

Recent cultivation techniques of Poor Man's Apple: Guava

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1. Introduction

Guava (Amrud) (*Psidium guajava* L., Myrtaceae; Chromosome No: $2n = 22$) in an origin of Tropical America (from Mexico to Peru) is one of the most common fruits in India. It ranks 4th in area and production after mango, banana and citrus. It is said to have been introduced from tropical America. It is grown in many parts of the world. It is also popularly called as apple of the tropics and poor man's apple widely naturalized in the country. As a cheap nutritious fruit with a wide adaptability to diverse climatic and soil conditions, the guava undoubtedly deserves greater popularization among the orchardist. Allahabad has the reputation of growing the best guava in the country as well as in the world. It is a very hardy sub-tropical plant, prolific bearer.

2. Soil and climate

It is a subtropical and tropical fruit which requires a distinct winter for developing good quality. Guava cultivation can be extended to varying agro-climatic regions owing to wider adaptability. It does well up to an altitude of 1,000-1,500 meters. It can thrive in semi arid tracts of India and enjoys cooler climate up to an elevation of 1000 m but it cannot withstand frost. Places having more than 250 cm rainfall are not suitable for guava. Optimum temperature requirement is 23-28°C. It can grow in soils with pH ranging from 4.5 to 7.5 but the best soils are deep, friable and well drained. It is sensitive to waterlogged conditions.


















3. Varieties

Guava varieties can be mainly grouped into two groups based on the flesh colour,

- i. Red fleshed
- ii. White fleshed

Among these two, white fleshed are more common and red-fleshed are less common. Different varieties and hybrids of guava has been evaluated under different condition based the physico- chemical properties. Hisar Surkha recorded the maximum quality attributes except ascorbic acid content among the different cultivars evaluated. Lalit, Shweta and PantPrabhat were assessed as high yielder with moderate fruit quality (Reddy *et al.*, 1999; Singh *et al.*, 2008). Hisar Surkha recorded maximum quality attributes and Lalit, Shweta and Pant Prabhat were assessed as a high yielder with moderate fruit quality (Pandey *et al.*, 2016). Varietal description Anapalli: The fruits are slightly oval in shape with a fruit length of 5.9 - 6 cm. The average fruit weight is 95 g. The seeds are soft and fleshy. It has 393 mg of vitamin C per 100 g of flesh. Allahabad Safeda: This is the most famous variety grown in Uttar Pradesh for table purpose. Tree is medium in height (5.8- 6.5m) with vigorous branching and dense foliage. Fruits are medium in size (180g), round in shape with few seeds. Fruit is white fleshed with good keeping quality. Chittidar: It is a white fleshed variety with spherical fruits. Each fruit weighs 95 g and the fruit size is 4.4 x 4.7 cm. Pulp has good

taste and flavour. At calyx end, longitudinal furrows are seen. Skin is thin. The pulp has 108 mg of vitamin C/100 g. Lucknow - 46 (Guja guava): Fruits have got a short neck at the pedicel end and broad tip resembling the pear fruits (Pyriform). Each fruit weighs 80 g, size 7.4 cm long and 4.9 cm diameter. Flesh is white, meaty with good taste. Vitamin C is 130 mg / 100 g of flesh. Lucknow - 49 (Sardar guava): Fruits are round, fairly bigger each weighing 150 – 170 g with a rough surface. The flesh is white with good taste. It has a good adaptability to various localities. Lalit: Selection from half-sib population of Apple Colour guava, High yielder with wider adaptability, Responsive to pruning; suitable for high density plantings, Fruit yield is 100 kg per plant per annum at around 6 years of age, higher than any other commercial guava variety, Fruits are saffron yellow in colour with red blush, Average fruit weight of 185-200g, Pulp firm and pink with good blend of sugar and acid, TSS of 12° Brix and vitamin C- 250 mg per 100g pulp, Suitable for both table as well as processing, Pink colour of beverage remains stable for more than a year in storage.

		
Allahabad Safeda		Surka Chitti Natputani
		
Lalit	Arka Kiran	Panneer Guava
		
Red Fleshed		Hafsi
		
Lucknow 49		Arka mirdula
		
Sabdana Badari		Bapatla
		
Superior Sour Lucidem		KG Guava
		
Karela		Lucknow 49

4. Propagation

Vegetative propagation through layering is therefore recommended. Both air layering and simple air layering or ground layering has been found to be successful. In about 45 days, layers can be separated from the mother plants. These separate layers should be planted in full size pots and they are hardened by gradually exposing them to direct sunlight. Such hardened layers are ready for planting in about six months. Though it is hard to rooting, semi hard wood cuttings, treating with IBA or NAA at 2000 to 5000 ppm root well under mist conditions.

