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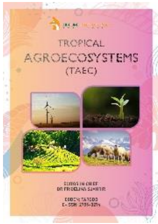

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REVIEW ARTICLE

CROP REGULATION IN GUAVA: A REVIEW

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ABSTRACT

Guava (*Psidium guajava* L) is a tropical fruit that belongs to the Myrtaceae family, which contains about 150 species. It is grown in the terai, inner terai, and hilly regions of Nepal, with the highest-producing districts being Kailali, Jhapa, Dhading, Taplejung, and Khotang. Guavas grow in the leaf axils during the present season and yield solitary white flowers or in cymes of two to three flowers. Guavas are primarily self-pollinated, with the major pollinator being honey bees. Guavas often flower twice or three times a year, with the rainy and winter seasons seeing the most blooming. Crop regulation is the manipulation of the natural flowering and fruiting of guava in the desired season of the year so as to increase fruit yield, quality, and profitability. Crop regulation can be carried out in guavas through various techniques, including withholding irrigation, pruning, root pruning and root exposure, bending of shoots, hand thinning, nutrient application, de-blossoming by hand, and using different plant growth regulators and chemicals. Stoppage of irrigation after harvest of winter crops (December–June) and applying fertilizer and irrigation in June creates profuse flowering and production in the winter season. Another method of crop regulation in guava is terminal pruning, which involves cutting the plant 20 to 30 cm in April to prevent rainy season crops and promote winter season flowering. Exposing the roots to the sun by removing 7–10 cm of soil around the tree, creating water stress by withholding irrigation for a month or two before flowering, and covering the roots one month before desired flowering with soil. In order to avoid rainy season crops and have a good winter harvest of guava, FYM and prompt irrigation are helpful. In guava, bending shoots between August and September promotes increased flowering and fruit set, as well as an increase in the CN ratio. In leaves, barks, and fruits, bending has also been shown to raise the amounts of pectin, tryptophan, proline, polyphenol oxidase, catalase, and peroxidase. Hand or chemical thinning in March and April reduces crop yields during the rainy season and increases winter fruit set and good flowering. Furthermore, fertilizer time and dose can be changed to promote greater vegetative development and boost winter season yields. De-blossoming is done manually, with PGRs, or with chemicals to enhance the amount of winter-season crops in guava and prevent any rainy-season crops. In conclusion, guava crop regulation can be accomplished successfully by a variety of chemical and cultural techniques that control summer flowering and winter fruit production.

KEYWORDS

Crop regulation; Pollinator; flowering; fruiting;

1. INTRODUCTION

Guava (*Psidium guajava* L, 2n = 22), also known as the apple of the tropics, poor man's apple, or super fruit, belongs to the Myrtaceae family, which contains about 150 species. It can be grown in a wider climatic condition, from tropical to subtropical, due to its wider adaptability. It appears to have started in Mexico and traveled all the way to Peru from tropical America (Mahadevan, 2017). Because of its great remunerative value and high nutritional content, it is one of the world's most significant commercial crops. When compared to other commercial fruits, the cost of production is lower, and the yield is guaranteed with minimal maintenance. It ranks fifth globally in terms of area after mango, banana, citrus, and apple, and fifth globally in terms of production, behind papaya, banana, mango, and citrus. India, China, Thailand, Pakistan, and Mexico are the top producers of guavas, in that order (Pariona, 2017). Guava is a popular summer fruit crop in Nepal. It is mostly grown in Nepal's hilly regions, Terai and Inner Terai. Approximately half of its manufacturing takes place in Nepal's hilly regions. Approximately 53% of the country's land and 50% of its overall output are shared among the eastern and central regions. The far-west region has the highest production (9.01 mt/ha), whereas the national average is 8.3 mt/ha. The districts of Kailali, Jhapa, Dhading, Taplejung, and Khotang in Nepal are the highest producers of guavas (MOALD, 2076).

