

EFFECT OF NAPHTHALENE ACETIC ACID ON FLOWER AND FRUIT THINNING OF SUMMER CROP OF GUAVA

Malik Mohsin Abbas*, Saeed Ahmad** and Muhammad Afzal Javaid***

ABSTRACT

The study was conducted at University of Agriculture, Faisalabad, Pakistan during 2009-10. The project was undertaken to find out some useful methods to investigate the most economical and suitable concentrations of Naphthalene Acetic Acid (NAA) to thin the flowers of summer crop of guava (*Psidium guajava*) to get bumper winter crop. The results showed that maximum flower drop (69.45%) was observed in the guava plants sprayed twice with NAA with the concentration of 500 ppm during last week of April and first week of May. It was also noticed that as the concentration of the chemical increased the flower drop percentage was also increased. The most suitable concentration of NAA was 400 ppm which produced maximum yield (32.75 kg/plant) during the winter with maximum flower drop percentage (64.92) during the summer. Maximum TSS (7.13%) was recorded in the plants treated with NAA at 200 ppm and the minimum TSS (5.35%) was recorded in the plants treated with NAA @ 500 ppm.

KEYWORDS: *Psidium guajava*; guava; flower thinning; fruit thinning; Agronomic characters; plant growth retardant; naphthalene acetic acid; Pakistan.

INTRODUCTION

Guava (*Psidium guajava*) produces flowers on new vegetative shoots arising from mature wood. Thus, in equatorial climate, it can flower during every month of the year. In sub-tropical areas, guava flowers two to three times a year in the north (rainy, winter, and spring seasons) and distinctly three times in the south (15, 16, 18). In mild tropical or sub-tropical climates, guava flowers and fruits continuously throughout the year if water and temperatures do not become limiting factors (15).

In Punjab (sub-tropical climate) there are two crops i.e. summer and winter crop. Winter crop is considered comparatively of higher quality as compared

*Horticulturist, ***Director, Horticultural Research Institute, AARI, Jhang Road, Faisalabad, **Associate Professor, Institute of Horticultural Sciences, University of Agriculture, Faisalabad, Pakistan.

to summer crop regarding taste, texture, color and yield. The summer crop is mostly affected by fruit fly which causes entire rotting of fruit due to presence of maggots inside the fruits and causes heavy loss to the farmers. The guava fruit is preferred food host of fruit fly and the main damage is caused by larvae, which feed inside the fruit (13, 21). To get rid of this problem the farmers use to thrash flowers of the crop that cause not only damage to leaves but also damage to twigs where new flowers have to be emerged and the farmers bear heavy loss of yields in both seasons. The injured parts of the plant also invite different diseases like guava wilt and anthracnose.

The thinning in early stages of fruit growth increases size of remaining fruits, reduces trunk breakage, and promotes regular bearing (5). It was reported that fruit thinning was found effective in guava to increase individual fruit weight (17). It was observed that when flowers were removed from 11 year old guava tree in summer, winter crop was largest with best fruit quality (19).

This necessitates to find out some suitable technique to de-blossom the summer crop of guava in a view to get bumper winter crop. In present study the effect of different concentrations of Naphthalene acetic acid was investigated on flower and fruit thinning of guava.

MATERIALS AND METHODS

The guava, variety, Gola was tested for flower and fruit drop during the month of April, 2009 and 2010 in the experimental garden, square No. 9. University of Agriculture, Faisalabad, Pakistan. Six years old plants of guava were selected, marked, tagged and checked for insect, pest and disease attack. All the plants were given standard cultural practices (NPK @ 1000-500- 500g along with 30-40 kg FYM/plant) were applied during December. The nitrogen was applied in two split doses i.e. one in August and second in November. Naphthalene Acetic Acid (NAA) was sprayed two times during the flowering season i.e. last week of April and first week of May, with different concentrations (T_1 no NAA. $T_2 = 200$, $T_3 = 300$, $T_4 = 400$ and $T_5 = 500$ ppm), with the help of tractor mounted power sprayer. The dropped flowers were counted two times daily to calculate flower drop percentage. Under subtropical climatic conditions guava bears two crops in a year i.e. summer season crop (flowering during months of April- May and harvesting during July-August) and winter season crop (flowering during months of November-December and harvesting during February-March) (10, 16). Twenty fruits per plant (of both crops) were picked randomly for analysis. Fruit drop percentage was calculated by following formula.

$$\frac{\text{Number of flowers dropped}}{\text{Total number of flowers}} \times 100$$

The fruit size (cm²) was measured by electronic digital caliper, fruit weight (g) was measured by electronic scale, SF-400 and TSS(%) were measured by digital refractometer Pal-1. Average yield per plant (kg) in summer and winter was recorded.

