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RESEARCH ARTICLE

EFFECT OF VARIOUS CONCENTRATIONS OF BIO-REGULATORS AND TIME OF AIR-LAYERING ON THE MULTIPLICATION OF JACKFRUIT (*Artocarpus heterophyllus* Lam.)

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ABSTRACT

Studies was conducted to find out the effect of various concentrations of IBA, NAA (i.e. 5000, 10000, and 15000 ppm) and Keradix at four times of air-layering operations (i.e. 2-3 July, 25-26 July, 17-18 August, 9-10 September) on the rootability in jackfruit through air-layering. A critical study of present findings show that the treatment of 10000 ppm concentration of IBA was found to produce highest percentage of rooted layers (82.8 %), profuse callus formation, maximum number of primary roots (19.95), longer length of longest root (15.59 cm), thickest diameter of longest root (1.45 mm), maximum percentage of layers showing secondary roots (66.6%), higher fresh (0.924 g) and dry (0.466 g) weight of roots with higher survival percentage (71.37) of layered plants in nursery beds. The best time of air-layering was recorded 2-3 July in respect of higher percentage of rooted layers (73.78), profuse callus formation and maximum weight of fresh (0.808 gm) and dry (0.404 gm) roots, higher survival percentage of layered plants (62.83%) and percentage of plants showing new growth (62.83%), while 25-26 July time of air-layering was found better in relation to maximum number of primary roots (13.68), longest length of root (13.43 cm), diameter of longest root (1.3 mm), higher percentage of layer showing secondary rooting (26.85%), length of new growth (1.87 cm) and number of leaves on new growth (2.05).

INTRODUCTION

The jack-fruit (*Artocarpus heterophyllus* Lam.) is indigenous to India and belongs to family 'Moraceae'. It is quite important both for use as a fruit and vegetable. Tender fruit appears in the market in spring and continues until summer as a popular vegetable. Ripe fruit has high nutritive value and comparatively cheap fruit which is favoured by poor people when price of staple food is very high. It is hardly regarded as a commercial fruit crop of although it is very popular in the eastern and southern part of India. It is largest among the edible fruits, weighing sometimes up to 40 kg. each and produces highest yield per hectare also. In South India, the jackfruit is a popular food ranking next to the mango and banana in total annual production. The skin of the fruit and leaves are excellent cattle food. Jack timber is valuable for making furniture as it is rarely attacked by white ants. Government horticulturists promote the planting of jackfruit trees along highways, waterways and railway lines to add to the country's food supply (Morton, 1987). The male and female flowers of jack-fruit are borne in separate catkins. Male catkins are much more profuse and do not develop in the fruits. The fruits are mainly borne on small leafless stalks arising from the trunk and main branches of the tree. Sometimes, fruits from the underground parts of the tree are seen emerging out of the soil. Jack-fruit is universally propagated from seed, which may take 12-15 years to produce fruits and possess great variabilities. However, plant raised by vegetative means takes 5-6 years to produce fruits. In order to encourage the cultivation of jack-fruit some vegetative means of propagation is necessary to standardize. Among all methods of vegetative propagation, air layering is an easy and simple method of vegetative propagation. The present investigation has been carried out to find out the effect of bio-regulators and time of air layering on the multiplication of jack-fruit.

MATERIALS AND METHODS

The experiment consist of 36 treatment combinations of IBA and NAA having three concentrations i.e. 5000, 10000, and 15000 ppm., and Keradix at four times of air-layering operations i.e. 2-3 July, 25-26 July, 17-18 August, 9-10 September with 8 controls. The lanolin paste of 5000, 10000, and 15000 ppm was prepared by mixing 20 gm of pure lanolin in each with 100 mg, 200 mg and 300 mg of Indole-3 butyric acid and α-Naphthalene acetic acid. The Keradix was applied

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Table 1. Effect of bio-regulators, their concentrations and time of air-layering on the performance of rooting in jack-fruit

