Original Research Article

Regulation of summer season flowering to enhance the Flowering and physical parameters of mrig bahar in guava (*Psidium guajava* l.) Cv. Lucknow-49 under sodic soil

ABSTRACT

The present investigation entitled "Regulation of summer season flowering to enhance the Flowering and physical parameters of mrig bahar in guava (Psidium guajava L.) cv. Lucknow-49 under sodic soil" was conducted at Production Processing of Usar Waste Land Akma, Department of Fruit Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Ayodhya (U.P.) during 2021-22. The experiment was conducted in a Randomized Block Design with three replications and ten treatments. The treatments were Urea (15, 20 and 25%), NAA (75, 150 and 225 ppm), 2,4-D (20, 40 and 60 ppm) and control applied on second week of April. The results denoted that all the treatments were emphatic in summer deblossoming and enhanced the physical attribute of fruits throughout both season over the control, however, maximum yield per plant, maximum no. of fruits per plant, maximum fruit set percentage and minimum flower drop percentage was recorded with control in rainy season. The profitable effects of the treatments tried were observed to be more prominent in winter season crop than the rainy season crop. Among the treatments, deblossoming with NAA 225 ppm showed maximum enhancement in Flowering characters viz. Percent flower drop (%), Percent fruit set (%) and fruit physical characters viz. Number of fruits per plant, fruit length (cm), width (cm), weight (g), fruit yield per plant (kg/tree) over the control in winter season as well as in rainy season crop.

Keywords: Guava, Deblossoming, NAA, 2,4-D, RBD.

INTRODUCTION

Guava (Psidium guajava L.) is a very popular fruit of India and it is also called the 'Apple of tropics. In India, guava is one of the most significant tropical and subtropical fruit crops. It is a member of the "Myrtaceae" family and chromosome no is 2n=22. It is originated from Tropical America, stretching from Maxico to Peru (Radha and Mathew, 2007). In recent years, guava cultivation has gained popularity due to increasing international trade, nutritional contents and value-added products of guava.

The guava fruit is a berry with a big, seedy core. Fruits can either have ridges and waxy layers or be smooth. Guava is a shrub with spreading branches and weak roots. In typically, plants have a height of 4-5 meters, although older trees may reach a height of 9 meters. It is a hardy, prolific bearer and highly remunerative fruit crop which grown widely in tropical and subtropical region and succeed under a wide diversity of climatic conditions . It may be cultivated without irrigation on soils with a pH range of 5.5 to 7.5. It can withstand temperature as low as 12 to 14℃ and as high as 46℃. Best quality guava is obtained during the winter season when the average night temperature is only 10℃. The optimum temperature lies between 23℃ to 28℃ (Samson, 1980). Guava fruits can be cultivated on varied type of soil– heavy clay to very light sandy soils, saline, sodic, alkaline, barren and neglected lands where most of the fruit crops can't be grown. Guava was introduced in Indian subcontinent in 17th century by the Portuguese (Singh, 1995). At present, guava market has got well established in more than 60 countries of the world (Negi and Rajan, 2007). Major guava producing countries are India, Pakistan, Algeria, Australia, Brazil, Cuba, Costa Rica, China, Indonesia, Thailand, Philippines, Nigeria, USA, Mexico, Egypt, Spain and South Africa etc.

Lucknow-49 is a selection made at Poona, (Cheema and Desmukh, 1927) also known as 'Sardar guava'. Plant is semi-dwarf, 2.3 to 3.4 meter tall and vigorous with heavy branching. Leaves are large, 12.8 to 13.2 cm long, 6.8 cm broad elliptic-ovate to oblong in shape. Fruits roundish ovate in shape, skin colour primrose-yellow and pulp white, very sweet and tasty. Keeping quality of this variety is excellent. Sardar guava has comparatively better field tolerance to wilt and sodicity compared to Allahabad Safeda.The basic principle of crop regulation in guava is to control the natural flowering and force the plant to induce the flowering in desired season of the year that contribute to increased fruit yield, quality, profitability and sustainability of the environment by reducing the pesticides load (Boora *et al.*2015). In India various methods have been used for crop regulation in guava to reduce rainy season flowering by foliar application of various chemicals such as Urea (Rajput *et al*. 1986); NAA (Chaudhary *et al.* 1997); 2,4-D (Kumar and Hoda 1977) to enhance the yield and fruit quality of winter season crop.

