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ADVANCES IN GUAVA CROP REGULATION: A REVIEW OF RECENT RESEARCH AND DEVELOPMENTS

Kajal Sahu[1*], Sevan Das Khunte[2], Yogesh Kumar Chandrakar[1] and Ajay Singh[1]
[1]Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India 492012
[2]Department of Fruit Science, Mahatma Gandhi University of Horticulture and Forestry, Durg, Chhattisgarh, 491111, India
*Corresponding author E-mail: kajalsahu348@gmail.com
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ABSTRACT

Guava (*Psidium guajava* L.), one of India's most promising fruit crops, is extremely valued for its exceptional nutritional benefits and lucrative financial returns. In recent years, guava has gained immense character in the global market due to its processed products and high nutritious content. Typically, guava plants yield two crops annually, with the rainy season harvest producing fruits that are watery and bland, making them unsuitable for preservation. The primary objective of crop regulation in guava is to induce a resting period, enabling the tree to concentrate its energy on producing an abundance of fruit and flowers during one of the two or three flushes. This approach aims to maximize profits and output while ensuring consistent quality. Guava, along with pomegranate and lemon, is among the fruits that naturally bloom multiple times a year. The selection of Bahar, a critical aspect of crop regulation, is primarily determined by factors such as water availability, disease and pest occurrence, and market positioning at a given location. To achieve effective crop regulation, diverse techniques are employed, including withholding irrigation, flower bud thinning, shoot pruning, and application of specialized chemicals. By adopting these strategies, farmers can optimize guava production, enhance quality, and increase profitability. This review synthesizes current research and developments in guava crop regulation, highlighting advances in techniques such as pruning, thinning, irrigation management, fertilization, and plant growth regulator application. This review discusses the impact of these innovations on guava productivity, fruit quality, and sustainability. The review furthermore identifies awareness gaps and future research directions to further enhance guava crop regulation.

Keywords **:** Crop regulation, guava, bahar treatment, pruning, productivity.

Introduction

The Guava tree, or *Psidium guajava* L., is a fruit crop of great importance in India. It has become well-known for its elevated nutritional value, moderate price range, pleasant aroma, and tasty flavour. It is considered the "apple of the tropics" and is solitary of the most widely enjoyed fruits in India, enjoyed by both the rich and the poor. It is also one of the hardiest fruit trees, withstanding a wide scope of soil and climate conditions.

One of the most popular fruits cultivated extensively in tropical and subtropical regions of the world is the guava (*Psidium guajava* L.), which belongs to the Myrtaceae family and has chromosomal number 2n=2x=22. It is also referred to as the "Apple of the Tropics" or the poor man's apple. It is a crop that originated in tropical America and stretches from Mexico to Peru. Over time, its hardiness, abundant yield, high vitamin C content, fair amount of calcium content, and high remuneration even in the absence of much care have made it a commercially significant

crop in several countries. It is possible to consume guava fruits raw or processed.

In India, guava ranks fourth in importance among fruit crops, behind citrus, mango, and banana (Ray, 2002). In India, 264.86 thousand hectares are planted to guava. The states that produce the most guavas are Uttar Pradesh (928.45 thousand metric tons), followed by Madhya Pradesh (686.7), Bihar (427.61), Andhra Pradesh (229.78), West Bengal (215.20), Chhattisgarh (197.18), Punjab (195.6), Gujarat (169.57), and Tamil Nadu (155.06) thousand metric tons. The total amount produced in India is 4053.55 thousand metric tons. In Chhattisgarh, guava covers 20.40 thousand hectares of land, and production in 2022–2023 was 187.56 thousand metric tons (Anon., 2024). Madhya Pradesh, Maharashtra, Bihar, and Uttar Pradesh are significant states in the nation that grow guavas. According to Mitra and Bose (1990), the Uttar Pradesh district of Allahabad is known for producing the world's highest-quality guava fruits. The hardiness of guava, which can be grown on soil that is both alkaline and poorly drained, contributes to its significance. Guava productivity in the state is poor compared to the national average, which could be caused by a lack of adoption of advanced crop management technologies, such as those related to irrigation, plant protection, nutrition, and planting systems.