Treatments	Percentage of rooted layers	Percentage of layers showing Callus formation			Average No. of primary roots / layers	Length of the longest root in cm.	Diameter of the longest root in mm.	Percentage of layers showing secondary roots	Fresh wt of roots in gm.	Dry wt. of roots in gm.
		Profuse	Good	Poor						
5000 ppm IBA	73.50	18.75	77.08	4.17	14.08	14.09	1.37	26.05	0.814	0.406
10000 ppm IBA	82.80	68.75	31.25	0.00	19.95	15.59	1.45	66.67	0.924	0.466
15000 ppm IBA	72.34	30.21	66.67	3.13	14.93	14.07	1.38	32.29	0.838	0.418
5000 ppm NAA	67.83	12.50	63.55	23.96	12.14	13.50	1.36	14.59	0.771	0.385
10000 ppm NAA	75.00	50.00	50.00	0.00	17.58	13.52	1.35	47.92	0.874	0.428
15000 ppm NAA	71.61	12.50	77.09	10.42	12.67	12.93	1.36	10.42	0.796	0.397
Keradix	62.44	3.13	50.00	46.88	9.86	10.25	1.38	3.13	0.728	0.372
Control (Lanolin)	53.33	2.09	15.63	82.29	7.22	8.26	1.36	0.00	0.624	0.311
Control	47.97	0.00	17.71	82.29	7.09	8.19	1.38	0.00	0.609	0.308
CD at 5%	7.96	NS	NS	NS	1.51	0.67	0.07	NS	0.065	0.018
2-3rd July	73.78	25.93	49.54	24.54	13.38	13.15	1.37	24.08	0.808	0.404
25-26th July	71.36	22.69	54.63	22.69	13.68	13.43	1.40	26.85	0.799	0.397
17-18th August	55.43	21.30	47.19	31.52	12.57	11.99	1.39	19.44	0.758	0.379
9-10th September	69.13	18.06	47.69	34.26	11.71	10.51	1.34	25.93	0.736	0.368
CD at 5%	3.05	NS	NS	NS	0.89	0.45	0.04	NS	0.034	0.014

Table 2. Effect of bio-regulators, their concentrations and time of air-layering on the survival performance of rooted layers in jack-fruit

Treatment	Survival percentage of layered plants	Percentage of plants showing new growth	Length of longest new growth (cm)	Number of leaves on new growth
0 ppm IBA	60.29	60.29	1.83	1.71
10000 ppm IBA	71.37	71.37	2.16	2.50
15000 ppm IBA	57.71	57.71	1.70	1.63
5000 ppm NAA	58.57	58.57	1.47	1.23
10000 ppm NAA	60.49	60.49	1.91	2.13
15000 ppm NAA	52.01	51.99	1.40	1.38
Keradix	43.85	43.85	1.33	1.48
Control (Lanolin)	24.58	24.58	0.64	0.67
Control	29.05	29.05	0.57	0.56
2-3rd July	62.83	62.83	1.51	1.61
25-26th July	61.71	61.71	1.87	2.05
17-18th August	49.04	49.04	1.32	1.51
9-10th September	30.5	30.5	0.86	1.92

directly. Two years old well developed healthy shoots of light brown colour were selected for air-layering. The approximate lengths of the selected shoots were 35 cm. with a diameter of 1 cm. A ring of bark of about 2.5 cm. was removed from the branch. The upper cut in the bark was given just below the bud and applied with different concentrations of bio-regulators. Thereafter it was covered with the moist *Sphagnum moss* and wrapped with transparent polythene sheet. The polythene was tied firmly at both the ends with strong jute strings in order to make airtight. Two month after air-layering, rooted layers were detached from the mother plant and planted in well prepared nursery beds under partial shade, after removing the polythene sheet used for layering, without disturbing the roots. Most of the leaves from the layers were removed to minimize the transpiration. The irrigation was done immediately after planting. The observations of rooting and survival performance were recorded regularly at 10 days intervals and experiment was laid-out in split-plot design with four replications.

