International Journal of Agriculture Innovations and Research
Volume 5, Issue 5, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received: 23/03/2017 | Accepted on : 31/03/2017 | Published : 06/04/2017

The Effect of Foliar Feeding of Plant Growth Regulators on Growth and Fruiting Behavior of Phalsa

Bhujbal Singh*, A. L. Yadav and Ashok Kumar Meena*
Department of Horticulture, College of Horticulture and Forestry, Narendra Deva University of Agriculture & Technology, Narendra nagar (Kumarganj), Faizabad-224 229 (U.P.) India
Corresponding author email id: akmhans@aau.ac.in, Bhujjusingh007@ gmail.com

Abstract **– The present investigation was carried out to investigate "The effect of foliar feeding of plant growth regulators on growth, yield of phalsa (*Grewia subinaequalis* D.C.)" was conducted at Main Experiment Station, Horticulture, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad, Uttar Pradesh during 2014-2015 in Randomized Block Design and replication three and seven treatments T_1 - Control (Water spray), T_2- NAA 100 ppm, T_3- NAA 150 ppm,T_4- NAA 200 ppm,T_5- GA_3 50 ppm,T_6- GA_3 100 ppm,T_7 – $GA_3$150 ppm. replication three and considering two plants as a unit. The observations were recorded growth, yield of phalsa fruits. The maximum shoot length, number of shoots per plant, number of leaves per shoot, internodal length, number of fruits per node, number of fruiting nodes per shoot, fruit yield per plant (kg), fruit yield per hectare (q) were increased with the application of GA_3 @150 ppm. Overall from experimental finding it can be concluded that foliar application of GA_3 @ 150 ppm was found to be best for vegetative growth, yield.**

Keywords **– Foliar Spray, Growth, Phalsa, Plant Growth Regulator, Yield.**

INTRODUCTION

Phalsa (*Grewia subinaequails* D.C.), belongs to the family Tiliaceae with chromosome no (2n) = 36, Fruit is known as berry. The family has about 41 genera and 400 species which are mostly distributed in the tropical and subtropical regions of the world. Phalsa is commercially propagated by seed as well as vegetative means such as cutting and layering is also possible with the help of growth regulators (IBA 2500-3000 ppm) It can be grown as filler crop and intercrop with mango, aonla, ber, bael and boundary plantation with meagre investment. The edible portion of fruit is 69 per cent and moisture content 80.8 per cent. It contain about 50-60 per cent juice and 10-12 per cent sugar fruit are very delicious tasty and use for table purpose. The pulp contains per 100g, protein 1.3g, fat 0.9g, carbohydrates 14.7 g, fiber 1.2 g, minerals 1.1g, phosphorus 39 mg, calcium 129mg, iron 3.1 mg, carotene 0.48 mg, niacin 0.3 mg and vitamin C 22 mg. The energy value is 300 Cal /100g.

The plant growth regulators are relatively new in use. Hormones defined as a substance produced in one part of any plant but later on transferred to another part of the same plant where it after a specific physiological action, It must be note that a hormones has to be produced in plant and it is transported from the place to the actual site of action. NAA is widely used in horticulture for various purposes and play many important roles in flowering, fruit setting and tissue culture, increase in fruit set or prevent fruit drop in mango and citrus, blossom thinning in peach and guava and fruit thinning in apple and pear. The GA is transported to the aleurone layer, which responds by producing enzymes that break down stored food reserves within the endosperm, which are utilized by the growing seedling. GAs produces bolting of rosette-forming plants, increasing internodal length. Gibberellins are produced in greater mass when the plant is exposed to cold temperatures. They promote flowering, cellular division, and in seeds growth after germination. Gibberellins influence various developmental processes including stem elongation, dormancy, germination, sex expression, enzyme induction and fruit senescence.

II. MATERIALS AND METHODS

The experiment was conducted on twenty year old trees of phalsa at the Main Experimental Station, Department of Horticulture, NDUA&T, Kumarganj, Faizabad (U.P.) during 2014-15.The experiment was laid out in randomized block design with 7 treatments and three replications. The treatment consisted two foliar applications of naphthalene acetic acid and gibberellic acid. The treatments were T_1 Control (Water spray), T_2 (NAA 100 ppm), T_3 (NAA 150 ppm), T_4 (NAA 200 ppm), T_5(GA_3 50 ppm), T_6 (GA_3 100 ppm), T_7 (GA_3 150 ppm). The treatments were imposed at two times first spray of plant growth regulators was done in Pre blooming Stage and second spray just after fruit setting. The observations were recorded on the parameters viz. Length of shoot (m), Number of shoots per plant, Number of leaves per plant, Internal length (cm), Number of fruits per node, Number of fruiting nodes per shoot, Fruit yield per plant (kg) and Fruit yield per ha.(q) Statistical analyses of the data obtained in the different sets of experiments were calculated as suggested by Panse and Sukhatme (1985) and results were evaluated at 5% level of significance.