According to Nasier *et al*. (2018), the guava fruit is a rich supply of vitamins A, B, and C in addition to minerals, carbohydrates, crude fiber, flavonoids, thiamin, niacin, pyridoxine, cyanogobalamin, phenolic, betacyanins, polyphenol, and carotene. High concentrations of flavonoids and polyphenols linked to strong antioxidant activity can be found in guava leaves (Pandhi *et al*., 2022). The relaxing impact of quercetin on the muscles lining the digestive tract is thought to be the cause of its antiplasmodial action. Guava leaf polysaccharides, which humans can also employ as an antidote, can be used to treat diabetes.

Table 1 : Nutritional composition of guava fruit

S. No.	Nutrients/ minerals	Value/100g
1.	Water	80.80g
2.	Fiber	5.4g
3.	Protein	2.55g
4.	Energy	68 kcal
5.	Carbohydrates	14.32g
6.	Potassium	417 mg
7.	Magnesium	22 mg
8.	Phosphorus	40 mg
9.	Calcium	18 mg
10.	Iron	0.26 mg
11.	Vitamin C	228.3 mg
12.	Vitamin B2 (riboflavin)	0.03-0.05mg
13.	Vitamin B3 (Niacin)	0.5-1.0 mg
14.	Vitamin B6	0.1-0.2 mg
15.	Total fat	0.95 g

It is crucial to understand how crops flower and fruit, over and above which bahar will produce a healthy crop after considering all of its related aspects. Acid lime trees exhibit continuous flowering throughout the year, with a prominent peak blooming period occurring between February and March. Conversely, a relatively quiet period is observed from July to August. Guavas produce different amounts of fruit all year long. Guava blossom thrice in a year are Ambe bahar, Mrig bahar, and Hasth bahar. The main crop in North India often ripens during the showery period, which runs from July to mid-October.

Table 2 : Blossom in guava

Flowering season	Flowering	Fruiting
Ambe Bahar (February)	February – March	July –August
Hasta Bahar (October)	October- November	March – April
Mrig Bahar (June)	June- July	November- December

The freeze period, which runs from November until mid-February, produces a tiny, distinct harvest, while Assam climate reports two blossoming seasons (Lal *et al*., 2013). The guava crop grown during the rainy season is coarse, bland, low in quality, and less nutritional. It is also plagued by a number of pests and illnesses (Radha and Mathew, 2007). Fruits harvested in the winter months are of higher quality, are immune to pests and diseases, and command higher prices on the market. Winter crops can be shipped to locations that offer competitive rates because they have a longer shelf life (Lal *et al*., 2013).

Species of guava

Psidium is a family of the Myrtaceae and its basic chromosome number is x=11. The Indian guava varieties are all members of the same species, *Psidium guajava* about 150 species are thought to be in the genus, only a minute number have been methodically investigated. According to Bailey (1919), the two kinds of pyriferum and pomiferum that Linnaeus listed are only trees that bear round or pear-shaped fruits. Other species were shortly identified and recorded.

Key Characteristics of Major Crop Species:

Psidium guineense: This is sometimes referred to as the Brazilian guava or Guinea guava. The plants resemble miniature trees or shrubs. The broad, oblong-oval, acute or obtuse, 8–12 cm long, bottom surface pubescent leaves have a green colour. There are red hairs on the middle veins.

Psidium montanum: Like shrubs, plants have flat, rounded branches and can grow to a height of approximately 1.5 meters. It is located in Jamaica's mountains. Round, very low-quality fruits are produced.

Psidium fredrichsthalianum: It's referred to as Chinese guava. The fruits are tiny, globose, and contain a lot of acid; the plants are tall (7–11 m). You can make jelly using it. Guava wilt does not harm plants.

Psidium Cattleanum: It is referred to as the Strawberry or Cattely guava. It grows to a height of 3–6 m as a shrub or small tree, with small, globose fruits that are deep scarlet in colour. Compared to *Psidium guajava*, this species is more resilient to cold temperatures.

Psidium cattleianum var. Lucidum: In Hawaii Island, tree height exceeds that of Cattley guava. Plant height is observed to reach up to 12 meters. It is usually spread by seeds. Yellow fruits are used to make jelly.

Psidium molle: The leaves of the medium-sized tree are oval-shaped and green in colour. The lower portion of leaves appears velvety, while the apex of the leaf is pointy. There are red hairs on the main veins. One leaf has six to eight pairs of main veins. There are five to eleven petals, 196–239 stamens, and a tall, large ovary with three to five chambers in the stigma. Fruits are tiny, weighing an average of 13g. About 70 mg of vitamin C are present per 100 g of pulp.

