Plant Archives Vol. 17 No. 1, 2017 pp. 608-610 *ISSN 0972-5210*

EFFECT OF GA_3 ON GROWTH, YIELD AND QUALITY OF PHALSA (*GREWIA SUBINEQUALIS* D. C.)

Tanveer Alam and Ashok Kumar*

Department of Horticulture, College of Horticulture & Forestry, N. D. University of Agriculture & Technology, Faizabad - 224 229 (U.P.), India.

Abstract

The present investigation was carried out at Main Experimental Station, Horticulture, N. D.U.A. & T., Kumarganj, Faizabad (U.P.), India; during the year 2015-16, to investigate the effect of GA_3 on growth, yield and quality of Phalsa (*Grewia subinequalis* D. C.). The experiment was laid out in Randomized Block Design with four replications and five treatments e.i. five levels of GA_3 (0, 50, 100, 150 and 200 ppm). Results revealed that GA_3 at 150 ppm enhanced vegetative growth, improved fruit quality and decreased acidity contents in the fruits. Maximum number of shoots/ plant (86.37), number of fruits/ node (17.33), number of fruiting nodes/ shoot (16.33), and fruit yield (65.93 q/ha) were recorded with the application of GA_3 at 150 ppm. Physical and chemical qualities of phalsa were also improved by the spraying of GA_3 at 150 ppm. Maximum fruit length (0.97 cm), fruit width (1.13 cm), weight of 50 fruits (43.28 g), pulp stone ratio (1.22), T.S.S. (21.97 ^{0}Brix), reducing and non-reducing sugars percentage (14.77 & 3.30) and ascorbic acid content (40.57 mg/100g pulp) were found. However, minimum acidity was noticed by used of GA_3 at 150 ppm.

Key words : Phalsa, GA_3, fruits, reducing and non reducing sugars, ascorbic acid, acidity.

Introduction

Phalsa (*Grewia subinequalis* D. C.) is a subtropical fruit belongs to the family Tiliaceae with chromosome no. of (2n=36). Its fruit are known as berry. India is considered to be the home of phalsa. It is quick growing very hardy shrub which thrives well in arid and semi-arid region. Ripe fruits of phalsa are deep reddish-brown in colour, sour to sweet in taste with a desired and pleasant flavor. It is rich source of vitamins (A & C) and minerals (phosphorus, calcium and iron), contains 50-60 percent juice, 2-2.5% acids, 81.13% moisture, 1.58% protein, 1.82% fat, 1.77% crude fiber and 10.27% sugar. The fruits of phalsa are used as fresh as well as making juice and squash. Growth, yield and quality of phalsa can be increased by adopting proper cultural practices, supplying balanced doses of nutrients and through use of growth regulators. Gibberellic acid (GA_3) is an important plant growth substance which plays a vital role on overall performance including growth, flowering and quality of fruits. It increases cell division and cell elongation in the plants. Keeping in view the importance of Gibberellic acid the present study was under taken to assess the effect of GA_3 on growth, yield and quality of Phalsa.

***Author for correspondence :** E-mail: akmnduat@yahoo.com.

Materials and Methods

The present study was under taken at Main Experimental Station, Horticulture, N.D.U.A. & T., Kumarganj, Faizabad (U.P.), India; India during the year 2015-16. The experiment was laid out in Randomized Block Design (RBD) with four replications and five treatments *i.e.* five levels of GA_3 (0, 50, 100, 150 and 200 ppm). GA_3 was sprayed first in second fortnight of March at pre blooming stage and second just after fruit set in second fortnight of April. Twenty years old uniform phalsa plants in two units transplanted at 3 × 3 meters were selected for present investigation. Manure, fertilizer and other orchard management practices were followed as per recommended package and practices for phalsa. Number of shoots per plant was counted after the last harvesting and average of shoots were expressed as number of shoots per plant. Intermodal length was counted for five tagged shoots in last week of October at full growth stage. Number of shoots were randomly selected and tagged in each plant for counting the number

of fruits per node and average number of fruits per node was recorded. Fruiting nodes per shoot were counted from tagged shoot of each plant and average number of fruiting node was expressed as number of fruiting nodes per shoot. Yield per hectare was calculated by multiplying the average yield per plant with number of plants per hectare. Fully ripened fruits were taken from each treatment randomly and weight for calculating yield. Length and width of fruits were recorded at the colour break stage with the help of vernier calipers. Statistical analysis of the data obtained in the different experiments was calculated as suggested by Panse and Sukhatme (1985).