III. RESULT AND DISCUSSION

Shoot Length (m)

Plant growth regulators spray significantly effect the shoot length. However, the maximum (2.52 m) shoot length was measured with foliar spray of GA_3 @150ppm followed by spray of NAA @100 ppm (Table-1). The increase in vegetative growth of the phalsa plant with the spray of plant growth regulators and may be attributed to the association of nitrogen in the synthesis of protoplasm and in the primary manufacture of amino acids and increased auxin activities. As a result, meristematic activities increased which in increase the vegetative

growth. Similar results have also been reported by Karole and Tiwari (2016) with spray of NAA + GA_3 + urea in ber and Kumar *et al*. (2014) in phalsa.

Number of Shoots Per Plant

Number of shoots per plant was also influenced significantly by the application of plant growth regulators. However, the maximum (123.33) number of shoots per plant was measured with foliar spray of GA_3@150ppm followed with the spray of GA_3 @100ppm (Table-1). Number of shoot per plant was increased with the application of plant growth regulators spray. Increase in plant growth parameters might be due to fact that gibberellin (given in the form of GA_3 sprayed) is a constituent of protein which is essential for formation of protoplasm and thus, affecting cell division and cell elongation. All these contributed in enhancing shoot length and number of shoots per plant of phalsa. The present findings are in conformed to the report of Moon Young *et al.* (2003) in Satsuma mandarin and Kumar *et al.* (2014) in phalsa.

Number of Leaves per Shoot

The number of leaves per shoot increased significantly with the application of foliar feeding of plant growth regulators and the highest (61.46) number of leaves was obtained with spraying of GA_3@150ppm (Table-1). The favorable effect of GA_3 and NAA in promoting number of leaves might be due to abundant supply of GA_3 on plant growth moreover, the increase in vegetative growth may be attributed to an increase uptake of these elements which being a constituent of protein component of protoplasm, favorably influenced chlorophyll content in leaves. All these factors contributed to cell multiplication, which has resulted in to better photosynthetic activity and it's translocation to promote better vegetative growth. Thus increased number of leaves per shoot with the spray of GA_3. The findings are in agreement with result of Karole and Tiwari (2016) with spray of NAA + GA_3 + urea in ber and Singh *et al*. (2011) and Kumar *et al.* (2014)in phalsa.

Inter-nodal Length (cm)

The inter-nodal length was increased significantly with plant growth regulators. The maximum (6.13cm) inter nodal-length was achieved with foliar spray of GA_3 @ 150 ppm (Table-1). Higher inter-nodal length achieved might be due to cell division and cell elongation growth enhancing properties of gibberellin reported by Singh *et al* (2015) with the spray of 20 ppm GA_3 and Kumar *et al*. (2014) in phalsa.

Number of Fruits per Node

The maximum (12.06) number of fruits per node was obtained with foliar spray of GA_3 @150 ppm followed with the spray of NAA @ 200ppm (Table-1). The higher number of fruits per node might be due to fact that nitrogen is component of chlorophyll and gibberellic acid and auxin help in chlorophyll formation that regulate the buildup of proper C:N ratio, which controls the flowering and fruiting of plants. It is also assumed that gibberellin and auxin play significant role in photosynthetic activity and better translocation of metabolites for developing fruit lets. These results are in close conformed with finding of Kumar *et al*. (2014) in phalsa.

Number of Fruiting Nodes per Shoot

The maximum (12.50) number of fruiting nodes per shoot was counted with the spray of GA_3@150 ppm (Table-1). It might be possible because Gibberellin causes vegetative growth for development of fruiting nodes. Gibberellin and auxin helps in the translocation of carbohydrates and other metabolites for better reproductive growth of plants. These results are in close conformed with finding of Kumar *et al*. (2014) in phalsa.

Fruit Yield (kg per Plant)

A perusal of data regarding fruit yield clearly revealed that plant growth regulators spray significantly influenced fruit yield (kg) per plant. The maximum (5.37kg) fruit yield per plant was recorded with the spray of GA_3 @150ppm followed by GA_3 @ 50ppm (Table-1). 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 and yield as compared to NAA. These results are in close conformed with finding of Anawal *et al*. (2015) in pomegranate cv. Bhagwa, Rajput *et al*. (2015) in guava cv. L-49, Gersthein (1973) in orange and Sharma *et al.* (2008) in mango.

