



## Crop Regulation in Fruit Crops

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Some fruit crops bear blooming throughout the year without any resting period and produce two or three crops known as bahar, in a year but yield and quality is not so well in all crop harvest. It is very essential to know the flowering and fruiting behaviors of crops and India is major fruit producing country in the world after china. India have rich fruit diversity in tropical, subtropical and temperate regions. Some of the fruits like Guava, pomegranate, lemon, acid lime, mandarin etc., give various flowering flushes throughout the year if left without any treatment. These crop shows three distinct flowering seasons i.e. February-March (Ambe Bahar), June-July (Mrig Bahar) and October-November (Hasta Bahar) with the corresponding harvest period during rainy (June – July), winter (November-December) and spring season (February- March), respectively. The main prime objective of crop regulation is to give the force of the tree for rest and produce profuse blossom and fruits during any one of the two or three flushes. To get good quality production bahar regulation are necessary in such a way that they could produce only one crop instead of two or three flushes in a year. It can be achieved through various treatments and methods like withholding irrigation, root pruning, root exposure, shoot pruning, defoliation, flowers thinning, one leaf pair pruning, spray of chemical e.g. NAA, urea, NAD, 2.4 D etc. Crop regulation is planning method to obtain good quality fruit and yield with good income generation by selected season crops. It is sustainable operation because this must be achieved without negatively impacting people, the environment or the financial bottom line.

Crop regulation, bahar treatment, flowering and fruiting, yield and quality which bahar will give good crop with considering all the factors related with a particular bahar. Bahar treatment is practice which manipulates the flowering of any crop toward desired season by various methods and treatments. It is a vital for regularity and increased production of fruit crops along with qualitative traits. It can be achieved through deblooming of flowers, root pruning, withholding of irrigation, one pair leaf pruning, manual thinning, chemical thinning, selective harvesting, training, summer and winter pruning, prevention of pre harvest fruit drop etc.

Crop density, a measure of fruit crop, influences fruit growth and eventually fruit size at harvest. It mainly depends upon flowering and fruit set. With ideal conditions, most fruits often set heavier crop that cannot be satisfactorily sized to meet market requirement for higher price. Leaf to fruit ratio fairly guide about the extent of thinning to be carried out in a particular orchard. Usually 30-40 leaves per fruit are sufficient to produce fruit of good quality. Though, thinning may



reduce the total yield, but net return increases as larger fruits fetch much higher price in the market.

The acid limes bloom throughout the year but the main blooming period is spring season (February-March) with lean period from July to August. There are three distinct flowering seasons with corresponding harvesting periods i.e. rainy, winter and spring. It is desirable to take only one crop in a year. In North India, winter crop is of better quality and the fruits also escape the attack of white flies.

**Principle of crop regulation:-** The basic principle of crop regulation is to manipulate the natural flowering of the fruit plant in desired season that contribute to increased fruit yield, quality and profitability. This concept is based on the fact that most of the crops bear flowers only on new, succulent, vigorously emerging vegetative growths. These new growth flushes can be either on new emergences of lateral bud on older stems or extensions of already established terminals of various size and vigour. Guava, citrus, pomegranate etc. are the best examples that accomplish such features for crop regulation.

**Objective of crop regulation:** 1) To obtain suitable crop at a desired season 2) To force the tree for rest and produce profuse blossom and fruits during any one of the two or three flushes, 3) To regulate a uniform and good quality of fruits 4) To maximize the production as well as profit to the grower Reduce crop load intensity 5) To get better market price 6) To obtain good quality fruit e.g. winter guava. 7) To maintain balance between vegetative and reproductive phases in next year which crop taken. 8) To prevent flower and fruit drop.

**Criteria for bahar selection:** The selection of a bahar at a location is mainly determined by prevailing production constraints like: Availability of irrigation water Occurrence and extent of damage by diseases and pests Market demand Quality of products Climate of the area Availability of fruit in the market Comparable yields

**Need of crop regulation:** Some fruit crops which bloom more than one in a year do not produce good yield and quality of the fruit throughout the year. In guava, the fruits produced in the rainy season are rather insipid and watery and do not keep well. The winter season crops (mrig bahar) which ripen from second fortnight of October to first fortnight of January are superior in quality, free from diseases and pests and fetch higher income. Winter season crop is superior in quality which fetches higher prices than rainy season crop. Second, the flowering is more in guava during summer season because of heavy new flushes that lead to more fruit production in rainy season.