During the present growing season, guava trees exhibit solitary white flowers or in cymes of two to three blossoms in the leaf axils. Guava fruits also have an abundance of fruits. A few centimeters in length, the bearing twig sprouts four to five pairs of leaves. After then, either flower buds begin to form or the twigs stop growing until the following season. The flower is carried laterally by the blooming branches, which bear mixed-type flower buds. The axillary buds may seem dispersed because they are not formed evenly across the shoot. A variety's flowering or blooming period can last anywhere between 25 and 45 days, depending on the locale, season, and type. Guavas are mostly self-pollinating, with honey bees serving as the main pollinators. Although it has an initial fruit set of 80–86% in the wild, only 35–46 percent of the fruits mature because of severe fruit loss. Twelve days after flowering, fruit starts to form. The average time for guava fruit to ripen is between 15 and 17 weeks (International Tropical Fruits Network, 2022).

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Guava flowers twice or sometimes three times a year under normal circumstances, however the greatest flowering occurs in the rainy crop (April–May) and winter crop (Aug–Sept.). The poor-quality flowering and fruiting seasons in Amber Bahar are February through March and July through August, respectively. Mrig Bahar has great quality flowering from October to November and fruiting from November to January. Guava is the main crop that follows these seasons. Because the Ambe Bahar are already depleting their food supplies during the flushing, flowering, and fruiting stages, Mrig Bahar is less intensive. While Mrig Bahar yields small crops in the winter, Ambe Bahar produces heavy crops during the rainy season (Samant et al., 2016).

Winter crops are preferred over rainy crops because they have a pleasant taste, maintain quality, and have a high market value despite their lower output volume. Similar to this, October is when Hasth Bahar flowers, and February to April is when it fruits, producing a modest yield of high-quality fruit. Because of the unpredictable amount of rain that falls in Hasth Bahar between August and September, trees must be forced to become dormant at this time. This is a chance crop, then. Therefore, in order to make guava farming extremely profitable and market-oriented, the flowering and fruiting behavior of guavas must be controlled in order to produce a huge load of high-quality fruits throughout the winter season.

2. Types of Crop Regulation

Crop regulation, which reduces the frequency of pesticide use, is the process of guiding guava plants to naturally flower and fruit at preferred seasons of the year. This increases fruit yield, quality, profitability, and environmental sustainability (Boora et al., 2015). Guavas flower profusely during the rainy season due to the high humidity and the sprouting of new shoots that carry fruit buds in the axils of the leaves and fruits. However, the fruits of the rainy season are tough, poorly nutrient-dense, taste awful, and difficult to store after harvest due to pests, illnesses, and insects. In contrast, winter fruit is more desirable due to its larger size, better aroma, higher quality, better taste, and lower frequency of pests, illnesses, and insects.

In contrast, winter-season fruits are better in terms of size, flavor, scent, quality, and incidence of pests, diseases, and insects. As a result, they are in high demand from consumers and sell for a good price (Mahaveer and Bhatnagar, 2019). Crop regulation's principal goal is to make the tree take a break and yield copious amounts of fruit and flowers at any one of the tree's two or three flushes. The main advantage is a reduction in production costs, as year-round blooming and fruiting would result in a light crop that would otherwise require expensive care, marketing, and intercultural activities. To obtain solely winter fruits, one must control flowering, which can be done by using the following methods:

3. Withholding of Irrigation

Guava trees shed their blossoms and rest after irrigation is stopped following the harvest of winter crops. The tree's basin is excavated in June, and it receives irrigation and fertilizer. The tree begins to develop fruit and flowers profusely in the winter after 20 to 25 days. It has been suggested by most of researcher to induce water stress by delaying irrigation from December to June, or until the start of the monsoon (Cheema et al., 1954; Teaotia and Pandey, 1964; Boora et al., 2015). In order to reduce rainy season harvests and produce a good winter crop, cutting fibrous roots and exposing feeder roots can cause water stress. In a study by most of reseachers, it was found that water-stressed trees produced significantly less during the rainy season on two varieties of trees, Sardar and Allahabad Safeda (Singh et al., 1997). Additionally, when the relative water content reached 60.2% and 53.4%, respectively, flower abscission was observed. Mid-June saw the water-deficient trees irrigated, which started a heavy flushing process that produced the highest output of the winter in "Allahabad Safeda."

