



Shoot Bending: An Eco-Friendly and Cost-Effective Crop Regulation Practice in Guava

(*Amit Kumar¹, Mohni Parmar², Smita Agrawal¹ and Manoj Kumar Kureel¹)

¹Dept. of Horticulture, B.M. College of Agriculture, Khandwa, RVSKVV, Gwalior (M.P.)

²Department of Horticulture, AKS, University, Satna (M.P.)

*Corresponding Author's email: amitkumar01220122@gmail.com

Guava (*Psidium guajava* L.) is the fifth most important fruit crop of India after mango, banana, papaya and *citrus* as well as a popular fruit crop of tropical and subtropical areas of the world. It is easily available with reasonable price thus, named as “apple of tropics” and due to its rich nutritional values, it is also considered as “super fruit”. It is grown on commercial scale in many countries like; India, China, Thailand, Pakistan, Mexico, Indonesia, Brazil, Bangladesh, *etc.* In India, it was introduced during the early 17th century by Portuguese. It is widely grown all over the tropical and subtropical parts of India viz., Uttar Pradesh, Maharashtra, Bihar, Odisha, West Bengal, Chhattisgarh, Gujarat, Madhya Pradesh, Andhra Pradesh, Punjab, Tamil Nadu, and Karnataka. Being a very hardy fruit crop, it excels most other fruit crops in productivity, adaptability and vitamin-C content. It bears heavy crop every year and give good economic returns with very little inputs and gives an assured fruit crop twice a year.

India ranks first in production of guava which comprises about 45.22 % of the world production. Area of guava in India is 265,000 ha in which production of 40, 54,000 MT of guava. In India, Uttar Pradesh which has production of 928440 MT from 49530 ha area with productivity of 18.75 MT/ha. Andhra Pradesh rank 1st in term of productivity of guava in India which is 24.12 MT/ha (Anonymous, 2018).

In sub-tropical conditions of India there are two major flowering seasons in guava, one during March - April (*Ambe Bahar*), the fruits are harvested in rainy season *i.e.* July – August and second flowering season comes in June – July (*Mrig Bahar*) and fruits are harvested during winter season *i.e.* October to March. The fruit of rainy season crop are usually insipid and poor in quality also attacked by many insect pests and diseases and such fruits are not fit for marketing and ultimate consumption. On the other hand, winter season crop fetches higher price because supply is less and demand is more in the market as compared to rainy season crop.

Since, *Mrig Bahar* or winter season guava demand more in market and fetches higher profits. Therefore, flowering should be regulated in such a way that only best quality fruits can be harvested during the winter season, as the winter season crop is superior in quality, free from pests and diseases. To obtained heavy flowering and fruiting in guava for winter season crop certain crop regulation methods are adopted, in general. In guava crop regulation has been achieved by various methods *i.e.* use of chemicals, application of PGR's, bending of lateral shoots, shoot pruning, manual removal of flower buds, exposure of roots and withholding irrigation.

Bearing habit of guava and shoot bending

Guava plant bears flowers on current season's growth or new shoots irrespective of time of year. New shoots are produced on mature wood or past season's growth laterally or terminally. In general flowers are produced in the axils of leaves as solitary or in cymes of two or three flowers. The current season's flowering shoot continues its growth till fruit setting. After fruit setting the terminal bud ceases its growth until the next growing season. Sometimes, flowers appear at the tip of the current season's growth. Such shoots do not grow further.

Bending of lateral shoots in guava is one of the most important and economical practices for crop regulation. The most suitable time of bending for producing better quantity and quality of guava during *Mrig Bahar* is reported in April to June month under sub-tropical region. Bending induces profuse flowering and fruiting as well as fetches greater return in guava. Thus, crop load depends upon the number of new shoots. Emergence of more number of lateral shoots on a branch means more flowering and fruiting. Upright/erect growing branches produce new lateral shoots near to their top end. The lower buds of such branches remain dormant because of apical dominance phenomenon.

The tip of the branches produces a plant hormone known as auxin that moves downwards and inhibits the growth and development of lateral buds. This suppressive effect of auxin on lateral buds gets diluted in spreading, droopy or horizontally growing branches and such branches produce enormous number of new lateral shoots.

Therefore, guava branches can be induced to promote more numbers of lateral shoots by adoption of branch bending technique. Bending of branches invigorates or activates the dormant lateral buds by means of suppressing the apical dominance. Besides, this technique induces more flowering by maintaining higher C: N ratio and stimulating proline biosynthesis under an episode of stress.

Crop regulation and shoot bending

Throughout India, *Mrig Bahar* is preferred over *Ambe Bahar* and *Hasth Hahar* because rainy season guava crop is insipid, watery, less nutritive and is infested by fruit flies. Winter season crop is superior in terms of fruit size, taste, shelf life and incidence of pests and diseases.

Hasth Bahar is observed in western and southern India. The quality of fruits is good, but yield is very low. However, these offseason fruits fetch good market price.

Guava growers are advised for crop regulation so as to take only one crop per year because bearing crops throughout the year results in no rest period for the plants and lower yields at different times of the year.

Crop regulation by adopting branch bending technique is an economic technique wherein an orchardist can induce new fruit bearing shoots in guava in any season and can regulate fruit production according to local market.

The technique of shoot bending

Branch bending is a very simple technique to adopt in an orchard planted at conventional plant density (5m X 5m). However, in case of high density (less than 5m x 5m) orchard its adoption is not feasible as bending requires more space and plant becomes spreading in nature. Shoot bending can be performed in two years old plant and it can be continued till eight years. Following Steps for shoot bending are given below: -

- Apply half of the fertilizer requirement of the crop 15 -20 days prior to bending.
- Remove small shoots, leaves, fruits, flowers from the branches keeping 10-12 pairs of leaves intact at the terminal portion of each branch.
- Bend down the branches to open up the central canopy. To bend the branches pressure should be applied at the base and it should gradually progress to the tip portion.

- Untie the bent branches when the new shootlets are 1 cm in length.
- Apply remaining half amount of fertilizer at marble stage of fruit growth.

Time of bending

Though bending can be practiced throughout the year, an orchardist is advised not to practice it during rainy and winter season to avoid crop losses due to flower drop and slow growth, respectively. Bending in summer and autumn season is considered desirable to get more yields.

Time of bending	Summer bending	Autumn bending
	April to June	September to November
Shoot emergence	After 12 to 14 days of bending	After 25-30 days of bending
Flowering	After 40 to 45 days of bending	After 60 to 65 days of bending

Advantages of shoot bending

- Shoot bending technique is very simple and easy to practice.
- It is eco-friendly and cost effective as it does not require costly and hazardous chemicals for crop regulation.
- Shoot bending opens the central canopy of the plant and allows better penetration of sunlight and facilitates aeration in canopy.
- It minimizes infestation of diseases and insect pests.
- Shoot bending increases number of shoots by activating a greater number of dormant lateral buds, thus inducing profuse flowering and fruiting without much removal of the biomass.
- It augments uniform flowering and fruiting.

Conclusion

This technique with its scientific base has a great potential in maximizing the productivity of guava through regulating the crop and producing a greater number of lateral new shoots. farmers can regulate the guava production as per the market demand and harvest crop before and after the glut in local and distance market. Thus, guava orcharding can be made more profitable by adopting this simple, eco-friendly and economically feasible technique of shoot bending.



Fig.1 Bending of lateral branches with partial removal of old leaves



Fig. 2 Bearing of guava fruit in orchard

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