J Agric. Res., 2019, Vol. 57(2):105-107
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Agriculture Department
Government of Punjab

HORTICULTURE

IMPACT OF VARIOUS LEVELS OF GROWTH REGULATOR (IBA) ON ROOTING OF LITCHI (*LITCHI CHINENSIS SONN.*) IN AIR LAYERING

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ABSTRACT

An experiment was conducted at Horticultural Research Institute, Ayub Agricultural Research Institute, Faisalabad over two years (2014-2016) for standardization of clonal propagation technique in litchi (*Litchi chinensis* Sonn) Application of different levels (0, 1500, 2500 and 3500 ppm) of IBA (indole butyric acid) were applied on litchi (cv. Bedana) during the month of July to enhance rooting in air layering, and produce true-to-type nursery plants. The results showed that maximum number of roots (17.00) were counted in trees where IBA @ 2500 ppm was applied while in control the roots remained at 10.00. Number of leaves corresponding different treatments indicated that IBA @ 2500ppm produce (31.75) as compared to 6.25 leaves in untreated trees. The length of sprouts was found maximum (70.5cm) in trees treated with 2500ppm IBA air layering branches and 31.75cm in case of control. The study produced encouraging results to employ this technique of air layering with 2500ppm IBA application for commercial production of nursery plants and ensuring varietal/cultivar purity.

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Article received on: 06/11/2017

KEYWORDS: *Litchi Chinensis* Sonn; Litchi; air layering; IBA pedigreed plant; Pakistan.

INTRODUCTION

Litchi (*Litchi chinensis* Sonn.) is one of the emerging subtropical fruit crop in Pakistan due to its high income per unit area and desirable taste. It was introduced in Pakistan during 1932 by Sardar Faqir. Punjab is producing approximately 1644 tons of good quality fruit out of an area of 274 ha. It has tremendous health benefits having high Vitamin C (71 mg/100g) and various mineral substances prominently potassium. Litchi accounts for 2.5 times more income than any other fruit crop (Khushk and Leghari, 2006). It remained un-noticed due to the slow growing nature and long precocity (Rajwana *et al.,* 2010). Unavailability of an easy and reliable propagation method is an immense limiting factor in large scale cultivation of litchi. It is a cross pollinated plant, due to its heterozygous behavior; plants produced by seeds are not true to parental type. So its propagation through seed is not recommended. Litchi can be multiplied sexually but owing to disadvantages of seedling plants, it is chiefly propagated through vegetative means. The absence of easy and reliable clonal propagation method limits large scale cultivation of promising varieties and use of modern techniques like micro propagation has not proved very successful in litchi (Amin *et al.,* 1996). In Punjab litchi is being propagated through seeds and only a few nurseries which have their own mother blocks, are producing plants through air layering. Additionally, sexual propagation method do not authorize the superior characteristics of clone such as disease tolerance (viral, fungal or bacterial), adaptability to unpredictable agro-ecological conditions, management of tree growth, fruiting and enhanced effect of certain rootstock on scion. Vegetative propagation is, thus the only best way to produce true to type plants in litchi. (Hackeet, 1998).

Air layering method is effective in propagating plants because the layered branch is not detached from the mother plant and, receives continuous supply of water and mineral nutrients through the xylem and remains alive (Hartmann *et al.,* 2010). Due to harsh climate of Punjab the success rate of the air layering in litchi is low. Exogenous application of auxin-type (IBA, NAA) growth regulators can accelerate the root development in air layers of litchi (Hackeet, 1998; Ram and Majumder, 1993; Rehman *et al.,* 2000; Naz and Aslam, 2003). Auxins stimulate meristematic differentiation, and along this, their growth adds to the form of root callus in the girdling zone of the branch (Tchoundjeu *et al.,* 2002).

Use of root promoting substances in layering of litchi facilitates to get profuse rooting and IBA is more effective growth regulator (Nanda and Kochar 1985). In order to find out optimum dose of IBA for air layering in litchi, this study was carried out for minimizing the mortality and promoting better growth of litchi layers to

produce maximum numbers of true to type plants.

The objective of this study was to evaluate some suitable concentration of indole-3-butyric acid (IBA) for producing true to type plants of litchi in short period of time employing air layering method of propagation.

MATERIALS AND METHODS

The study was conducted in the fruit orchard at the Horticultural Research Institute, Ayub Agricultural Research Institute, Faisalabad during the year 2014-2016 . The geographical attributes of trial site in terms of latitude, longitude and elevation were 31.42° N, 73.09°E and 189 m respectively. Soil of the experimental farm was loamy, having pH 8.1 (alkaline), organic carbon 0.86 %, available phosphorus 8.1 ppm and potash 200 ppm.

