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Crop Regulation in Fruit Crops

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Introduction

Flowering/fruiting cycle management is another term for crop regulation. Crop regulation's major goal is to force the tree to rest and produce abundant blossoms and fruits during one of the two or three flushes. Only by limiting the crop to a single season can a good yield be achieved (bahar). Crop regulation provides the foundation for a consistent and high-quality harvest. It is also known as "vegetative-reproductive balance management." The availability of water, the occurrence of diseases and pests and the market position all play a crucial role in bahar selection. Typically, 30-40 leaves per fruit are adequate to produce high-quality fruit. Many fruit crops bloom all year, with no rest period in between and produce 2-3 bahars per year, with poor quality fruits and reduced output. To determine which bahar will produce the best harvest, it is vital to study the flowering and fruiting behaviour of crops while taking into account all relevant parameters.

Bahar	Month	
	Flowering	Fruiting
Ambe bahar	February-March	July-August
Mrig bahar	June-July	November-December
Hast bahar	October-November	February-March

Principle of Crop Regulation

Crop regulation's main premise is to regulate the fruit plant's natural flowering in the appropriate season to maximize fruit output, quality and profitability. The majority of crops only bear blooms on young, succulent and vigorously emerging vegetative growth which supports this theory. These fresh growth flushes might appear as new lateral bud emergence on older stems or as expansions of already established terminals of varying size and vigour. Guava, citrus, pomegranate and some other fruit trees that have such characteristics for crop regulation are the greatest examples.

Why the need?

The bahar determines the yield and fruit quality. Many crops that bloom more than once a year do not produce a consistent yield and fruit quality throughout the year. When compared to the winter season harvest, the rainy season crop of guava (for example) is inferior in quality and is damaged by several biotic and a biotic stressors. Winter crop (mrig bahar), which ripen from the second fortnight of October to the first fortnight of January is of greater quality, devoid of diseases, pests and yields higher profit. This necessitates many ways for controlling blooming (from ambe bahar to mrig bahar) in order to achieve the most profitable harvest. Depending on meteorological parameters, cropping pattern, cultivar and other considerations, different methods of crop management are used in different regions. This crop regulation of flowering from ambe to mrig bahar to obtain most profitable crop is done using several methods:

With respect to fruit crops, crop regulation aim at

- Optimal crop annually.
- Improve fruit quality.
- Modify the balance between growth and fruiting to obtain higher yield and reduce management costs.
- Improvement in flowering and fruit set, especially where the yields are sub-optimal.
- Reduce the crop load in order to avoid competition.
- Uniform flowering.
- Maximize production.
- Profit to the grower.

Methods of Crop Regulation

In order to get only appropriate season crop it is necessary to manipulate the flowering. The following practices can be adopted

- De-blossoming or Thinning.
- Withholding of irrigation.
- Root exposure or Root pruning.
- Shoot Pruning.
- Chemical/PGRs application.
- Nutrients application.
- Shoot bending.

A. De-blossoming or Thinning

One way for crop management is to de-blossom rainy season crop. Hand thinning of flowers and tiny fruits, done twice in April and May at fortnight interval has been proven to be highly successful in this regard. However, the method is expensive and inconvenient. This approach also reduces the plant's total yield for the year. Under various agro-climatic conditions, growth regulators and specific chemicals have been found to be very effective in flower thinning and manipulating the cropping season. NAA, NAD, 2, 4-D, carbaryl and ethrel have all been found to be effective in reducing the rainy season and increasing the winter crop. Flower thinning has been attempted with varied degrees of success using Naphthalene Acetic Acid (NAA), Naphthalene Acetamide (NAD), 2,4-Dichlorophenoxy acetic acid (2,4-D), potassium iodide (KI), 2-chloroethyl phosphonic acid (ethephon), 4,6-Dinitro-O-Cresol (DNOC) and urea. Cultivars, tree state, soil type and habitat may all play a role in this aspect. Chemical thinning, according to the majority of workers, is cost-effective and boosts winter yield while also improving fruit quality.