The improvement in winter yield efficiency due to stress may be due to less competition between vegetative and reproductive organs during spring, due to which there is a buildup of carbohydrate reserves prior to flowering for the winter crop. The control of excessive vegetative growth during spring at the time of bud break may promote the partition of current-season photosynthates into fruits and not into vegetative growth, resulting in maximum production of flower buds in the following season (Singh et al., 1997).

4. Pruning

Guava reacts well to trimming since it depends on the growth of the current season and flowers on the leaf axils. Due to rapid vegetative growth and frequent branch intermixing, particularly on the lower half of the tree, guava trees typically exhibit a significant drop in output and fruit quality after 8 to 10 years of age. This eventually results in unfruitfulness. Such unproductive trees can be forced to produce a profitable crop for an extended period of time by careful trimming. By allowing only a small number of growing points to expand rapidly, pruning aids in maintaining the vigor and growth of shoots while also assisting in the restoration of the root-shoot system's equilibrium (Saini et al., 2018). Guavas with a 20–30 cm terminal length should be cut in April to prevent Ambe Bahar, a crop that grows during the wet season. For guavas, severe pruning is not recommended. It is advised to prune spring flush growth in order to prevent rainy season crop damage (Mahaveer and Bhatnagar, 2019).

In order to control cropping patterns and improve crop production and quality in guava, annual pruning is an inexpensive and useful cultural strategy (Bhagawati et al., 2015). Elicit therapy is the term used to describe the procedure. 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 (Dhaliwal and Gill, 1998). On the other hand, the degree of pruning greatly influences the control of flowering. Prasad reported that with guava trees with light pruning, the rainy season produced the most blossoms, while the winter season produced fewer (Prasad, 1981).

According to Prasad, guava trees that had been heavily pruned flowered best in the winter and poorly during the wet season (Prasad, 1981). However, by completely trimming the shoots, a group researchers were able to prevent flowering during the wet season (Singh & Reddy, Regulation of cropping in guava, 1997). Only 40–60% of lateral guava trees blossomed, compared to 70–80% of lateral trees on clipped trees (Aravindakshan, 1963). According to Bajpai and Shukla, trees that had been pruned produced laterals 12.8 days earlier than trees that had not been pruned (Bajpai and Shukla, 1973). Reducing fruit set during the wet season can also be accomplished with full shoot trimming (Tiwari and Tiwari, 1992).

5. Root Pruning and Root Exposure

By excavating up to 7–10 cm of dirt in an area 40–60 cm in diameter around the tree trunk, the roots of the plants are exposed to the sun. Before flowering, water is withheld for one or two months, causing water stress that causes leaves to wilt and drop to the ground. The roots of the intended bahar are once again covered with a soil and FYM mixture one month before the desired bahar begins to flower, and they are then promptly irrigated. Plants produce abundant fruiting, blooming, and new vegetative growth as a consequence. However, root exposure should not be done in shallow, light-sandy soils. For these soils, allowing water to stand for two to three weeks is enough to cause tree withering and defoliation. In order to obtain a good winter crop of guava, a group researcher observed that root cutting, and root exposure can be employed to suppress the rainy season crop (Cheema et al., 1954). In guava, the roots are left uncovered, little roots are removed, and irrigation is stopped to allow the leaves to shed (Kumar, 2010).

6. Bending of Shoots

One method for producing higher-quality fruits during the guava off-season is to bend the shoots (Sarkar et al., 2005). Shoots are bent between August and September, or 45–60 days ahead of the anticipated flowering dates (Mitra and Gurung, 2008). Prune in the summer to bend the shoots. At two years old, one does their first bending. Small shoots, blossoms, and fruits from branches are chopped off or removed before the leaves bend, leaving the terminal twigs, which are 10 to 12 inches long, untouched. The fall season (September to November) is when the new shootlets emerge, taking 20 to 25 days. When the young shootlets are around 1 cm in length, bent branches should be released. At 4-5 pairs of leaf stages, 45–50 days into the summer and 60–65 days into the autumn, the new shootlets begin to flower. 15 days prior to the branches bending, and again during the pea stage of fruit growth, manures and fertilizers should be applied, followed by watering (Singh and Reddy, Regulation of Cropping in Guava, 1997).