5. Planting

Pits of 0.5 m x 0.5 m x 0.5 m size are dug at a spacing of 5m x 5m. The layers with the ball of earth are planted in the centre of the pit.

5.1. High Density Planting

Under HDP guava plants planted at 3 x 6m (555 plants / hectare) provides cent per cent higher planting density over 6 x 6m spacing (277 plants / hectare). Higher fruit yield (159.4/tree) in 3 x 3m planting system over 6 x 6m (124kg/tree) was observed in 8 year old trees. Recommended planting density under conventional system is 277 plants per hectare (6 x 6m). Bearing habit is on

current season's growth; responds well to training and pruning; canopy



Air layering of guava

engineering is feasible. HDP together with canopy management provided 47.1 tonnes per hectare yield, 65.2 per cent increase over the recommended spacing. Allahabad Safeda and Lalit perform well under HDP.

5.2. Ultra High Density Planting System in Guava

A 'Meadow Orchard' system; Develop by CISH, Lucknow. Very high productivity with superior fruit quality. Plants spaced at 1 x 2m accommodate 5000 plants per hectare; Canopy management through topping and hedging Plants are topped 2 months of planting in October for emergence of new shoots below cut end. 50 per cent length of each new shoots, pruned again in December-January for induction of more shoots ; flower buds differentiate; well spread is attained by May. Heading back of all shoots is repeated annually in September, May and January; ensures dwarf, compact canopy, better fruiting

and easy horticultural operations. Production starts from very first year of planting, 12.5 tonnes reaching up to 55 tonnes per hectare. Lalit performs very well under Meadow orcharding (Singh, 2008). Root stock Mirzapur Seedling, Cheeni guava and Karela could be used as rootstock under saline condition (Santhi *et al.*, 2019) which increases the area and productivity of guava in India.

6. Manures and fertilizers

It responds well to the application of inorganic fertilizers along with organic manures. Therefore for the bearing trees, 50 kg of FYM and one kg in each of N, P and K are applied per tree in two equal split doses, once during March and again during October. The manure and fertilizers are spread in the entire basin of the tree, 15 cm away from the trunk up to leaf drip and incorporated by shallow digging. It also responds to foliar spray of nutrients and spraying of urea 1% + Zinc sulphate 0.5% twice a year during March and October increase the yield. Guava sometimes suffers from deficiency of micro nutrients. Hence, a mixed sprays containing ZnSO₄, MgSO₄, MnSO₄ @ 0.5% and CuSO₄ and FeSO₄ @ 0.25% plus a wetting agent @ 1 ml per 5 litre of solution at various stages *viz.* new flush, flowering, one month after first spray at flowering

and at fruit set are recommended. Foliar nutrition Khamis *et al.*, (2007) studied that spray the guava trees with Dormex at 2% in January then sprays twice with combination from (urea at 1% + K₂SO₄ at 2% + ZnSO₄ at 0.5% + Borax at 0.3%) at full bloom and after fruit set (one month later) to improve vegetative growth; nutritional status; yield and fruit quality of guava.

7. Special Horticultural Practices (Or) Techniques (Or) Operations

7.1. Training

Open centre systems or delayed open centre is generally recommended.

- Open centre - 4 primary shoots for initial frame work.
- No criss - crossing branches.
- Primary branches @ 75 cm above.
- Canopy shape - East - West more spread.
- Remove off-shoots, dried and diseased parts.

7.2. Pruning

Pruning consists of removal of suckers arising from the base of the trunk. Dried twigs and branches have to be removed and the cut ends may be applied with Bordeaux paste. The flowers are borne



on the axils of current season shoots. Light annual pruning after harvesting promotes vegetative growth and flowering. In Tamil Nadu, it is recommended that the tips of 10-12 cm lengths of past seasons shoots are pruned during September and February every year to encourage more laterals. Pruned trees give large fruits and early ripening. Care must be taken to prevent criss-crossing of the primary branches in the initial years of planting. In case of varieties having spreading habit, primary branches are allowed at least 75cm above ground level. It is better to shape the tree canopy to a limited height into a rectangular shape, allowing more spread in East-West direction. Dead, diseased, intercrossing branches and suckers coming up from the base and sides of framework should be pruned back annually.