a. Withholding of Irrigation

During the months of February and March, irrigation is turned off for a couple of months. Trees go into dormancy when their growth cease, leaves turn yellow and fall off owing to water stress. At the end of May or early June, the orchard soil is ploughed and individual tree basin is manured with farm yard manure and afterwards irrigation is performed. The first two irrigations should be spaced three days apart, with successive irrigations spaced 10-15 days apart until the monsoon arrives. The plants subsequently continue growth and blossom profusely in August–September, yielding a large number of high-quality fruits over the winter season.

b. Root Exposure and Root Pruning

Root trimming of various degrees has been found to be effective in reducing the rainy season crop. In areas with a high atmospheric humidity and water table, root exposure and pruning is practised. After removing the top 8 cm of soil, the method comprises exposing the tree's higher roots up to 1.5 ft. radius around the trunk. The primary root system is not harmed, but the fibrous roots on them are pruned away with a pruning shear. Hence, the

tree sheds its leaves. The exposed roots are now covered with dirt, mixed with manures, and irrigated promptly. Root pruning, on the other hand, should be avoided as it shortens the life of the plant. The plant's roots are exposed to the sun by removing up to 7-10 cm of soil from a 40-60 cm radius around the tree trunk. Before blossoming, the water is withheld for a month or two. Leaves wilt and fall to the ground as a result of water stress. Roots are again covered with a mixture of soil and FYM and irrigated right before one month of targeted bahar. Irrigations are administered at appropriate intervals after that. As a result, plants produce fresh vegetative growth, as well as abundant flowering and fruiting.

c. Shoot Pruning

Crop management in fruits like guava has been proven to be particularly effective when new shoot (current season) growth is pruned in the first week of May. This procedure entails removing half to three-quarters of the shoot development. As a result, of this pruning, the flowers and flower buds of the spring flowering season are automatically removed, and the rainy season crop can be lowered. This approach has been determined to be effective and cost-efficient, with little impact on the plant's annual total production. When guava plants were clipped up to 45 cm in May, highest TSS, sugar: acid ratio and yield were observed (Meena *et al*., 2017). Patil *et al*. (2018) discovered that pruning a 10 cm terminal shoot at the date of harvest resulted in significantly more flowers per metre shoot and fruit set.

d. Chemical PGRs/application

The application of growth regulators to manipulate the flowering season has been discovered to be particularly successful for crop regulation. Growth regulators including NAD, NAA, and 2, 4-D has been proven to be particularly effective in flower thinning and cropping season manipulation. Summer flower thinning can be accomplished with chemical treatments of NAD at 30 and 50 ppm, NAA at 100 and 125 ppm and 2, 4-D at 15 and 30 ppm.

e. Nutrition Application

Nutrients also have a role in crop regulation. Two treatments with 15% urea at 15 day intervals in April-May were more successful in reducing rainy season crop and increasing winter crop (Singh *et al*., 1996). In Allahabad Safeda and Sardar guava, two sprays of 10% and 15% urea at 10-day intervals during flowering in the summer season proved economically feasible for crop regulation (Singh *et al*., 2000). For the guava crop, Gupta and Nijjar (1978) recommended using a mixture of NPK @ 40, 100, 40 g per tree. With a 10% urea concentration, Singh and Singh (2009) observed highest floral bud production, fruit weight and fruit output in guava.

f. Bending of Shoot

Guava flowers and fruits profusely when bent, resulting in higher yields (Ghosh and Sukul, 2003; Sarkar *et al*., 2005). Before bending, some of the shoots were trimmed and the remainder of the shoots were cleaned from the base to the terminal area, except for 25-30 cm. The plant's branches were then bent down and connected to the plant's base with coconut thread. When a branch bends, the wood tension of the branch increases and phloem production decreases. As a result, photosynthetic products travel slowly from bending branch shoots to other areas of the plant, preserving a higher C:N ratio and inducing more flowering and fruit set.

Conclusion

Crop regulation in various fruit crops can be adopted successfully by employing various cultural and chemical methods as discussed in the article. Several studies conducted by research workers have markedly advocated that application of various cultural and

chemical methods was effective to regulate flowering of summer flowers and to produce fruits in winter in fruit crops like guava. The suitability of crop regulation method must be tried first at micro-level before adopting it at large scale level. Still there is an obligation for more research in this regard.

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