International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Effect of Indole Butyric Acid on Rooting and Vegetative Parameters of Pomegranate *(Punica granatum* L.*)* Cuttings

Steffy Kamboj[1], Karampal Singh[2], Snehdeep Singh[3], Navdeep Gandhi[4]

[1,2,3,4]*Department of Agriculture, D.A.V. College, Abohar (India)*

ABSTRACT

The purpose of this study was to evaluate the effect of Indole Butyric Acid on rooting and vegetative parameters of pomegranate (Punica granatum L.) cuttings. The experiment was investigated on the Hardwood cuttings of the pomegranate at the Department of Agriculture, D.A.V. College, Abohar. In this study, the 15 cm long cuttings were taken and treated with three levels of IBA i.e. 100 ppm, 500 ppm and 1000 ppm. The cuttings were planted in the month of February and the cuttings were studied after 90 days and 120 days of planting. The results revealed that the maximum average stem diameter, leaf number, roots number per plant, root length and root weight was observed in the cuttings treated with IBA at 1000 ppm.

Keywords: February, Hardwood cuttings, IBA, Pomegranate, Vegetative parameters

I. INTRODUCTION

Pomegranate (*Punica granatum* L.) is one of the oldest known edible fruits and its major cultivation is confined in tropical and sub-tropical regions. It is popularly called as "Anar". It belongs to genera *Punica* and family Punicaceae. It is a genus of large shrubs or small trees with 2 species. One is *granatum* and other is *protopunica*. The scientific name *Punica granatum* is derived from the name Pomum (apple), granatus (grainy or seeded apple). *Punica granatum*, is reported to contain 2n=16, 18 chromosomes. Pomegranate is a Sub-Tropical fruit. The plants are deciduous under subtropical region and evergreen under tropical conditions (Singh, [1]). The Pomegranate cultivation is spread all over due to its hardy nature, high yield with low maintenance cost and good keeping quality. Therefore Pomegranate is regarded as the "Fruit of Paradise". Pomegranate is very much liked for its cool, refreshing juice with sweet acidic taste and also for its medicinal properties. Its flower and rind are good sources of natural dye. Its grains (arils) after drying are used as a condiment (Anardana) in Indian homes. The double flowered Pomegranate (which does not bear fruits) are grown in parks and ornamental gardens for their beautiful red flower. *Punica granatum* L. can be propagated from seeds as well as from softwood, semi-hardwood and hardwood cutting. Pomegranate plants raised from seeds show a great variability with respect to tree vigour and quality of fruits. Therefore vegetative propagation is utmost desirable to propagate true to type plants. Multiplication of plants through stem cutting is the most convenient method and by this method a stronger plant can be developed considerably in less time. Rooting of the cutting is affected by

internal factors like genetic material, stored nutrition, hormones in the stems and external factors like pruning, fertilization, irrigation, stem cutting time, rooting and hormones applications (Polat and Caliskan, [2]). Therefore in order to improve rooting ability and success per cent, one technique has been improved in which synthetic root promoting growth regulator is used. Various types of growth regulators such as auxins, cytokinins, inhibitors and ethylene influence the root initiation. Among these auxins have the greatest effect on root formation in cuttings. IBA is a plant hormone in the auxin family and is an ingredient in many commercial horticultural plant rooting products. IBA induce rooting in stem cuttings and in air layers due to their ability to achieve to active cambium regeneration, cell division and cell multiplication (Kaur *et al*, [3]).

II. MATERIAL AND METHODS

The experiment was conducted during the February to May in the Department of Agriculture, D.A.V. College, Abohar. The investigation was aimed to study the effect of different doses of IBA on the pomegranate cuttings. The hardwood cuttings were taken from the trees of pomegranate cv. Bhagwa. Hardwood cuttings of about pencil thickness and 20 cm in length having 3-6 buds were taken from healthy pomegranate trees. A straight cut was made at the basal end just below the bud and a slanting cut was made at the apical end just above the bud. The IBA solution was applied by quick dip method. In this method, the cuttings were dipped in the solution of IBA for 2 minutes just before the planting.

Treatments	Chemicals	Concentration
T_1	IBA	100 ppm
T_2	IBA	500 ppm
T_3	IBA	1000 ppm
T_4	Control	No Treatment

The cuttings were planted in the beds. While planting about 2/3rd length of cutting was buried in the soil, leaving 1/3rd part exposed to the environment. The cuttings were planted 10 cm apart with a row to row distance of 30 cm.