Bending a branch causes its wood tension to increase and its phloem development to decrease. As a result, photosynthetic products from the bent branch's shoots move more slowly to the other parts of the branch, increasing the C:N ratio and encouraging more fruit set and blooming. Dormant reproductive buds are forced to open by bending. The upright branch yields fewer possible that these modifications increased blooming and fruiting, which raised yield. flowers and fruits than the bending branch (Ito et al., 1999). Bending controls flowering by bending shoots, which also results in fruiting and flowering (Ghosh, 2013; Mitra and Gurung, 2008). According to Essa and Gowda, bending also raised the amounts of pectin, tryptophan, proline, polyphenol oxidase, catalase, and peroxidase in leaves, barks, and fruits, but also lowered phenolics (Essa and Gowda, 2012).

It's possible that these modifications increased blooming and fruiting, which raised yield. Mamum et al. (2numberiscovered that during the on-season (312.33) and off-season (111.33), the largest amount of blooms per plant were produced. Sarkar and Ghosh also discovered that during the off-season, shoot bending improved the amount of fruit set per plant (Sarkar and Ghosh, 2006). In their experiments, a group researcher found that branch bending had a beneficial impact on fruit quality, yield, blooming intensity, and shoot growth (Samant et al., 2016; Sarkar et al., 2005). Branch bending for crop management in guava in hot and humid conditions in eastern India (Samant and Kishore, 2016).

7. Hand Thinning

Reducing the rainy season harvest has been successful when red fleshed, Allahabad Safeda, and Sardar cultivars have had their flower buds thinned in March and April (Singh and Singh, 2011). According to a study, hand thinning in May produced an 82% fruit set in the winter (Mitra et al., 1982). The strongest results came from hand-thinning summer blooms, which boosted the following winter harvest by 18.4% and decreased the crop during the rainy season by 81% (Singh, 2013). 50% of fruit thinning treatments produced the best yield (20.46 kg/plant), and 75% of fruit thinning treatments produced the lowest yield (10.06 kg/plant). 50% fruit thinning treatment showed the highest fruit retention (89.28% and 90.47%, respectively) during both the on and off seasons. According to research done by F.M. Tahir and Kamran Hamid on the effects of full and partial fruit thinning in summer crop guava on the physiochemical changes and leaf NPK status during the winter crop, thinning improved the winter crop's fruit quality by increasing the production of sugars, TSS, and ascorbic acid while reducing the fruit's acidity. Thinner plants' fruits and flowers displayed less decline than the control group.

8. Nutrient Application

In order to maximize the amount of the winter crop and avoid the rainy season crop, the timing of fertilizer application should be adjusted. In order to boost the winter season crop and encourage greater vegetative development, the fertilizer schedule should be adjusted from April to May to May to June (Boora et al., 2015). Application of a mixture of NPK at 40, 100, and 40 gm, respectively, was recommended by Gupta and Nijjar to induce greater vegetative growth (Gupta and Nijjar, 1978). In Lucknow and Punjab conditions, Singh and Singh advised using 10% urea for improved guava crop varieties, Sardar and Allahabad Safeda, during the winter (Singh and Singh, 1994).

9. De-Blossoming

De-blossoming can be done manually by hand with the use of various plant growth regulators and specific chemicals in order to maximize the amount of winter-season crop and prevent rainy-season crop. Rainy-season flower de-blossoming by hand works very well in small-scale kitchen gardens and at an early stage of the plant's life, but it is exceedingly time-consuming and unprofitable in large-scale commercial orchards. However, it was discovered that hand thinning slightly and then pruning were efficient ways to decrease crops during the wet season, which led to an increase over the winter (Mahaveer and Bhatnagar, 2019). According to Sahay and Kumar, hand de-blossoming produced the most output throughout the winter (Sahay and Kumar, 2002). Chemical deblossoming is comparatively less labor-intensive than PGR deblossoming (Dhillon et al., 2018). The way the chemicals react can change depending on the cultivar and climate. Naphthalene Acetic Acid (NAA), Naphthalene Acetamide (NAD), 2-chloroethyl phosphonic acid (Ethephon), Potassium Iodide (KI), Maleic Hydrazide (MH), 2,4-dichlorophenoxy acetic acid (2,4-D), Carbaryl, 4,6-dinitro-ocresol (DNOC), and urea are often used compounds in de-blossoming. The concentration of the chemicals utilized determines the fruit set, yield, size, and percentage of blooms.