Experiment was laid out in RCBD. Data was analyzed statistically by using the Fishers analysis of variance and treatments were compared by using the least significant difference (LSD) test at 5% probability level (20). There were five treatments including control, which were repeated four times making total number of twenty experimental units (2 plants in each experimental unit total, 40 plants).

RESULTS AND DISCUSSION

The flower drop percentage of summer crop of guava was counted from June to July to determine the average flower drop. The data regarding the flower drop percentage showed that NAA sprayed at the concentration of 500 ppm dropped maximum number of flowers (69.45) as compared to control (33.51). The NAA sprayed at the concentration of 400, 300 and 200 ppm caused 64.92, 53.38 and 50.46 % flower drop, respectively. The data revealed that there was linear relationship between the flower drop percentage and concentrations of NAA but the higher concentration disturbs the physiology of plant. NAA forms the abscission layer that causes the flower to drop. These results were in line with the findings of Basak and Krzwinska (4) and Mitra *et al.* (12) who reported that NAA and BA reduced fruit set and the number of fruits per tree. These results are also in line with the findings of some other scientists (14, 22, 6, 8).

The data regarding average yield per plant during the summer season showed that the plants under control gave maximum yield (19.81 kg/plant) as compared to the plants sprayed with NAA at 500 ppm. It happened because no flower and fruit thinning was carried out in the plants kept as control as no chemical was sprayed on the plants. The plants sprayed with NAA at the concentration of 200, 300 and 400 ppm gave average yield of 17, 14.83 and 13.25 kg per plant, respectively. As more flowers dropped so less summer yield was recorded.

Table 1. Physical characteristics of guava as affected by different concentrations of NAA.

Treatments	Flower drop (%)	Average yield (kg/plant)		Average size of fruit (cm ²)	Average weight of fruit (g)	Average TSS (%)
		Summer	Winter			
T ₁ Control	33.51 c	19.81 a	14.60 c	25.32 a	103.91 a	6.23 b
T ₂ NAA 200ppm	50.46 b	17.00 ab	22.42 b	21.14 b	88.68 ab	7.13 b
T ₃ NAA 300ppm	53.38 b	14.83 bc	25.44 b	17.93 bc	82.20ab	6.90 ab
T ₄ NAA 400ppm	64.92 a	13.25 bd	32.75 a	14.63 c	55.24 c	6.53 ab
T ₅ NAA 500ppm	69.45 a	11.06 d	26.02 ab	20.58 d	72.43 bc	5.35 c
LSD (0.05)	9.56	3.63	6.90	2.95	26.08	0.72

Yield is directly related with number, size and weight of fruit. Data regarding the average yield per plant during the winter season was also recorded which showed that plants treated with NAA at 400 ppm gave maximum yield (32.75 kg/plant) as compared to the plants kept as control (14.60 kg/plant). As the result of fruit thinning, the tree did not become exhausted due to use of energy in fruit development and ripening, the prepared food remained reserved which helped to increase yield and improve the fruit quality during next winter crop. During summer, the problem of fruit fly is very serious, which damages almost all the fruit. At the same time stored food of the plants is used for fruit setting, development and ripening (22, 9, 10).

The data on yield of winter season was also recorded. The plants sprayed with NAA at the concentration of 200, 300 and 500 ppm gave the average yield of 22.42, 25.44 and 26.02 kg per plant, respectively. These findings confirm the findings of Basak and Krzwinska (4), who reported that after flower and fruit drop in one season, trees showed a tendency to more vigorous growth than untreated control during the next season. These findings also correlated to the findings of Kundu and Mitra (11), who described that de-blossoming in summer results in subsequent increase of fruit set in winter. The flower drop percentage was maximum in plants treated with NAA at 500 ppm but these plants showed lesser yield as compared to the plants treated with NAA at 400 ppm due to some harming factors. The results are also in line with the findings of Tahir and Kamran (22).

The physico-chemical analysis of yield of winter crop was carried out and the data regarding average size of fruit revealed that the weight of fruit and its size was found maximum (103g, 25.32cm²) in control plants because when the number of fruit decreases the individual weight and size of fruit increases due to natural load sharing and that happened exactly for plants kept under control as there was less number of fruits so the weight of individual fruit increased (3, 7, 23).

The data on TSS revealed that maximum (7.13%) TSS was recorded in T₂ and minimum (5.35%) in T₅. The results are also in line with the findings of Singh *et al.* (19), who reported that flower thinning from guava plants during summer; improve fruit quality during next winter. These findings are in line with the findings of Kundu and Mitra (11), who reported that appreciable improvement in fruit quality was also observed due to different chemical treatments as compared with the fruits obtained from manually de-blossomed and control plants.