III. RESULTS AND DISCUSSION

3.1 Shoot number

It was evident from the data presented in Table 4.1 that the growth regulators significantly affected the shoot number. After 90 days of planting, the maximum number of shoots was registered from the cuttings treated with IBA at 1000 ppm followed by IBA at 500 ppm with 4.96 and 4.1 respectively. After 120 days of planting, the maximum number of shoots (7.50) was observed from the cuttings treated with IBA at 1000 ppm and the minimum number of shoots (4.36) was observed in control. It might be due to vigorous root system which increases the nutrient uptake. This affects the cell division in the cambium and cell expansion resulting in increase in number of shoots. Similar work was carried out by Baghel *et al* [4] on different IBA concentrations and time of air layering on rooting and success of air layers in guava and found that the maximum number of sprouts was recorded in 1000 ppm IBA. Kaur and Kaur [5] also revealed that IBA @ 1000 ppm and PHB @ 750 ppm show maximum number of shoots (7.71) per cutting while studying on pomegranate.

3.2 Average stem diameter

The data related to the stem diameter was significantly affected by the different concentrations of IBA as shown in Table 4.1. After 90 days of planting, maximum stem diameter (1.43 cm) was observed in IBA @ 1000 ppm and the minimum (0.57 cm) was observed in control. After 120 days of planting, the 1000 ppm IBA shows maximum stem diameter followed by 500 ppm IBA with 2.00 cm and 1.88 cm respectively. The minimum stem diameter (0.81 cm) was shown by control. The increase in diameter was due to higher cell activity, more synthesized food material and photosynthesis. Similar trend was observed by Singh [1] on Pomegranate cv. Ganesh hardwood cuttings and found the maximum average sprout diameter (3 mm) under the treatment 5 $g.L^{-1}$ of IBA. Also Singh *et al* [6] examined the stem cutting of Mulberry under mist house conditions and concluded that the IBA at 2000 $mg.L^{-1}$ shows maximum average stem diameter (2.67 mm).

3.3 Leaf number

From the Table 4.1, The result revealed that the after 90 days of planting, the IBA at 1000 ppm gives maximum number of leaf (82) followed by IBA at 500 ppm and the minimum leaf number (37) was given by control. After 120 days of planting, the maximum number of leaf shown by IBA at 1000 ppm followed by IBA at 50 ppm with 137 and 76 respectively and minimum (51) was shown by control. The appropriate planting time, application of IBA as well as genetic makeup of genotype use may have played role in increasing the number of leaves. Similar findings were given by Kassahun and Mekonnen [7] on asexual propagation of Stevia and revealed that the IBA and top part of cutting shows maximum number of leaves i.e. 7.16 and 8.22 respectively. Rahman *et al* [8] examined the shoots of litchi and concluded that the layers treated with 2500 ppm of IBA shows maximum number of leaves (10.65).

3.4 Roots number per cutting

Exogenous auxin treatment has been reported to increase the number of roots in the basal parts of cuttings, which led to increased rooting and root number. After 90 days of planting the higher number of roots per cutting (15.4) was found with IBA 1000 ppm followed by (13.8) with IBA 500 ppm. Control had minimum number of roots per cutting (3.7) as presented in Table 4.2. After 120 days of planting, the higher number of roots per cutting (19.6) was found with IBA 1000 ppm followed by (15.1) with IBA 500 ppm. Control had minimum number of roots per cutting (5.4). Similar observations were recorded by Ullah *et al* [9] on the optimization of Auxin (IBA and NAA) required for the regeneration of Marigold and observed that among the IBA doses, 400 ppm has maximum effect on roots per plant (84.4). Tomar and Tomar [10] found that IBA at 2000 ppm shows maximum number of primary roots (37.29) while studying the pomegranate.

3.5 Root length

From the data given in Table 4.2, After 90 days of planting, maximum root length (5.3 cm) was observed in IBA at 1000 ppm while lowest root length (1.52 cm) was observed in control. After 120 days of planting, maximum root length (7.5 cm) was observed in IBA at 1000 ppm while lowest root length (3.08 cm) was observed in control. Evidence suggests that the auxin might have increased rooting and length of roots (Kaur and Kaur, [5]). Dawa *et al* [11] found the similar results while studying on different genotypes of rose that the *Rosa banksiae* at 1000 ppm IBA gives higher root length (8.6 cm) when compared with others. Also Polat and Caliskan [2]

concluded that 31 N 01 type when compared to others gave more favorable results in term of root length (15.60 cm) when treated with IBA at 1000 ppm.

3.6 Root weight

The data (Table 4.2) regarding root weight influenced by the treatment of IBA indicated that the maximum root weight (0.82 g) was found in IBA 1000 ppm followed by IBA 500 ppm and minimum (0.51 g) was found in control after 90 days of planting. After 120 days of planting, the maximum root weight (1.9 g) was found in IBA 1000 ppm followed by (1.6 g) IBA 500 ppm and minimum (0.8 g) was found in control. Maximum root weight was due to the fact that auxin is for initiation and growth of roots. This might also be due to the reserved food in the cuttings. Similar results were drawn by Rajkumar *et al* [12] on the efficacy of growing medium for root and shoot development in stem cuttings of pomegranate cv. '*Phule Arakta*' and revealed that the highest fresh root weight (1.35 g) was recorded in the treatment IBA @ 2500 ppm with vermiculite.