Psidium pumilum: Also known as Chinese guava. The leaves of the tree resemble pyramids; they have 13–17 pairs of principal veins and are tiny, non-pubescent, and light in colour. Fruits require around 130 days reaching full maturity. Fruit weights on average 19g, and 100g of pulp has 171 mg of vitamin C on average.

Psidium cujavilis: The plants' growth characteristics and flowering schedule are identical to those of *Psidium guineense*. Fruits range in size from small to medium, with an average weight of 30 to 50 g with a sour taste.

Psidium policarpum: The periform fruit shape is the only difference between the growth characteristics and *Psidium guajava*. Fruit weight between 200 and 250 grams on average.

Why Crop Regulation Matters: Enhancing Yields and Quality?

Several crop that blooms more than once in a year do not yield a satisfactory quantity or quality of fruit all year extensive. The bahar determines both the yield and the quality. As an illustration, Guavas grown during the wet season are of low quality and are impacted by numerous biotic factors and abiotic stressors in contrast to crops grown during the winter. The winter season crops, known as mrig bahar, are of greater quality, are free of pests and illnesses, and ripen between the second and first weeks of October and January. They also yield larger profits. One at a time to produce the largely profitable crop feasible using a variety of technique, flowering must be regulated (from ambe bahar to mrig bahar). Depending on the climate, cropping pattern, cultivar, etc., different agricultural rules are applied in different regions. Guavas flower more during the summer, due to large fresh flushes that result in increased fruit production throughout the rainy season. This season, as the high temperatures and abundant rainfall, the fruit harvesting period is shortened to 30 days. This results in an excess supply of fruit on the market, driving down prices and decreasing demand. Rainy season crops are not as high in quality as winter crops, which is why they sell for less. Fruit flies have a major infestation during the rainy season, which lowers fruit quality and renders it unfit for human consumption. To date, only winter crops should be harvested in order to obtain high-quality guava fruits; rainy season crops should be avoided.

Principles and Objectives of Crop Regulation for Enhanced Productivity:

Principle:

The principle of crop regulation is to control and manage the growth and development of crops to achieve optimal yields, improve fruit quality, and reduce production costs. This involves manipulating various horticultural practices and techniques to regulate the crop's vegetative and reproductive phases.

Objectives: The primary objectives of crop regulation are:

1. Yield Optimization: Maximize fruit production per unit area.
2. Improved Fruit Quality: Enhance fruit size, shape, color, and overall quality.
3. Increased Efficiency: Reduce production costs, labor, and resources.
4. Synchronized Production: Regulate fruit set and maturity to facilitate timely harvesting and marketing.
5. Pest and Disease Management: Reduce susceptibility to pests and diseases through regulated growth and development.
6. Environmental Conservation: Promote sustainable production practices and minimize environmental impact.
7. Extended Production Season: Extend the production period to meet market demands and improve profitability.
8. Better Resource Allocation: Optimize resource allocation (water, nutrients, pruning, etc.) for improved crop performance.

These objectives are achieved through various crop regulation techniques, including pruning, thinning, irrigation management, fertilization, and plant growth regulator application, among others.

The selection of bahar (a technique of crop regulation in fruit trees, especially guava) at a location is mainly determined by the following factors:

1. Climate: Temperature, rainfall, and humidity patterns influence the choice of bahar.
2. Soil Type: Soil texture, fertility, and water-holding capacity affect the selection of bahar.
3. Variety: Different guava varieties respond differently to various bahars.
4. Tree Age and Vigor: Younger or weaker trees may require different bahars than mature or vigorous trees.
5. Pest and Disease Incidence: Bahar selection may be influenced by the presence of pests or diseases in the area.
6. Market Demand: The choice of bahar may be driven by market requirements for fruit quality, quantity, and timing.
7. Water Availability: Bahar selection may depend on the accessibility of irrigation water.
8. Labor and Resources: The preference of bahar may be influenced by the ease of use of labor and resources.
9. Altitude and Topography: Bahar selection may vary based on the location's altitude and topography.

Methods of crop regulation in guava

Abundant techniques have been attempted to stimulate fresh vegetative growth during the rainy season in order to provide a bumper crop during the winter that follows (Singh *et. al.*, 2000). Different subheads are used to review the work that different scientists have done on crop manipulation.

