DOI: 10.15740/HAS/AU/12.TECHSEAR(1)2017/88-91
Agriculture Update
Volume **12** | TECHSEAR-1 | 2017 | 88-91
Visit us : *www.researchjournal.co.in*
e ISSN-0976-6847

RESEARCH ARTICLE :

Effect of NAA and IBA on stem cuttings of rose

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ARTICLE CHRONICLE :
Received :
05.07.2017;
Accepted :
22.07.2017

SUMMARY : A shade net experiment was conducted in Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu during 2016 – 2017 with an objectiveof determine the rose cuttings response to Auxins *i.e.* Indole butyric acid (IBA) and Naphthalene Acetic Acid (NAA) at 0, 500, 1000, 1500 and 2000 ppm concentrations in growing media. Both had a significant effect on all sprouting and growth parameters. Maximum bud sprouting (78.8 %), days to sprout (6), number of leaves / plant (10), chlorophyll index (39.3 mg/g) in rose cuttings were recorded at 1500 ppm of IBA (T_3). The optimum level of IBA was found in the range of 1000 and 1500 ppm, while no such effect was evident of NAA. Of these, IBA was superior to NAA for its strongsynergistic effect on all growth parameters.

How to cite this article : Krishnamoorthy, C., Shree, B. Subha and Suvetha, B. (2017). Effect of NAA and IBA on stem cuttings of rose. *Agric. Update*, **12**(TECHSEAR-1) **: 88-91; DOI: 10.15740/HAS/AU/12.TECHSEAR(1)2017/88-91.**

KEY WORDS :
Rose, Cuttings, IBA, NAA, Growth parameters

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BACKGROUND AND OBJECTIVES

Rose, the queen of flowers, is favoured for its beauty and many other uses like production of petals, making rose oil (*Attar*), rose water, rose wine, rose marmalade (*Gulkand*), rose jam, rose crystallized petals, rose honey, extraction of perfumes, extraction of vitamin C from hips, for medicinal uses and for sale as cut flowers (Khan *et al*., 2004). In agriculture the production of plant species through sexual as well as vegetative means is of prime importance to continuity of generation.

Most of the plant species perpetuate through sexual method of propagation, which is easy and plays a vital role in the development of new species that are best suited to the changing environment. Each individual resulting from sexual reproduction usually has a unique combination of genes. There are scores of plant species that are not only hard to be propagated sexually but also show complexities and produce undesirable characters if propagated through sexual means (Lidwien *et al*., 2006 and Uma and Gowda, 2007). Vegetative propagation therefore, is the most vital and sole method to reproduce these plant species still having desirable characters (Sun and Chen, 1998). These plant species are propagated true to type from somatic cells through cutting, budding, grafting, layering etc. Among these the use of stem cuttings is the most easy and common method for growing roses (Anderson and Woods, 1999 and Costa and Challa, 2008).

The establishment and growth rate of cutting dependsupon many factors like season of cutting, age and portion of the branch, growth media, moisture and nutrient status.

Keisling and Kester (1979) concluded that poor rooting of the cutting has been attributed to marginal condition of growing media. Provision of optimal growing conditions and proper timing may enhance the establishment and growth of cutting (Chate *et al*., 2000). In addition, the use of plant growth regulators also plays a pivotal role in influencing different plant processes comprising mostly of growth, differentiation and development e.g. rooting of cutting, root growth, flowering, aging, prevention or promotion of stem elongation, color enhancement of fruit etc. (Hobbie, 1998). Therefore, many kinds of chemicals have been used with the aim to induce root formation in species which are difficult to propagate or increase the number and extent of roots in others that develop slowly.

Synthetic root promoting chemicals that have been found most reliable in stimulating adventitious root production in cuttings are the auxins *i.e*. Indole 3 acetic acid (IAA), Naphthalene acetic acid (NAA) and Indole butyric acid (IBA) (Arteca, 1996). These chemicals are available in commercial preparations, like talc or concentrated liquid formulations and can be diluted with water to the proper strength.Keeping in view the role of plant growth regulators,Indole butyric acid (IBA) and Naphthalene acetic acid (NAA) were taken to evaluate their effect on the growth in rose cuttings.

RESOURCES AND METHODS

The research study was conducted at Vanavarayar Institute of Agriculture, Pollachi, Tamil Nadu during 2016–2017 with an objective to determine the rose cuttings response to growth regulators.

The growth regulators were prepared in ethylated distilled water at the rate of 500, 1000, 1500 and 2000 ppm according to the formula (Aslam Khan *et al*., 2009), along with control (distilled water only).Polythene bags (5 x 15 cm^2) were filled up with 650 geach of the growing media (Red soil: Sand: FYM - 2:1:1). Beforeinitiating the experiment growing media was analyzed for their physico-chemical characteristics.The experiment was laid out in Randomized Complete Block Design (RCBD) with nine treatments and replicated thrice. The treatments are T_0 - Control, T_1 - 500 ppm IBA, T_2 - 1000 ppm IBA, T_3 - 1500 ppm IBA, T_4 - 2000 ppm IBA, T_5 - 500 ppm NAA, T_6 - 1000 ppm NAA, T_7 - 1500 ppm NAA, T_8 - 2000 ppm NAA.