Fruit Yield (q per Hectare)

The increase in growth and yield attributes particularly number of per node and increased yield per plant which contributed towards such an increase in average yield per hectare. The maximum (59.65 q ha.) fruit yield per plant was recorded with the spray of GA_3 @150ppm followed by GA_3 @ 50ppm (Table-1).

The present findings are in conformed with the result of Anawal *et al*. (2015) in pomegranate cv. Bhagwa and Rajput *et al*. (2015) in guava cv.L-49.

Table No. 1. The effect of foliar feeding of plant growth regulators on growth and fruiting behavior of phalsa

Treatments	Shoot length (m)	shoots per plant	leaves per shoot	Internodal length (cm)	fruits per node	fruiting nodes/ shoot	Fruit yield (kg /plant)	Fruit yield (q / ha)
T_1-Control (Water spray)	1.78	78.33	43	5.06	9.46	9.93	3.95	43.87
T_2-NAA @ 100 ppm	2.04	84	47.66	5.4	9.8	10.8	4.37	48.54
T_3- NAA @150 ppm	2.28	84.66	51.13	5.3	10.16	10.26	4.64	51.62
T_4 -NAA @ 200 ppm	2.3	79.33	54.6	5.6	10.56	10.6	4.34	48.06
T_5-GA_3 @ 50ppm	2.41	81.33	56.53	5.63	10.4	11.26	5.34	59.39
T_6-GA_3 @100ppm	2.44	95	58.66	5.66	11.3	11.36	4.87	53.84
T_7-GA_3 @150 ppm	2.52	123.33	61.46	6.13	12.06	12.5	5.37	59.65
SEm±	0.11	7.71	1.17	0.11	0.38	0.29	0.25	2.83
CD at 5%	0.33	23.77	3.62	0.37	1.18	0.91	0.78	8.73

CONCLUSION

Thus, it may be concluded from the findings of the present investigation that the foliar application of (GA_3 150 ppm) was found to be the most effective to increase the vegetative growth and fruit yield compared to other treatments. Based an overall experimental findings, it may be recommended that two foliar sprays of GA_3 (150 ppm) after fruit set may be done in Phalsa for better yield and quality of fruits.

REFERENCES

[1] Anawal ,V. V.; Narayanaswamy, P. and Ekabot, S. D. (2015). Effects of Plant Growth Regulators on Fruit Set and Yield of Pomegranate Cv. Bhagwa, *International Journal of Scientific Research*.4 (9): 220-222.

[2] Grshtein L. A.(1973). Studies on the effect of gibberellins on citrus fruit set and quality subicheckeal no. 4:18-82.

[3] Karole,B. And Tiwari,R.(2016) Effect of pre-harvest spray of growth regulators and urea on growth, yield and quality of ber under malwa plateau conditions, *Annals of Plant and Soil Research* 18(1):18-22.

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

[5] Moon Young; Eel Kim Young Ho Kim Chang Myung and Kho Sangdok (2003). Effects of foliar application of GA_3 on flowering and fruit quality of very early-maturing Satsuma

[6] mandarin (Karan). *Korean Journal of Horticultural Science & Technology*, 21 (2) : 110-123.

[7] Nkansah, G. O.; Ofosu-Anim, J. and Mawuli, A. (2012). Gibberellin acid and Naphthalene cetic acid affect fruit retention, yield and quality of Keitt mangoes in the coastal savanna ecological zone of Ghana. .*American Journal of Plant Physiology* 7(6): 243-251.

[8] Panse, V.G. and Sukhatma, P.V.(1985) Statistical Method for Agriculture Workers. (4th edn.) P.&I. Division, I.C.A.R. New Delhi p. 58-62.

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

[10] Sharma, J. R.; Bhatia, S. K.; Gupta, R. B.; Singh, S. and Gehlot, R. (2008). Influence of nutrients and growth regulators on yield and quality of ber (*Ziziphus mauritiana* Lamk.) fruits cv. Umran. *Haryana Journal of Horticultural Sciences*, 37(3/4):217-219.

[11] Singh, Ashutosh Kumar ; Kumar, Anil and Yadav, A.L. (2015). Effect of pruning intensity, foliar feeding of P.G.R. and micro nutrients on physico-chemical attributes of phalsa (*Grewia subinaequalis* D.C.) fruits, *Res. Environ. Life Sci.,* 8(4) 675-678.