grafted plants should be hardened for two weeks under direct sun before planting. Dig holes 60 cm x 60 cm x 60 cm (length x width x depth). Mix 30 kg of decomposed manure and 120 g of TSP with the topsoil. Fill the hole with the mixture. Carefully remove the plant from the container with the soil intact and place it at the center of the hole and firm the soil around the plant. Water the plant immediately after planting.

Note: Cover crops (legumes or grain) can be planted a year before the orchard is established to increase the organic matter content and to minimize soil erosion and root rot.

Spacing: Spacing of trees depends on the variety, types of soil and climatic conditions. Generally, the recommended spacing for Fuerte varieties is 9 x 9 meters (123 trees per hectare).

Manuring

Avocado requires heavy fertilization. Application of nitrogen is the most essential. Nitrogen deficiency causes restricted growth, with reduced, pale coloured leaves and smaller fruits. An average crop of avocado removes 40 kg N, 25kg P₂O₅, 60 kg K₂O, 11.2 kg CaO and 9.2 kg MgO/ha from the soil. Therefore, to maintain the soil fertility for getting consistent yields, it becomes necessary to replenish these nutrients.

Interculture and Weed management

Deep cultivation in avocado orchards should be avoided because of surface roots. Intercropping with legumes or shallow-rooted crops can be done in young orchards which can smother weeds also. Avocado trees are pruned sparingly mainly by heading back the central shoot in upright growing cultivars such as Pollock, to develop a spreading habit. Branches are thinned and shortened in spreading cultivars like Fuerte.

Problems in fruit set

Avocado starts bearing at 5-6 years after planting and has a marked tendency to biennial bearing which is prevalent in a number of other fruit trees. But there is specific problem in fruit set as far as avocado concerned.

In avocado, the inflorescence is a compound panicle. The individual flowers are morphologically bisexual having fertile male and female organs. But they exhibit dichogamy viz., the male and female organs coming to maturity at different time thereby avoiding self-pollination of an individual flower. In dichogamy, they are protogynous viz., the female parts coming to maturity before male organs. The type of dichogamy in avocado is a complicated one unique to avocado-the diurnally synchronous dichogamy.

The female parts of all flowers that open at a time in a particular tree will mature simultaneously and hence behave functionally as female flower. The male parts of same flowers will come to maturity when the flowers open next time and hence all of them behave as male flowers during that period. By this the cross pollination between flowers of the same tree are also ruled out. The situation is further worsened by the fact that all the trees of a particular group will be exhibiting the same sex phase at a particular time and the opposite sex phase during the next opening of the same flower.



Avocado flowering

So, if the trees of single group are planting in mass, they will not set fruit and each group requires inter planting of trees of mother group, the two groups being compatible with one another. Based on this unique flower behaviour, avocado cultivars can be divided into two groups A & B. In group A, first opening takes place in the morning, second opening during the afternoon of the following day. In group B, first they open in the afternoon then again next morning. Therefore, every morning A-pistils can be fertilized by B-pollen, while during afternoon B-pistils are ready to receive A-pollen.

Crop protection

Diseases

Root Rot

Trees of any size from nursery trees to large, out trees may be affected. Longitudinal, distinctly sunken strips, of yellow or sometimes reddish colour appear on smaller stems and on fruits. The dead brown leaves hang for a long time and affected tree may suddenly collapse. More commonly, the tree yields gradually decline, leaves become smaller and paler yellow-green, then drop. The twigs and branches die back. Feeder roots are necrotic, black and brittle.

Control

- Improve soil drainage to avoid excessive moisture in the soils.
- Seeds picked from the soil should be treated in hot water (50°C for 20 min).
- Use a resistant variety as rootstock e.g., Puebla.
- Use melalaxyl (Ridomil) at the rate of 20-35g per m² of canopy area as a soil drench at monthly intervals in newly infected trees.

Anthracnose

Fruit rot begins as small, dark discoloration and slightly sunken spots. The disease rapidly spreads into the flesh.

Control

Use copper-based fungicides e.g., Copper oxychloride during fruit development.



Insect Pests**Systates weevil (*Systates pollinosus*)**

This is a black insect that feeds on the leaves especially when the plants are young leaving characteristic indentations on the edge of the leaves. It feeds only at night and rests under the mulch or loose soil at the ground level in the daytime.

Control

Cultural-Hand pick and destroy the insect.

Chemical-Use Deltamethrin as recommended on the label.

**Harvest and storage**

Fruits should be cut from the tree using hand clipper or a long pole equipped with a clipper and cloth catching bag. Average yield is about 100-500 fruits per tree.

Avocado fruit does not soften while on the tree, but does only after it is picked. The matured avocado fruit ripen in 6-12 days at 20°C.



Avocado fruiting