MATERIALS AND METHODS

The present investigation titled "Regulation of summer season flowering to enhance the Flowering and physical parameters of mrig bahar in guava (Psidium guajava L.) cv. Lucknow-49 under sodic soil" was carried out at Production Processing of Usar Waste Land, Akma, Department of Fruit Science, College of Horticulture & Forestry, Acharya Narendra

Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya 224229 Uttar Pradesh during the year 2021-22.Twenty years old guava plants cv. L-49, were planted at 6m x 6m apart, taken for present investigation. Other orchard management practices were followed as per recommended package and practices for guava. The experiment was conducted in a Randomized Block Design with three replications. The experiment consists of 10 treatments including control. T_1 =Control (Water spray), T_2=Urea 15%, T_3=Urea 20%, T_4=Urea 25%, T_5=NAA 75 ppm, T_6 =NAA 150 ppm, T_7=NAA 225 ppm, T_8 =2,4-D 20 PPM, T_9 =2,4-D 40 PPM and T_{10}=2,4-D 60 PPM were used. Spraying was done in Second week of April. The observations recorded as Flowering characters viz. Percent flower drop (%), Percent fruit set (%) and fruit physical characters viz. Number of fruits per plant, fruit length (cm), width (cm), weight (g), fruit yield per plant (kg/tree).

Data were analysed statically as per given by

Results and Discussion

A) Flowering Characters

1. Percent flower drop

The data reveals that the mean percent flower drop among all the treatments after sprays ranged from 34.46 to 88.00 percent in rainy season and 15.40 to 42.75% in winter season. In rainy season, the maximum flower drop (88.00%) was recorded in NAA 225 ppm followed by 2,4-D 60 ppm and Urea 25%, respectively whereas, minimum mean percent flower drop (34.46%) was recorded in control followed by 2,4-D 20 ppm. In winter season maximum percent flower drop (42.75%) was observed in control followed by Urea 15% whereas minimum (15.40%) found in spraying of 225 ppm of NAA. Similarly, Bashir *et al.* (2019) reported effectiveness of NAA in thinning of summer season flowers in guava fruits.

2. Percent fruit set

The fruit set of guava in rainy season crop was significantly influenced by various treatments. The average percent fruit set after the various treatments varied from 12.76 to 65.42% in NAA and Control, respectively in rainy season. Among various foliar applications, the fruit set for rainy season crop decreased with increase in concentrations of Urea, NAA and 2,4-D. In winter season all the treatments were found significantly superior to control. Maximum percent fruit set (84.63%) was found with foliar spray of NAA 225 ppm whereas minimum (57.24%) in control.Increased fruit set can be attributed to deblossoming of rainy season crop which increased the carbohydrate content and C/N ratio of leaves and shoot and high

carbohydrate was resulted to increase fruit set in following winter season (Mitra and Sanyal; 1991). The application of auxins caused translocation of hormones, food substances and other factors stimulating fruit formation to the tissues of ovary in greater amount which resulted in higher fruit set (Brahmachari *et al*. 1996.). Similar results are reported by Gurjar (2018), Dhillon *et al. (*2018), Agnihotri *et al.* (2013), Brar *et al.* (2007), Jain and Dashora (2007), Singh and Dhaliwal (2004), and Pandey *et al.* (1980).

