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"Effect of plant growth regulators on rooting and survival of Litchi (Litchi chinensis) Air Layers"

Bhuriya Verma*, Shushant Kumar Kaushik, Rampal rajak, Ajay kumar jatav and Prahalad Singh Yadav

Faculty of Agriculture, P.K. University, Shivpuri, Madhya Pradesh, India

A B S T R A C T

The present investigation entitled "Effect of plant growth regulators on Rooting and survival of Litchi (Litchi chinensis) Air Layers." The experiment was conducted at the Agriculture Farm, Faculty of Agriculture, P.K. University Shivpuri (M.P.) during the session 2021 - 2022. The experiment was laid out in Randomized Block Design (RBD) with 12 treatment combinations consisting of three level of IBA, Po - 0 ppm (Control), P1- 4,000 ppm IBA, P2 - 8,000 ppm IBA, P3-12,000 ppm IBA and three level of NAA, T0 - 0 ppm (Control), T1- 4,000 ppm NAA, T2 - 8,000 ppm NAA, T3 - 12,000 ppm NAA. Maximum rooting and its growth parameters were found significantly superior under the treatment of P3 (12,000 ppm IBA) followed by treatment P2 and P1 and for NAA treatments, treatment T3 - 12,000 ppm NAA was observed significantly higher followed by T2 - 8,000 ppm NAA in all the parameters. Interaction of P3T3 was also find out better than all the treatments, callus formation, number of primary roots/ air-layer, length of primary roots, diameter of primary roots, number of secondary roots / layer, length of secondary roots, diameter of secondary roots, fresh weight of roots/ air-layer, success in rooting percentage.

Key words: IBA, NAA, Litchi and Rooting

Introduction

Litchi (*Litchi chinensis*) is known as a queen of fruits. Litchi has a special position among fruit crops due to its excellent quality, pleasant flavour and attractive colour. Fruit is a single seeded nut and rich sources of Vitamin B2 Calcium and minerals having excellent flavour. Edible portion of litchi is fleshy aril. Litchi belongs to the family Sapindaceae and is closely related to fruit like Longan and Rambutan. In litchi production, India is second largest producer only next to China in spite of these; this crop is native to south China. In India litchi is grown mainly in the eastern part of the country. Bihar offers the most salubrious climate to grow this luscious fruit and has monopoly in litchi production in India. Bihar contributes about 74 percent of litchi production in India (Indian Horticulture database, 2002). In Bihar it is extensively cultivated in Muzaffarpur, Samastipur, Dharbhanga and Bhagalpur region. Besides Bihar it is cultivated in U.P., Assam and West Bengal. Litchi can be propagated by seed and vegetatively by air layering. Air layering is a commercial method of vegetative or asexual propagation (Bhambota *et al.*, 1968). In vegetative propagation bio-regulators like IBA and NAA play very important role in enhancing rooting percentage (Ram and Majumder, 1983; The use of plant growth regulators especially indole-3- butyric acid (IBA), naphthalene acetic acid (NAA) etc. have been advocated for accelerating rooting in litchi layers (Ram and Majumder, 1983). Nanda and Kochhar (1985) reported the application of root promoting substances during layering to get profuse rooting within a short time period and IBA has been found most effective. However, more information regarding use of growth regulators, ways to overcome higher mortality rate and improving the survival rate of litchi air layers needs to be generated. Air layering is only best and commercial propagation method for litchi mass multiplication has an advantage over budding and grafting because, being on its own root the suckering problem is minimized and for stem cutting it require specialized environment conditions such as mist propagation beds (Nelson 1954).

Air layering is practiced during the month of June- July with good success rates due to the relatively low temperature (23˚ C to 31˚ C), high relative humidity (80 to 90 %) and rainfall which provides the conductive environment for the root initiation (Ahmed, 1964). Layers prepared during these months get an additional advantage of longer duration of a favorable season for establishing the layer in the soil after preparation. The percentage of establishment and survival of rooted layers is reported to be poor, mainly due to hormonal imbalance and non-availability of standardized rooting media (Singh, 2002). Air layering with the help of plant growth regulators and rooting media is reported to stimulate root primordial in the air layers (Tyagi and Patel, 2004).