IV. OBSERVATIONS AND TABLES

Table 4.1: Effect of IBA on the Shoot number per cutting, average stem diameter and leaf number of pomegranate cuttings after 90 and 120 days of planting

Treatments (IBA)	Shoot number per cutting		Average stem diameter (cm)		Leaf number	
	After 90 days	After 120 days	After 90 days	After 120 days	After 90 days	After 120 days
IBA (100 ppm)	3.41	4.77	0.66	1.12	49.00	71.00
IBA (500 ppm)	4.10	6.23	0.85	1.88	55.00	76.00
IBA (1000 ppm)	4.94	7.50	1.43	2.00	82.00	137.00
Control	3.12	4.36	0.57	0.81	37.00	51.00

Table 4.2: Effect of IBA on the roots number per cutting, root length and root weight of pomegranate cuttings after 90 and 120 days of planting

Treatments (IBA)	Roots number per cutting		Root length (cm)		Root weight (g)	
	After 90 days	After 120 days	After 90 days	After 120 days	After 90 days	After 120 days
IBA (100 ppm)	6.40	10.90	2.60	4.59	0.54	1.00
IBA (500 ppm)	13.80	15.10	3.10	6.57	0.67	1.60
IBA (1000 ppm)	15.40	19.60	5.30	7.50	0.82	1.90
Control	3.70	5.40	1.52	3.08	0.51	0.80

V. CONCLUSION

Among the various concentrations of IBA, it was found that the IBA at 1000 ppm was effectively in increasing the shoot number per cutting, average stem diameter, leaf number, roots number per cutting, root length and root weight. From the overall results, it was concluded that the increasing dose of IBA was positively affecting the vegetative and rooting parameters of pomegranate cuttings.

REFERENCES

[1] K. K. Singh, Effect of IBA concentrations on the rooting of pomegranate (*Punica granatum* L.) cv. Ganesh hardwood cuttings under mist house condition, *Plant Archives, 14(2),* 2014, 1111-1114.

[2] A. A. Polat and O. Caliskan, Effect of IBA on the rooting of cutting in various pomegranate genotypes, *Acta Horticulturae, 818,* 2009, 187-192.

[3] S. Kaur, A. Kaur, and G. Kaur, Effect of IBA, PHB and time of planting on rooting of pomegranate (*Punica granatum* L.) cuttings cv. Ganesh, *Asian Journal of Science and Technology, 7(11),* 2016, 3757-3761.

[4] M. Baghel, U. A. Raut, and V. Ramteke, Effect of IBA concentrations and time of air layering in Guava cv. L-49, *Research Journal of Agricultural Sciences, 7(1),* 2016, 117-120.

[5] S. Kaur, and A. Kaur, Effect of IBA and PHB on rooting of pomegranate (*Punica granatum* L.) cuttings cv. Ganesh, *Biological Forum, 8(2),* 2016, 203-206.

[6] K. K. Singh, T. Choudhary, and A. Kumar, Effect of various concentrations of IBA and NAA on the rooting of stem cuttings of Mulberry (*Morus alba* L.) under mist house condition in Garhwal hill region, *Indian Journal of Hill Farming, 27(1),* 2014, 125-131.

[7] B. M. Kassahun, and S. A. Mekonnen, Effect of cutting position and rooting hormone on propagation ability of Stevia (*Stevia rebaudiana* Bertoni), *The African Journal of Plant Science and Biotechnology, 6(1),* 2012, 5-8.

[8] N. Rahman, I. Hussain, M. Imran, T. Jan, and A. A. Awan, Effect of different concentrations of IBA on rooting of litchi (*Litchi chinensis*) in air layering, *Pakistan Journal of Biological Sciences, 3(2),* 2000, 330-331.

[9] Z. Ullah, S. J. Abbas, N. Naeem, G. Lutfullah, T. Malik, M. A. U. Khan, and I. Khan, Effect of indole butyric acid (IBA) and naphthalene acetic acid (NAA) plant growth regulators on Marigold (*Tagetes erecta* L.), *African Journal of Agricultural Research, 8(29),* 2013, 4015-4019.

[10] K. S. Tomar, and S. S. Tomar, Effect of different dosage of growth regulators on rooting and survival percentage of pomegranate (*Punica granatum* L.) air layers, *Green Farming, 3(6),* 2012, 701-703.

[11] S. Dawa, Z. A. Rather, P. Tundup, and T. Tamchos, Effect of growth regulators and growth media on rooting of semi hardwood cuttings of Rose Root Stocks, *International Journal of Current Microbiology and Applied Sciences, 6(4),* 2017, 1042-1052.

[12] Rajkumar, J. S. Gora, R. Kumar, A. Singh, A. Kumar, and Gajender, Establishment survival and growth of pomegranate cuttings with different concentrations of indole butyric acid and rooting substrates, *Ecology Environment and Conservation, 22,* 2016, S321- S327.