B) Physical characteristics of Fruit

1. Fruit length (cm)

The fruit size in term of fruit length in rainy and winter season crop was influenced by various treatments. The data shows that in rainy season, the mean fruit length varies from 5.20 to 6.25 cm. The minimum fruit length was recorded in control followed by Urea 25%. This is due to a greater number of fruits in the control that reduce the fruit size in comparison to the higher doses of the NAA and 2,4-D. The maximum length of the fruit was recorded in NAA 225 ppm followed by 2,4-D 60 ppm.In winter season, among the different chemical treatments, maximum fruit length was recorded in NAA 225 ppm (7.79 cm) which as at par with 2,4-D 60 ppm while minimum (5.62 cm) in control. The higher dose spray of NAA and 2,4-D showed significant effect on fruit length in rainy and winter season. Fruit length increase due to increase in cell division and larger cell size as well as enhanced metabolic activity under the influence of chemical stimulus. Agnihotri *et al.* (2013) and Singh *et al* (1996) also visualized similar effects in fruit size in terms of length and width in guava.

2. Fruit width (cm)

Maximum fruit width was recorded in NAA 225 ppm followed by 2,4-D 60 ppm, while the minimum (5.45cm) fruit width was recorded in control in rainy season. The fruit width was increased with increasing the concentration of NAA and 2,4-D. In winter season maximum fruit width (7.21 cm) was recorded in NAA 225 ppm and however the minimum fruit width (5.77 cm) was recorded in control. Amongall the treatments the fruit width ranged from 5.77 to 7.21cm. The fruit width decreased with the increasing of concentration Urea and increased with the increasing the concentration of NAA and 2,4-D. Increasing fruit width may be due to increase in cell division and larger cell size as well as enhanced metabolic activity under the influenced of chemicals stimulus. Singh *et al* (1996) also visualized similar effects in fruit size in terms of length and width in guava.

3. Fruit weight (g)

In higher doses of NAA fruit weight is significantly improved as compared to lower doses. Average fruit weight was found to increase with increase in levels of NAA and 2,4-D. In winter season the mean fruit weight ranged from 102.42 to 143.60 grams in control and NAA, respectively. Among the various chemical treatments maximum fruit weight (143.60 g) was recorded in 225 ppm of NAA whereas minimum (102.42 g) in control. Possible reason may be increased in fruit size due to accelerate rate of cell enlargement, cell division and more intercellular space. The results are supported by findings of Yadav *et al* (2001), Desai *et al* (1993), Singh *et al.* (1996), Das *et al* (2007), Agnihotri *et al* (2016), Sharma *et al* (2016) and Bashir *et al* (2019) in guava.

4. Number of Fruits per plant

Maximum number of fruits per plant (267.20) was found in control followed by NAA 225 ppm in rainy season. The average number of fruits in all the treatments ranged from 71.18 to 267.20. Improvement in number of fruits with increasing concentration of NAA and 2,4-D found significantly. During winter season number of fruits per plant ranged from 177.33 in control to 257.08 in NAA. Concentration of treatment influenced the number of fruits significantly when compared with each other. Maximum number of fruits per plant were found in spraying of NAA 225 ppm and was statistically at par with 60 ppm 2,4-D. However, the minimum number of fruit per plant obtained under the control. The perusal of the data indicate that the thinning of the fruit caused by Urea, NAA and 2,4-D regulate the crop load from summer to winter. The results are supported by finding of Desai *et al*. (1993), and Bashir *et al.* (2019), in guava.

5. Fruit yield per plant (kg/tree)

Fruit yield is the important parameters that decide the practical viability of the experimental results. The mean fruit yield varies from 7.71 to 25.06 kg/plant in summer season. The fruit yield decreased with increasing concentrations of Urea while increased with increasing concentrations of NAA and 2,4-D. Maximum yield (25.06 kg/plant) was obtained from control followed by NAA 225 ppm and minimum yield (7.71kg/plant) was found with spraying of urea 25%. During winter season crop, the mean fruit yield varied

from 18.13 to 36.92 kg/plant in control and NAA treatment, respectively. Foliar application of NAA 225 ppm resulted in the maximum yield (36.92 kg/plant) of winter season crop which wasat par with 2,4-D 60 ppm (35.77 kg/plant) while minimum value of yield was recorded in plants treated with water spray (control). All the treatments except urea resulted in significantly improvement in the yield of winter season. The similar observation was also reported by Desai *et al* (1993), Choudhary *et al* (1997), Dubey *et al* (2002), Nanra et al. (2001), Das *et al* (2007), Singh *et al* (2007), Sahar and Hameed (2014), Rajput *et al.* (2015), Agnihotri *et al.* (2016), Singh (2017), Dhillon *et al* (2018), Gurjar (2018) and Bashir *et al* (2019) by regulating rainy season crop. Similarly, Shankar *et al* (2006) reported that the maximum fruit yield per plant was recorded with control during the rainy season.