Shoot Pruning for Enhanced Crop Productivity and Sustainability:

To prevent Ambe bahar, the terminal area of guavas up to 20 or 30 cm in length should be cut in April. Severe trimming should always be avoided. It was advised to trim the spring flush growth now in progress in order to prevent the rainy season crop. In the country's northern regions, pruning the spring flush growth of the present season has been recommended as a way to prevent rainy season crops. It was discovered that trimming 25–50% of the shoots on April 20, May 10, or May 30 prevented flowering during the wet season and promoted Sardar guava flowering throughout the winter. Removing the sensitive shoots 4 to 5 inches from the tips reduced the percentage of guava trees that dropped flowers (Arivindakshan, 1963) while it's rainy. Bajpai *et al.* (1977) also made similar observations. Guava's unique flowering pattern, where blooms emerge solely on fresh shoots, makes shoot pruning a potent tool for regulating flower production, with consistent results throughout the year (Thakre et al., 2016). The ability to prune guava to manage the yield makes it special (Lotter 1990). Pruning off branches can aid in decreasing the size of the tree and enhancing the quality of the fruit (Singh and Bal, 2006). Numerous researchers have documented the positive impact of pruning on guava productivity and fruit quality (Bajpai *et al.,* 1973; Dhaliwal and Singh, 2004; Kumar and Mishra, 2010). In the first week of May, a single leaf pair shoot pruning of the spring flush growth for the current season produced the highest yield (Tiwari and Lal,

2007) in Uttrakhand and quality during winter season (Sharma *et al.,* 2013). On trees with heavy pruning, the lowest flower drop was measured at 100 cm, and the maximum floral drop was acquired during the rainy season on guava trees with light pruning (30 cm) (Bajpai *et al.,* 1973). In contrast, Tiwari *et al.* (1992) showed that pruning enhanced bloom growth; however, the percentage of blossoms dropped in the winter that followed. On the other hand, Lal *et al.,* (1996) discovered that during the wet season, the percentage of flowers dropped decreased as the harshness of pruning increased. According to Singh and Bal (2006), pruning can assist reduce tree size and progress the quality of the fruit. Lal (1983) reported that guava yield is increased by pruning.

The Effects of Root Pruning and Exposure on Crop Growth and Development

The plant's roots are made sun-exposed by excavating up to 7–10 cm of dirt in an area 40–60 cm in diameter around the tree trunk. Before blossoming, the water is suspended for one or two months. The wilting and falling of leaves due to water stress is observed. Before the intended bahar's first month of blooming, the roots are once more enclosed with a soil and FYM mixture, and they are immediately watered. Irrigation is continued at appropriate intervals after that. As a result, plants produce a lot of fruit, flowers, and new vegetative growth. It is up to the grower to decide which of the three bahar's to take in order to maximize profit; in light sandy and thin soils, however, disclosure of roots should not be practiced and 2–3 week water stoppage is sufficient to cause drooping and debilitation of trees. Farmers prefer mrigbahar (June) because it forces the plants to relax in April and May, thereby preventing the need for water during that time. According to Cheema *et al.,* (1954), guava can be grown with an excellent winter harvest by suppressing the drizzling season yield through root cutting and root exposure. To achieve a high yield, root trimming is used in some areas of Maharashtra. There are visible roots, and tiny roots are removed, and watering is stopped to consent to guava foliage to shack (Kumar, 2010).

Comparative Analysis of Root Pruning and Exposure Techniques for Crop Regulation

One method of producing higher-quality fruits during the guava off-season is shoot bending (Sarker *et al.,* 2005). When a branch bends, the branch's wood tension increases and Phloem production dropped. Consequently, additional flowering and fruit set are induced and the photosynthetic output passes gradually from the bent branch shoots to the other portions, maintaining an elevated C:N ratio. Inducing embryonic reproductive buds to develop through bending. Fewer flowers are produced by the upright branch, and compared to the bent branch's fruits (Ito *et al.,* 1999). Bending control blooming by bending shoots, this result in abundant flowering and fruiting in addition to higher returns (Ghosh, 2003; Mitra, *et al.,* 2008). Samant *et al.,* (2016) research has also demonstrated the benefits of shoot bending in guava. Mamum *et al.,* (2012) discovered the greatest amount of flower set per plant when the treatment of shoot bending was applied in the off-season (111.33) and during the on-season (312.33). According to Mitra *et al.,* (2008), the majority of West Bengali farmers prefer growing crops over the winter and control flowering by bending the shoots during August and September. The teaching of guava branches is crucial to this procedure. The guava plant should be trained to bend its branches for the first time at two years of age. Sarker and Ghosh (2006) also discovered that during the off-season, shoot bending increased the number of fruits set per plant. In a similar vein, shoot bending improved fruit quality and yield per plant in the off-season (Sarker *et al.,* 2005).