Materials and Methods

The experiment entitled "**Effect of plant growth regulators on Rooting and survival of Litchi (Litchi chinensis) Air Layers***"* was carried out, during *Kharif* season of 2021-22 at the Agriculture Farm, Faculty of Agriculture, P.K. University Shivpuri (M.P.)- 473665 during the year 2021 - 2022. The climate of bundelkhand region is hot and semi-humid where maximum temperature exceeds 45˚ C in May and June. The winters are cool and minimum temperature reaches as low as 5˚C in December and January; occurrence of frost is expected from the last week of December to the first week of February. Usually the monsoon arrives in the second fortnight of June and lasts till September. Occasionally light rains are expected during winter. The annual rainfall ranges between 650 to 751 mm, most of which received from end of June to end of September. Drought is the common feature due to the scanty and uneven distribution of rainfall. The total of 467 mm rainfall was received during the experimental period. In the present investigation ten healthy branches were selected under each treatment and replicated four times to form the Asymmetrical Factorial Randomized Block Design with12 treatments and 48 plants of litchi of uniform vigour and size were selected and about 1- 1.5 years old healthy branches of pencil thickness were selected for air-layering. The length of branches was 45-60 cm and diameter 1 mm approximately, 25 air-layers under each treatment and 1200 under the whole experiment were operated. The growth regulators were prepared in talcum powder base. First of all IBA and NAA with 4,000 ppm strength was prepared. 0.4 gm of growth regulators was weighed on electrical balance and then dissolved in about 10.00 cc absolute alcohol. This solution was then thoroughly mixed with 99.5 gm of talcum powder, IBA and NAA with 8,000 ppm strength was prepared. 0.8 gm of growth regulators was weighed on electrical balance and then dissolved in about 10.00 cc absolute alcohol. This solution was thoroughly mixed with 99 gm of talcum powder and IBA and NAA with 12,000 PPM strength was prepared. 1.2 gm of growth regulators was weight on electrical balance and then dissolved in about 10.00cc absolute alcohol (Table 1). The solution was then thoroughly mixed with 98.5 gm of talcum powder. For all treatment same rooting media were used which were prepared with (1:1) Soil+ FYM and white colour polythene wrapper was used at the time of operation. After 60 days from the date of air layering prepared, air-layers were detached by making a cut just below the lowest end of the ringed surface with sharp secateurs. The air layers were brought under shade after detachment and their polythene covers were removed gently. Care was taken to ensure that the roots were not injured at the time of removing polythene wrapper. After this, rooted air-layers were planted in polythene bags containing mixture of soil + FYM + leaf mould (2:1:1).

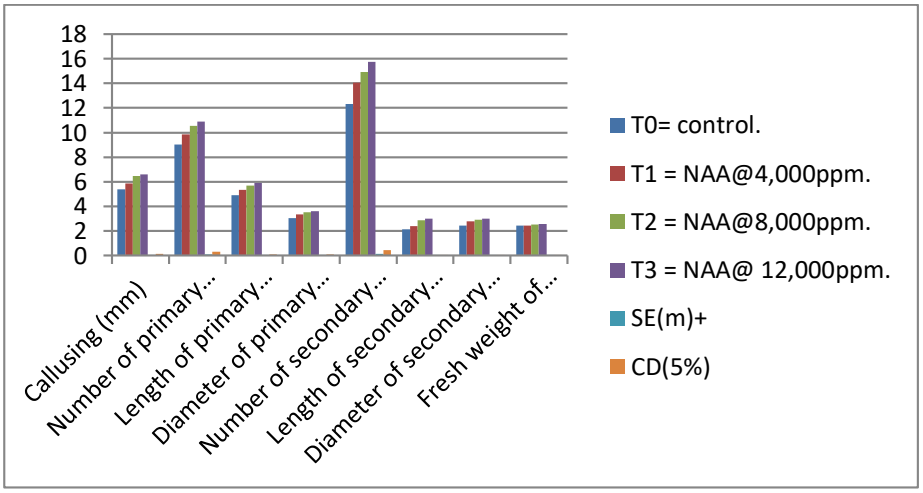
Results and Discussion

The data pertaining to callusing and root characters were recorded and statistically analyzed. The results are presented in **Table-1,** clearly shows that different concentrations combinations of IBA and NAA had significant effect on callusing and root characters.

Effect of NAA on callusing and Root Character of Litchi air layering

The data pertaining to naphthalene acetic acid (NAA) the maximum or higher callus formation **(6.61 mm)**, number of primary **(10.88)** and secondary roots **(15.75),** length of primary **(5.90 cm)** and secondary roots **(3.02),** diameter of primary **(3.60mm)** and secondary roots **(2.99mm),** fresh weight of roots **(1.29gm)** per air-layer were significantly recorded with the treatment T3 (12,000 ppm NAA) followed by T2 and T1 and it might be due to different and suitable concentration of NAA. The present results are closely related with the findings of Bhagat *et al.,* Rajput and Senjaliya (2015)and Sinish *et al.,* (2005) in citrus, and Singh *et al.,* (2007), Maurya *et al.,* (2012) and Rymbai *et al.,* (2012) in guava.

Figure-1 Effect of different concentration of NAA on Callusing and Root character studies



Effect of IBA on callusing and Root Character of Litchi air layering

In respect to indole 3-butyric acid (IBA), the maximum or higher callus formation **(6.94mm),** number of primary **(11.11)** and secondary roots **(15.76),** length of primary **(6.19cm)** and secondary roots **(2.84 cm),** diameter of primary **(3.18 mm)** and secondary roots **(2.21mm),** fresh weight of roots **(1.89gm)** per air-layer were significantly recorded with the treatment P3 (IBA 12,000 ppm). The present results are closely related with the findings Rathore (1982), Bhagat *et al.*, (1999), Das and Prasad (2014) Manga *at el.*, (2017).