Table 1: Effect of Urea, NAA and 2,4-D on flowering and physical parameters in rainy season and winter season crops of Guava (Psidium guajava L.) cv. Lucknow-49:

Symbol	Treatments	Percent flower drop		Percent fruit set		Fruit length (cm)		Fruit width (cm)		Fruit weight (g)		Number of Fruits per plant		Fruit yield per plant (kg/tree)	
		Rainy Season	Winter Season	Rainy Season	Winter Season	Rainy Season	Winter Season	Rainy Season	Winter Season	Rainy Season	Winter Season	Rainy Season	Winter Season	Rainy Season	Winter Season
T_1	Control (Water spray)	34.46	42.75	65.42	57.24	5.20	5.62	5.45	5.77	94.25	102.42	267.20	177.33	25.06	18.13
T_2	Urea 15%	83.32	30.00	17.41	70.25	5.90	6.30	6.09	6.76	115.32	129.19	112.16	228.41	12.97	29.53
T_3	Urea 20%	85.39	24.70	14.15	75.28	5.75	6.01	5.94	6.55	110.50	127.97	97.25	220.22	10.77	28.17
T_4	Urea 25%	86.17	23.11	13.42	76.88	5.25	5.86	5.76	6.36	108.42	123.88	71.18	215.20	7.71	26.65
T_5	NAA 75 ppm	81.50	25.55	18.50	74.44	5.35	6.20	5.57	6.86	120.42	132.33	98.74	224.57	11.85	29.69
T_6	NAA 150 ppm	84.73	22.25	16.40	77.75	5.60	6.34	5.86	6.79	121.38	135.19	103.69	243.02	12.53	32.85
T_7	NAA 225 ppm	88.00	15.40	12.76	84.63	6.25	6.79	6.37	7.21	128.88	143.60	116.63	257.08	14.44	36.92
T_8	2,4-D 20 ppm	79.14	24.85	20.03	75.11	5.47	6.18	5.80	6.56	104.18	126.67	84.38	221.33	8.76	28.05
T_9	2,4-D 40 ppm	82.49	21.30	17.44	78.69	5.58	6.35	6.11	6.68	109.78	137.03	105.78	234.05	11.64	32.00
T_{10}	2,4-D 60 ppm	87.18	19.35	13.48	80.67	6.10	6.68	6.30	7.00	124.93	140.13	105.03	255.80	13.92	35.77
	SE(m) ±	**1.66**	**1.43**	**1.17**	**1.35**	**0.12**	**0.17**	**0.12**	**0.12**	**1.64**	**1.60**	**6.26**	**8.00**	**1.11**	**0.87**
	C.D. at 5%	**4.93**	**4.24**	**3.48**	**4.02**	**0.37**	**0.49**	**0.36**	**0.37**	**4.87**	**4.75**	**18.58**	**23.76**	**3.30**	**2.59**

Conclusion

The investigation revealed that utilizing a spray of various chemicals proved effective in regulating flowering through summer deblossoming, consequently leading to increased fruit yield and improved quality during the winter season. The winter fruits exhibited significant superiority across various parameters such as size, weight, yield, and flowering characteristics compared to those harvested during the rainy season. By implementing a cropping regimen incorporating NAA at 225 ppm, farmers could achieve substantially higher production and earnings, with an average of 36.92 kg per plant, compared to traditional cultivation methods yielding only 18.13 kg per plant. Therefore, it can be deduced that the application of summer deblossoming using NAA at 225 ppm is a highly effective approach for regulating crop growth, followed by the application of 2,4-D at 60 ppm, to obtain superior quality fruits of the guava variety L-49 (Sardar guava) and maximize profits during the winter season.

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