Optimizing DE-Blossoming and Thinning Techniques for Improved Crop Yields

Rainy period crops have been DE blossomed using a variety of herbicides and PGRs, which has led to an increase in the crop grown in the winter (Lal *et al.,* 2017). Commercial hand DE blossoming is not economically feasible (Singh *et al.,* 2002); in contrast, Das *et al*. (2007) discovered that manual removal of 50% of the rainy season yield can be profitable. Rathore (1975) observed that in rainfed highland conditions in eastern India, guava cv. L-49 responded well to 200 ppm NAA, whereas 96% of guava DE blossoming was observed at 100 ppm NAA (Das *et al.,* 2007). Beside, 82% DE blossoming with 400 ppm NAA spray was recorded by Chundawat *et al.,* (1975). The application of 800 ppm of NAA has been found by several other workers to be useful to get a good winter crop (Singh and Reddy, 1997). However, Pandey *et al.,* (1980) recorded complete DE blossoming through 400 ppm of NAA, while More *et al.,* (2016) recorded maximum flower drop (80.40%) and fruitlet drop (73.54%) during showery season crop and higher yield in frost season crop with 800 ppm NAA. In guava, 20% urea spray has been shown to cause the most DE blossoming (Dwivedi *et al.,* 1990; Singh *et al.,* 1996 and Singh *et al.,* 2002). However, it was discovered by Singh *et al.* (1994) and Choudhary *et al.,* (1997) that 15% urea was the most successful in deblossoming the guava crop during the rainy season. In order to control the yield, Singh and Singh (1994) reported completely deblossoming guava plants with a double spray of 15%

urea. However, in just 12 days, a single treatment of urea (25–30%) totally eradicated all summer flowers and flower buds and significantly decreased the output during the rainy season. Trees that got a single treatment of 25% urea yielded better yields among the treatments. In the case of CV Sardar, the highest fruit yield was achieved with two applications of 10% urea, closely followed by a single treatment using 20% urea in the case of CV Allahabad Safeda (Singh *et al*., 2002). Manual deblossoming is a further option. Trees that deblossom or thin in April and May blossoms have the potential to be used as yield abundant flowers in June and July, as well as fruit harvests from November to February. Flower thinning, a crucial practice in fruit production, has been successfully achieved using various chemical thinners. These include 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. These chemicals have shown varying degrees of success in regulating flower numbers, improving fruit set, and enhancing overall yield and quality.

Optimizing Withholding Irrigation Techniques for Improved Crop Yields

Withholding irrigation in the northern plains after the winter guava crop is harvested causes the tree to rest and shed its blooms. In June, irrigation, well balancing manure, and fertilizer are applied. The tree began to bloom heavily after 20 to 25 days, and its fruit would eventually ripen in the winter. It has been advised to induce water tension by stopping irrigation from December to June, or until the start of the monsoon, depending on the circumstances (Cheema *et al.,* 1954).