**Methods are used in crop regulations: The following practices can be done:**

**Withholding irrigation Root exposure:** Flower thinning Shoot pruning Shoot bending Nutrient application Deblossoming of flowers Use of growth regulators Withholding irrigation The irrigation is withheld for 2-3 month during February- March. At the end of May or early June, the soil of orchard is ploughed and manured with Farm yard manure to individual tree. After application, tree is irrigated. The plants then resume growth and bloom heavily in August- September producing very high yield and quality fruits in winter season. Root exposure various degree of root pruning has been found suitable for minimizing the rainy season crop. The practice of root exposure and pruning is done in regions with high atmospheric humidity and water table. The main root system is not disturbed while the fibrous roots on them are removed by pruning shear. This results in shedding of leaves from the tree. At this stage, the exposed roots are again covered with soil, mixed with manures and immediately irrigated. Root pruning should, however be avoided as it has adverse effect on plant longevity.



**Flower thinning:** Deblossoming of rainy season crop is another method for crop regulation. Thinning of flowers and small fruits practiced by hand, twice during April-May at 15 days interval, has been found quite effective in this regard. However, the technique is costly.

**Shoot pruning:** The pruning of new shoot (current season) growths in first week of May has been found very effective for crop regulation in guava. This method involves the removal of half to 3/4th portion of the shoot growth. This pruning automatically removes the flowers and flower buds of spring season flowering and consequently the rainy season crop can be reduced. This method has been found effective and economical without much adverse effect on total yield of the plant in a year. Significantly maximum TSS, Sugar: acid and yield were recorded when guava plants pruned up to 45 cm in May (Mamun et al., 2012)



**Shoot bending:** Bending induces profuse flowering and fruiting in guava and fetches greater returns (Ghosh and Sukul, 2003; Sarkar et al., 2005). Before doing bending some of the shoots were thinned off and rest of the shoots was cleaned from the base of the shoot except 25-30 cm of terminal portion. Then all the branches of plant were bent down and tied to the base of the plant by coconut thread. In case of bending of branch wood tension of branch is increased and phloem formation decreased. As a result, photosynthetic products pass slowly from the shoots of bent branch towards the other parts maintaining increased C: N ratio and induce more flowering and fruit set.



**Time of bending:** The highest yield of guava when bending was done in October.

**Nutrient application:** Nutrients are also responsible for crop regulation. To reduce rainy season crop and increase winter crop, two sprays with urea @ 15 per cent in April-May at 15 days intervals was more effectively. Two sprays of 10 and 15 % urea at 10-day intervals during flowering in the summer season was economically feasible for crop regulation in Allahabad Safeda and Sardar guava.



**Use of growth regulators:** Manipulation of flowering season by application of growth regulators has been found to be very effective for crop regulation in guava. Growth regulators such as NAD, NAA and 2, 4 – D have been found very effective in thinning of flowers and manipulating the cropping season in guava. Chemical treatment of NAD at 30 and 50 ppm, NAA 100 and 125 ppm and 2, 4 – D at 15 and 30 ppm can be successfully used for thinning of summer flowers. NAA at 80 and 100 ppm greatly reduced the fruit set of guavas when sprayed in the month of April. Among the different fruit thinning chemicals used, NAD at 50ppm and 2, 4–D at 30 ppm were found the most effective chemicals for deblossoming of summer flowers.



By deblossoming the summer flowers, an increase in yield by 200 - 300 per cent was obtained and NAD at 50 mg /litre was more effective than NAA or 2, 4 - D. Treatment with ethrel (1ml/l) resulted in the highest ethylene forming enzyme activity in leaves and maximum number of flowers and fruits. The flowering was greatly enhanced by spraying urea at 25% and ethrel at 2000 ppm. (Mahalle et al., 2010) reported that two sprays of cycocel @ 1000 ppm at an interval of one month before initiation of flowering in August and September for Hasta bahar flowering (i.e., September and October) of acid lime resulted in maximum yield in terms of number of fruits per tree and weight of fruits per tree and this treatment also improved the fruit quality in respect to juice %, TSS, acidity, ascorbic acid content, peel percentage.

The water stress with hormones played an important role in regulation of flowering and there is relationship between severity of stress and flowering response. Crop regulation is the basis for the regular and quality crop. It may be adopted successfully in guava, citrus, pomegranate etc. by adoption of different methods viz., with holding irrigation, root exposure, flower thinning, shoot pruning, shoot bending, nutrient application, and use of growth regulators to increase production with enhanced fruit quality.

### Conclusion

Crop regulation in may be adopted successfully in various crops like guava, pomegranate, citrus and grapes by various cultural and chemical methods by various techniques like withholding of irrigation, flower and fruit thinning, shoot pruning and application of different chemicals like NAA, urea, Paclobutrazol etc. Off season production is more profitable for fruit production. Success off season production depends upon experience of growers, orchard management practices and climatic conditions. Proper extension activities required to disseminate the proved technology among the farmers.

### References

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