Results and Discussion

The statistical analysis of data revealed that number of shoot per plant and inter-nodal length has been influenced by foliar application of GA_3. Table 1 indicated that maximum number of shoots per plant and inter-nodal length was achieved with foliar spray of GA_3 @ 150 ppm. This might be due to cell division, cell elongation and growth enhancing properties on gibberellins as reported by Kumar *et al*. (2014) in phalsa.

The yield attributing parameters *viz*., number of shoots/ plant (86.37), number of fruits/ node (17.33), number of fruiting nodes/ shoot (16.33) and fruit yield (65.93 q/ha) have been enhanced significantly with the application of GA_3 @ 150 ppm were found significant in affecting yield and yield attributing characters. Findings might be due to enhancing vegetative growth produces higher yield and yield attributing characters. These results are in close conformity with finding of Kumar *et al*. (2014) and Kacha *et al*. (1914) in phalsa. Fruit yield obtained maximum by foliar spraying of GA_3 at 150 ppm. This may be due to the better physiology of developing fruits in terms of better supply of water and other compounds vital for their proper growth and development which resulted in improved size ultimately greater yield. These results are in close conformity with finding of Rajput *et al*. (2015) in guava cv. L-49. Table 2 indicated that the maximum fruit size was measured with foliar spray of GA_3 at 150 ppm. These can be attributed to nature of gibberellins to increase to vegetative growth due to which more food material might be made available to the developing fruits. Fruit length varied significantly due to various levels of GA_3. These finding are similar to the findings of Chandra *et al*. (1915), Singh *et al*. (2011) in phalsa and Kundu *et al*. (2014) in pear, Chundawat and Randhawa (1973) in grape and Brahmchari *et al*. (2001) in litchi. Pulp stone ratio and weight of fruits were recorded maximum with GA_3 @ 150 ppm. It may be due to the involvement of GA_3 to increase the cell division and translocation of food material which might be responsible to improve the weight of fruits. These findings

Table 1 : Effect of GA_3 on growth and flowering attributes of Phalsa.

Treatments	No. of shoots/ plant	Inter-nodal length (cm)	No. of fruits/node	No. of fruiting nodes/ shoot	Fruit yield/ plant (kg)	Fruit yield (q/ha)
T_1 (Control)	58.87	5.93	12.33	11.33	4.11	45.74
T_2 (GA_3 50 ppm)	77.70	8.33	15.67	15.33	5.25	58.33
T_3 (GA_3 100 ppm)	82.50	8.36	16.67	15.67	5.40	60.00
T_4 (GA_3 150 ppm)	86.37	8.47	17.33	16.33	5.93	65.93
T_5 (GA_3 200 ppm)	79.73	7.33	17.00	14.33	4.83	53.70
S Em±	2.08	0.04	0.49	0.39	0.10	1.12
CD at 5%	6.41	0.14	1.51	1.20	0.31	3.45

Table 2 : Effect of GA_3 on physical and chemical characters of Phalsa.

Treatments	Fruit length (cm)	Fruit width (cm)	Weight of 50 fruits (g)	Pulp stone ratio	T.S.S. (^{0}Brix)	Reducing sugars (%)	Non–reducing sugar (%)	Total sugars (%)	Acidity (%)	Ascorbic acid (mg/100 pulp)
T_1 (Control)	0.85	1.07	29.25	1.03	18.50	13.54	2.21	15.75	2.56	26.53
T_2 (GA_3 50 ppm)	0.88	1.12	41.80	1.16	20.95	14.55	3.28	17.83	2.38	37.77
T_3 (GA_3 100 ppm)	0.95	1.12	42.48	1.21	21.08	14.59	3.40	17.99	2.36	38.37
T_4 (GA_3 150 ppm)	0.97	1.13	43.28	1.22	21.97	14.77	3.60	18.37	2.33	40.57
T_5 (GA_3 200 ppm)	0.87	1.08	40.35	1.20	20.30	14.17	2.86	17.03	2.49	37.90
S Em±	0.03	0.01	0.64	0.01	0.49	0.41	0.43	0.21	0.01	0.26
CD at 5%	0.08	0.03	1.98	0.03	1.50	1.25	0.34	0.65	0.04	0.8

are supported by the results of Kacha *et al*. (1914) in phalsa and Chandra *et al*. (1915) in aonla fruits and Singh *et al*. (2015) in phalsa.