Crop Regulation through Chemical Intervention

Using chemicals to control crop load during the rainy season is a crucial strategy for achieving both a high-quality and high-quantity harvest (Singh *et al.,* 2002). Growth regulators have been revealed to be particularly successful in controlling the cropping season and flower thinning. Different agroclimatic conditions were found to be favorable for the reduction of the rainy season and the increase of the winter crop when NAA, 2,4-D carbaryl, and ethrel were used. Chemical spray crop regulation is a simple way to control the crop. Certain chemicals led to the deblossoming of the rainy-season crop, which in turn led to an enhance in the winter crop. Singh et al. (2002) noted that crop management in guava has been proven to be inexpensively efficient for quality invention with the use of single spraying of 25% urea and dual sprays of 10% urea in Sardar and Allahabad Safeda, respectively, at bloom stage (April-May). Because the fruiting was mostly concentrated in the winter, the fruit quality was higher and the treatments had no negative belongings on the tree. According to Tripathi and Dhakal (2005), paclobutrazol sprayed on July 17th was the most successful in causing early flowering, with flowers appearing in the fourth week of December, 70 days ahead of usual flowering dates. Moreover, the successive applications in September, October, and December accelerated flowering time by fifty-nine, forty-one, and thirty-two days, respectively. NAA (250 ppm) spraying on guava plants cv. Allahabad that are ten years old Safeda produced the highest yield and highest-quality fruits in the winter and caused the greatest amount of defoliation during the wet season flowering (Dubey *et al.,* 2002). Das *et al.,* (2007) and Choudhary *et al.,* (1997) both reported similar findings. According to Kundu and Mitra (1997), on 11-year-old guava cv. L-49, NAA 100 ppm and 2,4-D 100 ppm significantly increased the average size, weight, and pulp content of the fruit. According to Yadav *et al*. (2001), a spraying of 60 parts per million of NAA resulted in the maximum fruit weight, yield, and ascorbic acid in the winter crop of a 15-year-old guava tree cultivar known as Sardar. Agnihotri *et al.,* (2013) discovered corresponding increases in fruit volume (185.38 ml), pulp thickness, weight (175.57 g), pulp percentage (96.66), and canopy spread.

Nutrient Application Strategies for Enhanced Crop Productivity

The fertilizer schedule should be adjusted beginning April to May to May to June in command to increase the quantity of winter crop. This will induce more vegetation expansion, which in turn raises the amount of winter crops (Boora *et al.,* 2016). Gupta and Nijjar (1978) recommended applying a fusion of NPK@40, 100, and 40 g, in that order. In Lucknow and Punjab, 10% urea was suggested by Singh and Singh (1994) for improved Sardar guava and Allahabad safeda produce during winter.

Assessing the Economic Impact of Crop Regulation on Farm-Level Productivity

The demand for premium guava fruits is rising in India among consumers and marketers. During the rainy season, the fruits of the two most common guava cultivars grown in India, Sardar and Allahabad Safeda, are inherently of low quality (Singh *et al.,* 2002). With the appliance of 800 PPM NAA plant growth regulator, Gurjar *et al.* (2018) achieved the greatest and statistically superior yield (119.73 q/ha.), gross return (Rs 32925 per hectare), and net return (Rs 2,30,529 per hectare). The treatment with 800 ppm of NAA had the

highest cost-benefit ratio (1:3.33), making it the most practical and cost-effective method of crop regulation for guava fruit crops. Similarly, Singh *et al.,* (2000) found that spraying 10% urea during the winter season considerably increased the yield (100 kg/tree) in "Allahabad Safeda." Maji *et al.* (2015) discovered that summer deblossoming with NAD@ 60 ppm spray produced the highest benefit:cost ratio (7.84:1). Additionally, Thakre (2016) observed that in guava cultivars, lone leaf pair pruning of fruited branches alone (OLPF). Compared to alternative therapies, Pant Prabhat proved to be more profitable, with a cost-benefit ratio of 1:2.96. Additionally, this therapy showed the maximum yield when applied throughout the winter and wet seasons.

Conclusion

Guavas naturally bloom three times a year, in February-March, June-July, and October-November, resulting in staggered harvests during the rainy, winter, and spring seasons. However, this natural flowering pattern hinders optimal yield realization within the intended timeframe. To address this, farmers artificially induce a resting period in bearing guava trees, altering their natural predisposition to flower and increasing fruit production during a specific period. This artificial regulation can be achieve through various technique, excluding de-blossoming, pesticide or plant growth regulator (PGR) application, pruning shoots and roots, withholding irrigation water, and bending shoots. However, responses to these methods vary depending on factors such as cultivar, tree condition, soil type, and agro-climatic conditions. To prevent market oversupply and ensure a steady supply of fruits, regulated crops are preferred. The choice of bahar in a given area is dictated by current production restrictions, including irrigation water availability, output quality, market demand, and disease and pest damage. Research on crop management has shown that guavas can effectively control blooming by de-blossoming their summer blooms and producing fruits in the winter through shoot pruning and the use of different chemicals. Among these chemicals, urea (10-15%) and NAA (600-800 ppm) are widely used for guava crop management under diverse agro-climatic situations.

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