Diseases free uniform semi-hardwood rosecuttings (15 cm long) were dipped in dilute solution of growth regulators using dip method at room temperature (Hartmann and Kester, 1983). After planting, the bagswere placed in 50 % shade net. Irrigation was applied using rose can during the entire period. The data was recorded on days taken tobud sprouting, bud sprouting (%), number of leaves and chlorophyll index (mg/g of fresh weight). The experimental data were statistically analyzed as per the method suggested by Panse and Sukhatme (1978). The critical difference was worked out for 5 per cent (0.05) probability.

OBSERVATIONS AND ANALYSIS

The treatments differed significantly during the various stages of observations

Days taken to bud sprouting :

This attribute was significantly affected with growth regulator application. The minimum days to sprouting (6.00) were observed in the treatments receiving 1500 ppm of IBA (Table 1). The delay in sprouting on account of growth regulator application is plausible dueto higher metabolic activity causing a greater flow of metabolites to the growing bud differentiation that prolonged the bud sprouting period while the earlier bud sprouting in control perhaps due to the direct sprouting of already differentiated buds without any further differentiation (De Vries and Dubois, 2004 and Khan *et al*., 2010).

Table 1 : Effect of growth regulators on sprouting (days)

Treatment	Days to sprout (days)
T_0 - Control	8
T_1 - 500 ppm of IBA	8
T_2 - 1000 ppm of IBA	7
T_3 - 1500 ppm of IBA	6
T_4 - 2000 ppm of IBA	8
T_5 - 500 ppm of NAA	9
T_6 - 1000 ppm of NAA	10
T_7 - 1500 ppm of NAA	11
T_8 - 2000 ppm of NAA	-
Mean	8.38
S.E.±	0.351
C.D. (P=0.05)	0.743

Sprouting percentage :

Increased concentrations of growth regulators increased this attribute significantly. The highest sprouting

percentage was recorded in IBA 1500 and 1000ppm, whilst the lowest sprouting was observed in control (Table 2). Data further revealed that the sprouting percentage continued to increase by IBA upto 2000 ppm. However in case of IBA the sprouting percentage increase at 1500 ppm and then showed a decrease at NAA 1500 ppm. The data suggested that stronger promoting effect of IBA on bud sprouting as compared to NAA was presumably due to better performance of the former in development (Younas and Riaz, 2005).

Table 2 : Effect of growth regulators on sprouting percentage

Treatments	Bud sprouts percentage (%)
T_0 - Control	38.1
T_1 - 500 ppm of IBA	64.1
T_2 - 1000 ppm of IBA	77.5
T_3 - 1500 ppm of IBA	78.8
T_4 - 2000 ppm of IBA	68.0
T_5 - 500 ppm of NAA	46.1
T_6 - 1000 ppm of NAA	49.6
T_7 - 1500 ppm of NAA	56.8
T_8 - 2000 ppm of NAA	-
Mean	59.88
S.E.±	0.586
C.D. (P=0.05)	1.242

Number of leaves per cutting :

The average number of leaves per rose cuttings gradually increased with increase in growth regulator concentration. It ranged from 5.00 to 7.00 but significantly the maximum number of leaves (10.00) was recorded when the cuttings were treated with IBA 1500ppm (Table 3). It was followed by the treatment IBA at 1000 ppm (8.00). The control treatments significantly produced the lowest number of leaves (4.00). Increase in leaf number may be due to their significant effect on inducing vigorous rooting system by growth regulators thus enabling the cuttings to absorb more nutrients thereby producing more leaves as reported by Rahman and Ishtiaq (1996) and Stancato *et al.* (2003).

Table 3 : Effect of growth regulators on number of leaves

Treatments	Number of leaves / cutting (nos.)
T_0 - Control	4
T_1 - 500 ppm of IBA	7
T_2 - 1000 ppm of IBA	8
T_3 - 1500 ppm of IBA	10
T_4 - 2000 ppm of IBA	4
T_5 - 500 ppm of NAA	4
T_6 - 1000 ppm of NAA	4
T_7 - 1500 ppm of NAA	6
T_8 - 2000 ppm of NAA	-
Mean	5.88
S.E.±	0.816
C.D. (P=0.05)	1.731

Chlorophyll index :

The chlorophyll index was maximum in the 1500ppm of IBA (39.3) followed by 1500 ppm of NAA (38.4) (Table 4). The leaf chlorophyll content which is the key factor in determining the rateof photosynthesis is also considered as an index of the metabolic efficiency of plants. This pigment, responsible for harnessing solar energy and converting it into chemical energy, exhibits a differential pattern in its accumulation in response to nutrients (Farzad Nazari *et al.*, 2009 and Karthik, 2011).

Table 4 : Effect of growth regulators on chlorophyll index

Treatments	Chlorophyll index (mg/g)
T_0 - Control	31.4
T_1 - 500 ppm of IBA	27.2
T_2 - 1000 ppm of IBA	35.1
T_3 - 1500 ppm of IBA	39.3
T_4 - 2000 ppm of IBA	34.5
T_5 - 500 ppm of NAA	26.5
T_6 - 1000 ppm of NAA	37.2
T_7 - 1500 ppm of NAA	38.4
T_8 - 2000 ppm of NAA	-
Mean	33.7
S.E. ±	0.427
C.D. (P=0.05)	0.906

Conclusion :

Application of both growth regulators and growing media had a significant effect on the growth and development parameters of rose cuttings. IBA had more strong beneficial effect than NAA on root growth and development. Dipping the cuttings in IBA at1500 ppm shows better performance in days to sprout, bud sprouts percentage, number of leaves plant^{-1} and chlorophyll index.

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