Figure-2 Effect of different concentration of IBA on Callusing and Root character studies

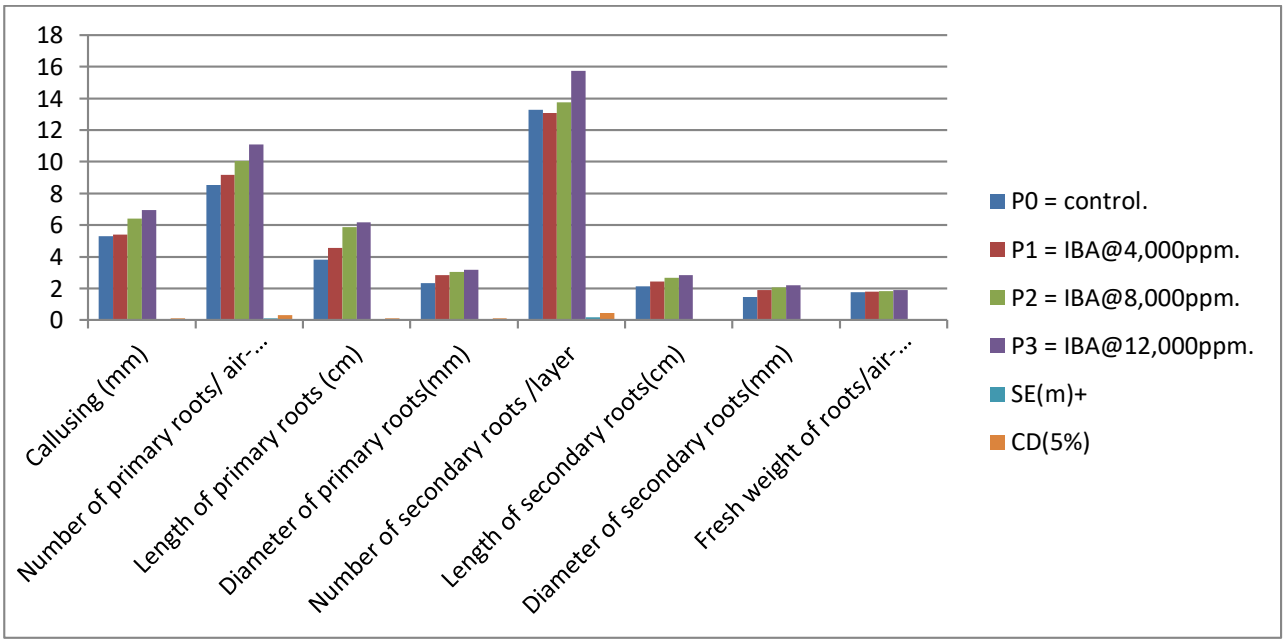


Table -1 Effect of different concentration combination of IBA and NAA on Callusing and Root character studies

Treat.	Callusing (mm)	Number of primary roots/ air-layer	Length of primary roots (cm)	Diameter of primary roots(mm)	Number of secondary roots /layer	Length of secondary roots(cm)	Diameter of secondary roots(mm)	Fresh weight of roots/air-layers(gm)
T0P0	0.48	6.36	2.34	0.56	8.68	0.62	0.68	1.24
T0P1	6.36	7.73	2.95	1.34	12.43	0.87	1.03	1.29
T0P2	7.73	8.23	3.34	1.62	13.31	1.44	1.19	1.37
T0P3	8.23	8.61	3.46	1.74	14.68	1.51	1.27	1.41
T1P0	8.61	6.23	3.22	1.60	8.93	0.94	1.23	1.32
T1P1	6.23	8.16	3.69	1.79	11.98	1.03	1.47	1.34
T1P2	8.16	9.23	3.88	1.93	13.18	1.71	1.58	1.41
T1P3	9.23	9.98	4.30	1.97	14.18	1.93	1.69	1.44
T2P0	9.98	8.98	4.44	1.84	12.43	1.22	1.29	1.35
T2P1	8.98	8.73	5.03	1.89	12.18	1.51	1.63	1.42
T2P2	8.73	9.48	5.38	2.14	13.18	1.83	1.74	1.45
T2P3	9.48	9.86	5.42	2.25	13.18	2.02	1.85	1.48
T3P0	9.86	9.98	5.06	2.01	14.06	1.26	1.43	1.41
T3P1	9.98	10.23	5.12	2.18	14.43	1.75	1.83	1.43
T3P2	10.23	10.61	5.58	2.20	14.81	2.12	1.91	1.50
T3P3	10.61	10.48	5.82	2.27	15.68	2.15	2.02	1.53
SE(m)+	0.07	0.23	0.08	0.07	0.32	0.02	0.02	0.03
CD(5%)	0.20	0.63	0.22	0.21	0.92	0.06	0.04	NS

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