9.1 De-blossoming by NAA

To de-blossom a spring flower flush, mist 50 parts per million of NAA. A studied guava crop regulation using NAA to manage guava reproduction (Dubey et al., 2002). Rathore found that 100 ppm NAA caused 96% of de-blossoming (Rathore, 1975). A group researcher found that applying 100, 200, and 400 ppm of NAA spray, respectively, resulted in 24, 51, and 82% de-blossoming (Chundawat et al., 1975). Similarly, a group researcher reported total de-blossoming by 400 ppm of NAA spray. In cv. Sardar, double spraying NAA at 800-1000 ppm at 20-day intervals was determined to be the most effective way to produce winter season yield (88 kg/tree) (Pandey et al., 1980; Tiwari and Tiwari, 1992).

9.2 De-blossoming by urea

A group researchers found that a 20% urea spray produced the maximum de-blossoming in guava, whereas discovered that a 15% urea spray produced the best results for de-blossoming the rainy season guava crop (Dwivedi et al., 1990; Singh et al., 1996; Bariana, 1998; Singh et al., 1994; Chowdhary et al., 1997). To control the crop, Singh and Singh reported completely de-blossoming guava with a double spray of 15% urea (Singh and Singh, 1994). 10% urea was sprayed in May after the majority of the blooms had opened, controlling the crop over the winter months (Singh et al., 2002). Sahay and Kumar suggest manual de-blossoming, a third current shoot cutting on May 30, a double spray of 15% urea at the 50% bloom stage, and a second spray 10 days following the first spray (Sahay and Kumar, 2004).

9.3 De-blossoming by other chemicals

Kaur discovered that a spray of 0.5% potassium iodide and then 20% urea caused the greatest amount of flower abscission (Kaur, 1997). In guava, Singh and Singh achieved total de-blossoming at 2000 ppm MH (Singh and Singh, 1975). According to a study, NAD at 40 ppm produces guava cv L-49 (Sardar) fruits of higher quality and increases crop yields during the winter (Maji et al., 2015). NAD at 50 ppm and 2, 4-D at 30 ppm were the most successful fruit-thinning chemicals for de-blossoming summer flowers among the several compounds utilized for crop management in guava (Kumar and Hoda, 1977). A group researcher found that guava cv. Allahabad Safeda yielded lower yields during the rainy season and higher yields during the winter (Singh et al., 2000). Subsequent sprays of ethephon (600, 1200, and 1800 ppm) and potassium iodide (0.5, 1, and 2%) applied at flowering in April and again two weeks later in May also had this effect.

Similarly, a group researcher reported that fruit set was increased in the winter season crop and decreased in the rainy season crop when guava cv (Agnihotri et al., 2013). Lucknow-49 trees were sprayed twice (the last week of April and two weeks later) with NAA (200, 250, or 300 ppm), maleic hydrazide (150, 200, or 250 ppm), urea (5, 10 or 15%), 2,4-D (20, 30 or 40 ppm), or NAD (25, 50, or 75 ppm). While working on a fruit management program with Beaumont guava in Hawaii, a group researcher observed that the greatest shoot length was achieved with ethephon treatment at 600 ppm and the maximum number of lateral shoots were produced by defoliation at 1200 ppm (Bose et al., 2000).

In table 1, the control treatment shows only 15.63% flower drop. The maximum leaf drop (26.89 %) was recorded in NAA 600 ppm followed by NAA 500 and 400 ppm, respectively whereas, minimum mean percent leaf drop was recorded in control followed by manual bud removal.