It is evidence in the table 2 that TSS was significantly increased (21.97%) with treatment of GA_3 at 150 ppm followed by GA_3, 100 ppm and GA_3, 50 ppm. The increase in total soluble solids and sugar percentage may be caused due to starch hydrolysis and early maturation of fruits. The present findings are in conformity with those reported by Yadav (2001) in guava and Kacha *et al*. (1914) in phalsa. Acidity percentage in the fruit juice was reduced significantly by GA_3 application. The less acidity percent was noted with the foliar application of GA_3 150 ppm followed by GA_3 100 ppm. The reason for decrease in acidity due to application of GA_3 might be due to increase translocation of carbohydrates and increase metabolism due to conversion of acid to sugar. The finding is in agreement to Kacha *et al*. (1914) in phalsa, Kher *et al*. (2005) in guava and Chandra *et al*. (1915) reported minimum acidity with spray of GA_3 in aonla. Maximum ascorbic acid content (40.57 mg/100g pulp) in fruit juice was noticed with GA_3 at 150 ppm. The increase in ascorbic acid content may be attributed to quality improving properties of GA_3 is assigned the role of quality nutrient and may help in synthesis of ascorbic acid in developing fruits. The result is in consonance with the findings of Rokaya et *al*. (2016) in mandarin, Kacha *et al*. (1914) in phalsa and Kher *et al*. (2005) in guava.

References

Brahmchari, V. S. and R. Rani (2001). Effect of growth substances on cracking and other physio-chemical composition of litchi. *Orrisa J. Hort*., **29(1)** : 41-45.

Chandra, R., R. Manju and K. K. Singh (1915). Effect of foliar application of various growth regulators on yield and quality of Aonla cv. NA-7. *International J. Tropical Agric*., **33(3)** : July- September.

Chundawat, B. S. and G. S. Randhawa (1973). Effect of plant growth regulator on fruit set, drop and quality of grape fruit (*Citrus paradise* L.) Saharanpur special. *Indian J. Hort*., **29(3-4)** : 277-282.

Kacha, H. L., G. Jat and S. K. Patel (2014). Performance of various plant growth regulators on yield and quality of phalsa (*Grewia asiatica* L.). *Hort. Flora Res. Spectrum*, **3(3)** : 292-294.

Kher, R., S. Bhat and V. K. Wali (2005). Effect of foliar application of GA_3, NAA and CCC on physico-chemical characteristics of guava cv. Sardar. *Haryana J. Hort*., **34(1/2)** : 31-32.

Kumar, S., A. L. Yadav, G. Vishwakarma and D. K. Yadav (2014). Effect of foliar feeding of nutrients and plant growth regulators on vegetative growth and yield of phalsa (*Grewia subinequalis* D. C.). *Res. Environ. Life Sci*., **7(4)** : 293-294.

Kundu, M., R. Joshi, P. N. Rai and L. D. Bist (2014). Effect of bio-regulators on fruit growth, quality and productivity of pear (*Pyrus pyrifolia*) cv. Gola under tarai condition. *J. Applied Hort*., **15(2)** : 106-109.

Panse, V. G. and P. V. Sukhatme (1985). *Statistical Methods for Agricultural Workers*, ICAR, New Delhi.

Rajput, R. P., H. J. Senjaliya, G. S. Vala and G. S. Mangroliya (2015). Effect of various plant growth regulators on yield and quality of guava (*Psidium guajava* L.) cv. L-49. *International J. Agric. Sci.*, **11(1)** : 179-182.

Rokaya, P. R., D. R. Baral, D. M. Gautam, A. K. Shrestha and K. P. Paudal (2016). Effect of pre-harvest application of Gibberellic Acid on fruit quqlity and shelf life of Mandarin (*Citrus reticulate* B.). *American J. Plant Sci*., **7** : 1-7.

Singh, J. P., S. Kumar, P. N. Katiyar and A. K. Dwivedi (2011). Effect of calcium nitrate, GA_3 and ethrel on fruiting, repening and chemical traits of phalsa (*Grewia subinequalis* D. C.). *Annals of Hort*., **12(1)** : 72-76.

Yadav, S., S. K. Bhatia, R. K. Godara and G. S. Rana (2001). Effect of growth regulators on the yield and quality of winter season guava cv. L-49. *Haryana J. Hort. Sci*., **30** : 1-2.