7.3. Bending

In medium aged trees, when the trees reach more height, the branches will grow more or less straight up. Such upright growing branches will not produce axillary growth leading to reduction in yield. Such upright branches should be bent and their terminal portions should be buried inside the soil or tied strongly to pegs driven in the soil around the trees. By this, the dormant buds are accelerated and

induced to produce new flush which will result in production of flowers leading to higher yield. Breaking the apical dominance and activating the latent buds present on the branch (Samant *et al.*, 2016) produce better quality fruits in the offseason (Sarkar *et al.*, 2005; Mamun *et al.*, 2012) and maintaining increased C:N ratio and induce more flowering and fruit set.

7.4. Pollarding (or) dehorning

When the trees become very old, there is practically no production of new flush. In such a situation, pollarding is resorted to. It is nothing but cutting back big branches leaving 30 cm length base at the places of their origin. The new growth in the following season will put forth profuse flowering and give high yields.



Bending of guava branches to induce new flesh

Rejuvenation of old guava trees by Pollarding /dehorning

7.5. Crop regulation (Bahar Treatment)

Bahar treatment is done by root exposure to sun, withholding water and also deblosseming the rainy season crop due to insipid taste of the fruits and inferior quality. So, winter crop is generally desirable.

7.5.1. Bahar treatment

In certain parts of Maharashtra, root pruning is practiced to produce heavy yield. In this method roots are exposed and minute roots are cut away and irrigation is withheld so as to allow the leaves to shed. It consists of root exposure and or root pruning before the onset of monsoon. Then, the basins are covered with the manures and soil and irrigated copiously. There are three distinct flowering seasons with corresponding harvesting periods like rainy, winter and spring. It is desirable to take only one crop in a year. In South India the rainy season crop is preferred even though it is of poor quality, since the price is high at this time. In North India, winter crop is of better quality and the fruits also escape the attack of white flies. In Western India, root pruning of guava to regulate the season of harvesting, as is done in the case of mandarins, is recommended in heavy

soils only. In lighter soils, withholding of water serves the purpose. This practice is known as bahar treatment. Singh *et al.*, (2001) studied the effect of pruning dates on yield of guava cultivars Allahabad Safeda and Sardar for five consecutive years. They reported that pruning from April to June, enhanced the flowering percentage as compared to pruning in February and March. The number of flowers per shoot on severely pruned (60%) trees of guava were more when compared to mild pruned (30%) trees and control (Jadhav *et al.*, 2002). Regulated crops are desired to avoid glut in the market and also ensure the regular supply of fruits. The choice of bahar at a particular location is determined by prevailing production constraints like availability of irrigation water, quality of produce, market demand and extent of damage by insect-pests and diseases (Lal *et al.*, 2017). The principle behind crop regulation is to induce flowering and fruiting in desired season of the year that contribute to increased fruit yield, quality, profitability and sustainability of the environment by reducing the use of the frequency of the pesticides.

8. Harvest and yield: Guava, being a climacteric fruit, it ripens after harvesting; the fruits are harvested throughout the year (except during May

and June) in one or the other region of the country. However, peak harvesting periods in north India are August for rainy season crop, November-December for winter season crop and March April for spring season crop. In the mid climatic conditions of other parts of the country, the peak harvesting periods are not so distinct. Change in colour of fruits from dark green to pale green is the indication of maturity, the fruits are harvested at their full yellow but firm for local market, whereas half yellow fruits should be picked for distant markets. The fruits are harvested selectively by hand along with the stalk and leaves.

9. Maturity index

- Change of dark green colour to greenish yellow or light yellow.
- Specific gravity: 1 - 1.02.
- Harvesting interval: 2-3 days during rains - 4-5 days during winter.
- Harvested along with 2 leaves

Mature or half ripe fruits are mostly preferred for consumption than ripe or over ripe fruits. Each tree will bear on an average 500-800 number of fruits weighing 20-25 kg may be obtained from guava. The yield per hectare would be 12-15 tonnes/year.

10. Postharvest handling and storage

Because of their perishable nature, guavas are disposed off immediately after harvesting in the local market and a very small quantity is sent to distant market, they are not kept in cold storage. However, shelf-life of guava can be extended up to 20 days by keeping them at low temperature of 5°C and 75-85% relative humidity. It can also be stored for about 10 days at room temperature (18° -23°C) in polybags, providing a ventilation of 0.25%.

11. Conclusion

It is concluded that the above-mentioned novel techniques for guava is scientifically proven that are highly potential enough to improve the crop productivity. The ultimate aim is to increase the productivity per unit area with the effective utilization of optimum inputs.

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