Table 1: Effect of various treatments on leaf and flower drop of guava cv. Shweta

Treatment	Leaf drop (%)			Flower drop (%)		
	30 April	15 May	Mean	30 April	15 May	Mean
Manual bud removal	4.48	5.52	5.00	100.00	100.00	100.00
NAA 400 ppm	25.16	21.95	23.56	82.27	78.17	80.22
NAA 500 ppm	26.59	24.16	25.38	83.66	81.39	82.53
NAA 600 ppm	28.61	25.16	26.89	88.56	84.36	86.46
Ethrel 1500 ppm	6.92	7.85	7.39	77.71	71.28	74.50
Ethrel 2000 ppm	9.75	9.51	9.63	81.71	78.88	80.30
Ethrel 2500 ppm	11.96	12.19	12.08	88.53	85.92	87.23
Urea 10%	24.20	20.28	22.24	47.35	44.30	45.83
Control	3.62	4.55	4.09	16.44	14.81	15.63
Mean	15.70	14.57		74.02	71.01	
CD at 5% Treatment (T)		1.31			3.17	
CD at 5% Date (D)		0.61			1.49	
CD at 5% (T x D)		1.85			NS	

(Adapted from article Effect of different chemicals and hand thinning on crop regulation in guava (*Psidium guajava* L.) CV. Shweta, Dhillon et al., 2018). The table shows effect of different concentration of NAA, Ethrel, Urea and Hand thinning on Leaf Drop and Flower drop of guava cv. Shewta when applied in 30th April and 15th May).

Table 2 shows that when chemical concentrations increased, the fruit set for a crop grown during the wet season decreased across different foliar treatments. While the average fruit set values at NAA 400 and 500 ppm were comparable, they were much different from NAA 600 ppm. Plants treated with varying doses of ethrel showed notable differences in fruit set from one another. When it comes to decreasing fruit set during the rainy season, urea applied topically proved to be less successful than NAA and ethrel. Because plants were in full bloom when foliar spraying took place on April 30, the early spray was shown to be more effective than the late spray, which occurred after fruit set on the plants. Moreover, a group researcher showed that applying 600–800 ppm reduced the amount of fruit set during the rainy season crop. AAA (Pandey et al., 1980). Singh and Reddy discovered that the rainy season produced the least amount of fruit set and the highest concentration of ethephon (ingh and Reddy, 1997).

Table 2: Effect of various treatments on fruit set for rainy season crop of guava cv. Shweta

Treatment	Fruit set (%)		
	30 April	15 May	Mean
Manual bud removal	00.00	00.00	00.00
NAA 400 ppm	17.73	21.83	19.78
NAA 500 ppm	16.34	18.61	17.48
NAA 600 ppm	11.44	15.64	13.54
Ethrel 1500 ppm	22.29	28.72	25.51
Ethrel 2000 ppm	18.29	21.12	19.71
Ethrel 2500 ppm	11.47	14.08	12.78
Urea 10%	52.65	55.70	54.18
Control	83.56	85.19	84.38
Mean	25.97	28.99	
CD at 5% Treatment (T)		3.17	
CD at 5% Date (D)		1.49	
CD at 5% (T x D)		NS	

Adapted from article Effect of different chemicals and hand thinning on crop regulation in Guava (Psidium guajava L.) CV. (Shweta et al., 2018). The table shows effect of different concentration of NAA, Etheral, Urea and hand thinning on Fruit set percent of guava cv. Shweta when applies at 30th April and 15th May

Table 3 shows that the largest fruit weight was recorded in ethrel at 2500 ppm, followed by NAA at 600 ppm, although there was no significant difference between the treatments. The average fruit weight in the summer it weight ranged from 174.26 to 205.47 grams on average during the winter. crop varied from 98.96 to 154.67 g. The fruit weight ranged from 174.26 to 205.47 grams on average during the winter. Because there were less fruits in urea than in the other chemical treatments, 10% of the total fruit weight was reported in urea among the various chemical treatments.