RESULTS AND DISCUSSION

The roots produced in air-layers due to treatment of different concentrations of bio-regulators reveals that the highest percentage of rooted layers (82.80 %) was recorded with 10000 ppm IBA. The treatment of 10000 ppm NAA (75.00 %) were also found equally batter for improving the rootings followed by 5000 ppm IBA (73.50 %). The minimum percentage of rooted layers (38.33 %) was recorded under control (Table 1). Chatterjee and Mukherjee (1980); Lingarajappa (1982); Desai and Patel (1984) and Dhua and Sen (1984) have supported the similar findings while Singh and Singh (2004) reported that the combination of IBA + NAA at 5000 ppm each showed the best effect on the rooting of the air layers of jackfruit. The layered branches were not produce new growth during the course of investigation.

Treatment with 10000 ppm IBA was found effective to produce profuse callus formation in comparison to control. The maximum number of primary roots (19.95), length of the longest root (15.59 cm) and diameter of longest primary roots were found significantly better in the treatment of 10000 ppm IBA. They also found to promote the percentage of layers which produce secondary rooting (66.67 %). The weight of fresh (0.924 gm) and dry (0.466 gm) roots were also observed significantly higher with the treatment of 10000 ppm IBA followed by 10000 ppm NAA. Lingarajappa (1982) has also recorded similar observation due to application of IBA in jack-fruit. The best time of air-layering was found to be 2-3 to 25-26 July due to high relative humidity (89%) and optimum temperature (32.4 ^{o}C). The maximum percentage of rooted layers (73.78 %), higher weight of fresh (0.808 gm) and dry (0.404 gm) roots were recorded when layering was done on 2-3 July followed by 25-26 July, while number of primary roots (13.68), length of the longest roots (13.43 cm) and diameter of the longest roots (1.40 mm) were recorded highest when air-layering was performed on 25-26 July followed by 2-3 July. On the other hand, the number of primary roots, length of longest root, diameter of longest root and numbers of layers show secondary rooting were reduced at before or after 25-26 July but the percentage of rooted layers, callus formation, fresh and dry weight of roots were found to be reduced when air-layering was done after July 2-3. It may be due to a particular correlation of temperature and humidity. Patel and Singh (1984) were also of the similar view. The interaction between bio-regulator concentration and time of layering were also found significant. The maximum percentage of rooted layers (66.67%), number of primary roots (24.33), length of longest root (16.67 cm), fresh (0.992 gm.) and dry (0.497) weight of roots, diameter of longest root (1.5 mm) were recorded when layering was done on 25-26 July (M_2) and treated with 10000 ppm concentration of IBA.

The highest survival percentage of layers (71.37 %) was observed with the treatment of 10000 ppm concentration of IBA followed by 10000 ppm concentration of NAA. It is also found to increase the percentage of plants showing new growth (71.37 %) in a short time, maximum length of longest new growth (2.16 cm) and number of leaves on new growth (2.5). The maximum survival percentage of layers (62.83 %) and percentage of plants showing new growth (62.83 %) were observed when the air-layering was done on 2-3 July followed by 25-26 July while 25-26 July time of air layering was responsible for higher length of longest new growth (1.87 cm) and maximum number of leaves on new growth (2.05) followed by 2-3 July. After 25-26 July time of air-layering, the survival percentage of layered plants, percentage of plants showing new growth, length of the longest new growth and number of leaves on new growth were found to reduce due to decrease in temperature and relative humidity. Lingarajappa (1982) and Dhua and Sen (1984) have reported similar observations.

Conclusion

A critical study of above findings shows that the treatment of 10000 ppm concentration of IBA and layering done during July were the best for obtaining higher percentage of rooted layers and maximum survival percentage in jackfruit propagation by air-layering.

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