Vigorous disease free mother plants of litchi cultivar ''Bedana'' were selected for air layering operation. Layering was carried out during the month of July and August for which at least 100 uniform, semi hard wood twigs were selected from all directions on healthy trees. Air layering was carried out by giving the circular rings of 3-4cm wide by removing the bark on twigs. Semi hard wood cuttings were treated with IBA solution @ 0 ppm (control), 1500 ppm, 2500 ppm, and 3500 ppm. For the preparation of IBA a stock solution was prepared and then different concentrations were made according to treatments by dissolving IBA in distil water. The IBA solution was applied on the removed cambium of twigs with the help of sterilized cotton during the layering operation. The cotton pieces were soaked in IBA solutions of different concentrations and placed them around the portion of twigs where the bark was removed. After application of IBA a media (clay, silt and compost at 1:1:1) was wrapped around the peeled surface and further covered with polythene sheet. Both the ends of polythene were tied tightly to minimize the loss of moisture through evaporation. After formation of roots (approximately 75 days later) the layered branches were cut off from mother plant and shifted in the lath house for acclimatization.

The temperature was measured through thermometer (AZ-8801) while humidity was recorded by hygrometer (C3-4154). The survival percentage and number of roots were counted after two months of transplanting in lath house. Length of sprouting was measured with the measuring tape. Experiment was arranged Randomized Complete Block Design (RCBD) having four treatments which were replicated thrice. In each treatment, 100 branches were air layered. Data were evaluated statistically via Fishers analysis of variance and treatments were compared by using the least significant difference (LSD) test at 5% probability level.

RESULTS AND DISCUSSION

The data presented in (Table 1) maximum success percentage (80%) was observed showed that maximum success percentage (80%) was received in the twigs treated with 2500 ppm of IBA @ followed by 60 % success in twigs treated with IBA 3500 ppm. Usually higher dose of root promoting hormone inhibits the sprouting of initials. Which happened truly in this experiment. Minimum success percentage (35 %) was observed in twigs where no IBA was applied (control). These findings are similar to the results obtained earlier (Manan *et al.,* 2002), whose cuttings treated with IBA at 1000 ppm gave 37% success and control showed 17.5% success. The results are also in agreement with the findings of (Abdullah *et al.,* 2006) who observed that highest rooting percentage (60%) was noted when applied 0.4% IBA solution followed by 0.2% IBA and the least was in controlled cuttings.

Data on number of leaves after 60 days of transplanting in lath house were also recorded. Maximum number of leaves (31.50) were observed in the shoots treated with IBA @ 2500 ppm. Shoots treated with IBA @ 1500 ppm produced 16.25 number of leaves while least number of leaves (6.25) were observed in the shoots retained as control. These results are supported by the findings of Wahab *et al.* (2001) who stated significantly higher number of leaves per cutting in IAA at 3000 ppm while the least number of leaves per cutting were found in IAA @ 4000 ppm and IBA @ 2000ppm concentrations. Hackett (1988) also described that highest number of leaves (10.20) were observed, in soft wood cuttings treated with 1000 ppm IBA.

Table 1. Effect of different levels of IBA on Success%, number of leaves, Length of sprouts and number of roots (average of two data)

IBA (ppm)	Success (%)	No. of leaves	Length of sprouts (cm)	No. of roots
Control	35.00d	6.25 d	31.75 d	10.50 c
1500 ppm	45.00 c	16.25 b	47.00 b	12.25 b
2500 ppm	80.00 a	31.50 a	70.50 a	17.00 a
3500 ppm	60.00 c	10.50 c	35.50 c	11.75bc

Means not sharing the same letter(s) within each column for each do not differ significantly at 0.05% level probability.

Maximum sprout length (70.50 cm) was recorded in the twigs treated with IBA at 2500 ppm and was significantly higher than control. Minimum sprout length (31.75 cm) was measured in the control. The present findings

also bear resemblance with the observations made by Hafeez *et al. 1988* and Khattak *et al.* 1983. From the data it is clear that different concentrations of IBA significantly affected number of roots. Highest number of roots (17.00) was noted in the twigs where 2500 ppm of IBA was applied while least number of roots (10.50) was found in the branches kept as control. The results are in conformity with those of (Wahab *et al.,* 2001) and also supported by the conclusions of (Rehman *et al.,* 2000) who observed that IBA treatments result in profuse rooting.

CONCLUSION

Although the studies remained confined to the Bedana cv. of litchi however the effort have opened a new line to litchi to initiating rooting from air layering using growth regulators of IBA for other rapid multiplication of different varieties of litchi.

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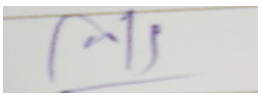
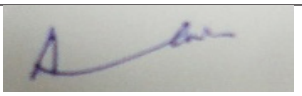
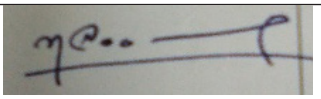
CONTRIBUTION OF AUTHORS

S. No.	Author name	Contribution	Signature
1.	Malik Mohsin Abbas	Conducted experiment, make concertration of IBA, sprayed on litchi blocks and wrote research paper	
2.	Muhammad Maaz Aziz	Performed analysis, applied statistical design, wrote material and method of paper and do analysis of the varieties	
3.	Muhammad Ishfaq	Managed the litchi field and wrote result of paper	
4.	Amina	Performed analysis, applied statistical design, wrote introduction of paper and interpret the results