Table 3: Effect of various treatments on fruit weight (g) in rainy and winter season crops of guava cv. Shweta

Treatment	Rainy season			Winter season		
	30 April	15 May	Mean	30 April	15 May	Mean
Manual bud removal	-	-	-	174.56	173.97	174.26
NAA 400 ppm	152.75	129.30	141.02	195.28	173.33	184.30
NAA 500 ppm	155.83	145.94	150.88	179.25	174.92	177.08
NAA 600 ppm	161.25	143.79	152.52	172.03	177.42	174.72
Ethrel 1500 ppm	145.00	140.42	142.71	195.01	163.58	179.29
Ethrel 2000 ppm	148.42	147.50	147.96	189.83	189.77	189.80
Ethrel 2500 ppm	156.42	152.92	154.67	186.69	195.69	191.19
Urea 10%	113.05	106.25	109.65	196.28	199.72	198.00
Control	99.58	98.33	98.96	201.67	209.27	205.47
Mean	141.54	133.06		187.84	184.18	
CD at 5% Treatment (T)		7.46			6.06	
CD at 5% Date (D)		3.52			2.86	
CD at 5% (T x D)		10.55			8.57	

Adapted from article Effect of different chemicals and hand thinning on crop regulation in Guava *(Psidium guajava* L.) CV. Shweta, Dhillon et al.,.2018). The table shows effect of different concentration of NAA, Etheral, Urea and hand thinning on fruit set percent of guava cv. Shweta when applied at 30th April and 15th May.

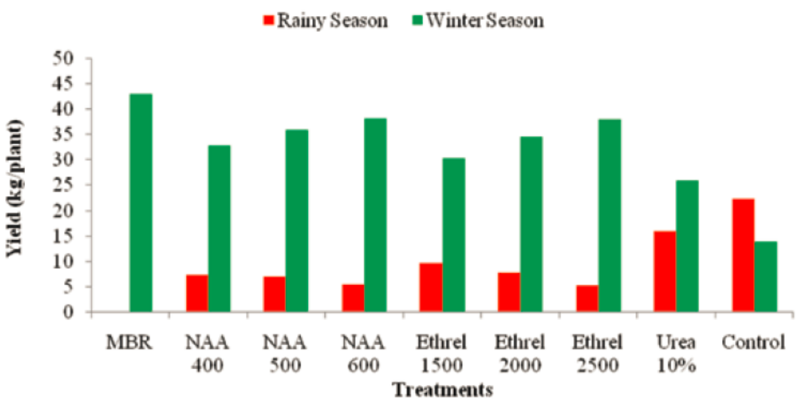

Figure 1: Effect of various treatments on fruit yield (kg/plant) in rainy and winter season crops of guava cv. Shweta)

Adapted from article Effect of different chemicals and hand thinning on crop regulation in Guava (*Psidium guajava* L.) CV. (Shweta, Dhillon et al., 2018). The table shows effect of different concentration of NAA, Etheral, Urea and hand thinning on fruit set percent of guava cv. Shweta when applied at 30th April and 15th May.

The mean fruit yield throughout the summer season in the given figure varies from 0 to 22.41 kg. As NAA and ethrel concentrations increased, fruit production dropped. The fruit output fluctuated along with the various ethrel levels. Out of all the chemical treatments, the plant treated with urea had the highest average fruit production, suggesting that this treatment was less successful in thinning the fruit. The winter season crop showed differences in mean fruit output between the control and MBR treatments, ranging from 13.86 to 42.98 kg/plant. The NAA 600 ppm treatment produced the highest average fruit output among the different treatments, matching the ethrel 2500 ppm treatment, while the urea 10% treatment produced the lowest average fruit yield.

10. Conclusion

It is possible to efficiently regulate the guava crop by using a variety of chemical and cultural techniques to control the summer blossoms and winter fruit production. The cultural methods include hand bud removal, pruning, holding of irrigation, shoot bending, root pruning, and root exposure. The chemical methods include the use of different PGRs and chemicals like urea, MH, KI, etc. for the purpose of de-blossoming and fruit thinning. Chemical methods are comparatively less labor-intensive with a higher a higher degree of success. The outcome of several studies reported by different scientists was that the fruit of the winter season was superior in terms of taste, quality, size, storage, and fetching a good price. Further research on crop regulation in guava is required to recommend a standard set of chemicals and standard cultural practices, and their dissemination to the farmers is essential.

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