CONCLUSION

It is concluded from above discussion that if the farmers spray guava plants with Naphthalene Acetic Acid twice at 400 ppm concentration during the flowering season i.e. last week of April and first week of May, maximum flowers of summer crop will drop and the plant will give better yield during the winter season.

REFERENCES

1. Adrees, M., M. Younis, M. Farooq and K. Hussain. 2010. Nutritional quality evaluation of different guava varieties. Pak. J. Agri. Sci., 47: 1-4.
2. Anon. 2009. Tropical guava fruit facts. www.crfq.org/pubs/ff/guava.html. Retrieved on 03/01/2009.
3. Barua, S. C. 1998. Productivity of Santa rosa plum trees in respect to tricontanol. J. Interacad., 2 :124-29.
4. Basak, A. and D. Krzewinska. 2006. Effect of Prohexadione-Ca (Regalis) on the effectiveness of NAA and BA used for fruitlet thinning in apple trees. Acta Hort. (ISHS) 727:139-44
5. Biswas, M., A. K. Azad, A. Ahmed, and A. K. M. A. Hossain. 1989. Effect of fruit thinning on fruit size, yield and quality of Kazi Piara guava. Bangladesh Hort. 17:1-4.
6. Bruno, R., G. Reginato, and S. Rojas. 2003. Chemical thinning of loquat with Naphthalene Acetic Acid. Hort. Tech. 13(1):128-32
7. Clark, H.E. and K.R. Kerns. 1943. Effect of growth regulating substance on parthenocarpic fruit. Bot. Gaz., 104:639-644.
8. Dhinesh, K. and D.S. Yadav. 2004. Physical and chemical thinning of peach in Subtropical North Eastern India. Acta Hort. (ISHS)662:327-31.
9. Khan, A. S., M. R. G. Khan, A. U. Malik., B. A. Saleem, I. A. Rajwana and I. Ahmad. 2011. Influence of defoliation and de-blossoming on the vegetative and reproductive growth of guava (*Psidium guajava* L.) cv. 'Gola'. Pak. J. Bot., 43: 2891-96.

10. Khan, S. A., M. G. Khan, A.U. Malik, I. A. Rajwana, T. Shaheen and A. Bakhsh. 2013. Influence of defoliation and deblossoming on fruit quality of guava (*Psidium guajava* L.) cv. Gola. Pak. J. Bot., 45(2):563-70.
11. Kundu. S. and S. K. Mitra. 1997. Regulation of cropping in guava. Indian J. Hort. 54(2).
12. Mitra, S. K., M. R. Gurung and P.K. Pathak. 2008. Guava production and improvement in India: An overview. Acta Hort. (ISHS) 787:59-66
13. Norrbom, A. L. 2001. Anastrepha Striata Schiner. The Diptera Site. <http://www.sel.barc.usda.Gov/dipteral/tephriti/Anastrep/striata.htm>. retrieved on 19/01/2009.
14. Pervez, M. A., F. M. Tahir, and A. Manzoor. 1999. Scientific approach to enhance income from guava orchard. Pakistan J. Biological Sci. 2(4):1637-38.
15. Rathore, D. S. 1976. Effect of season on the growth and chemical composition of guava (*Psidium guajava* L.) fruits. J. Hort. Sci. 51:41-47.
16. Samson, J. A. 1986. Tropical fruits, 2nd Ed., Tropical Agriculture Series, Longman Scientific and Technical, Longman Inc., New York.
17. Sheikh, M. K. and N. C. Hulmani. 1993. Effect of severity of pruning of flowering and fruiting of guava. Japan Agric. Res., 15:74-76.
18. Singh, R. R. and M. S. Joon. 1984. Seasonal influence on Physico-chemical composition of guava fruit. South Indian Hort. 32:88-89.
19. Singh, A. K., G. Singh, D. Pandey and S. Rajan. 1996. Effect of cropping pattern on quality attributes of guava fruit. Physiologica Plantarum. 71:187-92.
20. Steel, R. G. D. and J. H. Torrie. 1984. Principles and Procedures of Statistics Analysis. McGraw Hill Book Co., New York. U.S.A.
21. Stone House, J., R. Mahmood, A. Poswal, J. Mumford, K. N. Baloch, Z. M. Chaudhary, A. H. Makhdam, G. Mustafe and D. Huggett. 2002. Farm field assessments of fruit flies (Diptera: Tephritidae) in Pakistan: distribution, damage and control. Crop Protect., 21:661-69.
22. Tahir, F. M. and H. Kamran. 2002. Studies of Physico-chemical changes due to fruit thinning in Guava (*Psidium guajava* L.) J. Biological Sci. 2(11):744-45.
23. Winston, E. C. 1992. Evaluation of Paclobutrazol on growth, flowering and yield of mango cv. Kensington Pride. Australian J. Experi. Agric. 32(1) 97-104.