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SHORTCOMMUNICATION

EffectofIndole-3-butaricacidonair-layeringinjackfruitunder the Sub-Himalayan Terai region of West Bengal

NileshBhowmick*andSanthoshkumarGM

DepartmentofPomologyandPost-HarvestTechnology,UttarBangaKrishiViswavidyalaya, Pundibari, Cooch Behar, West Bengal, India.

**Email:nilesh@ubkv.ac.in*

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ABSTRACT

Thepresentexperimentwasconductedtostudytheeffectofvariousconcentrationsof Indole-3-butaricacid(IBA) on air-layering in jackfruit during 2020-21.Five IBA concentrations,viz.,T_1:Control (0 ppm), T_2: 1000 ppm, T_3: 5000ppm,T_4:10000ppmandT_5:15000ppmwereused.Resultsshowedthat,T_4(10000ppmIBA)hadthehighest, percentageofrootedlayers(82.50%),lengthoftheroot(6.17cm),diameteroflongestroot(1.50mm),andnumber of roots (primary and secondary). Although 10000 ppm IBA had the minimum number of days taken to rooting (33.40days),butitalsohadthemaximumfresh(0.98g)anddryweight(0.48g)ofroots.Therefore,itisconcluded that use of 10000 ppm IBA showed the highest performance of air-layers in jackfruits.

***Keywords*:**Airlayering, Indole-3-butaric acid (IBA)**,** Jackfruit,primaryroots.

INTRODUCTION

Jackfruit(*Artocarpusheterophyllus*Lam.)isone of the indigenous fruits of India and comes under the family Moraceae. The immature or mature unripefruitsareusedaspopularvegetableandthe ripefruitsareusedastablepurposefruit.Jackfruit isagoodsourceofnutrientssuchasstarch,protein, and minerals (Ocloo *et al*., 2010). Jackfruit is consideredasthenationalfruitofBangladesh,and isaplantofmultipleusesasfoodforalltheages, qualitytimberforfurnitures,fodderforcattle,fuel, preparation of medicinal and industrial products. Duetoitslongseasonalavailabilityaswellaslow price, it is called "*Poor Mans'Fruit"* in India.A maturetreeproducesupto700fruitsperyear,each weighing 0.5 to 50 kg. Despite the region having enormous potential for commercial cultivation of jackfruit,however, it is still consideredan underutilized fruit crop, and its commercial adoption is still at a primitive stage. Universally, jackfruit is propagated mostly by the fresh seeds and seedlings may take 8-10 years to bear fruits with great variability due to cross pollination behavioroftheplant.Oncontrary,thevegetatively propagatedjackfruitplantsrequireonly5-6years tocomeintocommercialbearingstage.Airlayering is one of the easy and quick methods among all vegetativemethodsofpropagation(Tomar,2011).

Layering is a method of propagation where generation of adventitious roots is forced in the plant parts while they are still attached to mother plants. Indole-3- butaric acid (IBA) is a most commonlyusedhormoneusedtoinduceformation of adventitious roots in cuttings or air layers that helpsinquickandbetterfieldestablishment,huge growthoftheplantsandearlyfloralbudformation (Singh, 2002).The media used for rooting in air layers and wrapping materials causes variation in the time required for root emergence, number of adventitious roots, root thickness and root length in air layers (Alam *et al.,* 2004). Considering beneficial effect of IBAin rooting in air layering and to generate uniform planting material in jackfruit,anexperimentwasundertakentofindout the effect of different concentrations of Indole-3-butaric acid (IBA) on success of air-layering in jackfruitundertheSub-HimalayanTerairegionof West Bengal.

The experiment has been carried out at the InstructionalFarm,DepartmentofPomologyand Post-Harvest Technology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal,India duringJune-July, 2020.The Instructional Farmcomes under the eastern Sub-Himalayanplainsat81°66′73″Elongitude

crossing28°58′86″Nlatitudewhichremainsatan elevationof42mabovemeansealevel.Theclimate oftheregionissubtropicalwithhighhumidity,high rainfall,andaprolongedwinter.Broadly,thereare two dominant seasons in a year: the long rainy seasonanddryrabi,orextendedwinterseason.The minimum and maximum temperature of this location varies from 7.1–8.0°C and 24.8–32.2°C respectively.The soil is coarse textured sandy loam innaturewithpoorwaterholdingcapacity,richin organic carbonand containshigh available nitrogen.

A shoot length of 30-45cm and 1.0-1.25 cm thick (pencil thickness) of 1-2year old branches wereselected.Defoliatedthebaseoftheshootand thenthestemwasgirdledbyremovingabarkabout 2-3cmwideatthebase.Theupperbarkcutportion wastreatedwithfivedifferentIBAconcentrations, viz.,T_1-Control (0 ppm),T_2- 1000 ppm,T_3- 5000 ppm, T_4- 10000 ppm and T_5- 15000 ppm. The openwoodisthencoveredwithhandfullofmoist soilmixture(soil:wellrottencowdung::3:1)and wrapped with 20-25 cm polyethylene sheet (200-300gauge).Thetwoendswerethentiedusingjute thread.Thetechnicalprocedureforairlayeringwas followedassuggestedbythemethodofBhowmick *et al*. (2023).

TherequiredquantityofIBAhormonalpowder wasweighedwiththehelpofanelectronicbalance. Then it was dissolved in the required amount of rectifiedspiritinabeaker.Thismaterialwaspoured and thoroughly mixed with the glass rod. After mixing, the mixture was kept in the air for a few hours, which helped evaporate the alcohol/spirit. Thedriedtalc,alongwiththehormonewasground intoafinepowder.Thisfinepowderwasstoredin anairtightcontainertoavoidmoisturizing,andit was applied to selected air layered shoots of the jackfruit plant. The concentration of IBA was expressed as ppm (parts per million) which is equivalenttomilligramofsoluteperlitreofwater or per kilogram of powder. Properly rooted air layers have been detached from the mother plant attwomonthsafterperformingtheair-layeringand transferredtoplasticpotskeptunderpartialshade in the fruit nursery. Majority of the leaves were removedfromthelayerstoreducethetranspiration loss.Thelayerswereirrigatedimmediatelyafter planting. After detaching the rooted layers, 10 layersarerandomlyselectedfromeachreplication forrecordingthedata(Ezekiel*etal*.,2016;Kumar, 2000).

The experiment has been carried out in a Randomized Block Design (RBD) with five treatments and four replications. Each replication has consisted 30 air-layers and a total of 120 air-layered jackfruit plants has been considered per treatment. The data collected from different treatmentswereanalysedwiththehelpofOPSTAT statistical software as designed for randomized block design (RBD) as described by Panse and Sukhatme (2000).

The results indicated that the application of various concentrationsof IBA significantly enhanced the rooting percentage and rooting attributes(Table1).Theapplicationof10000ppm IBAsignificantlygavehighestrootingsuccessof 82.50 % followed by 5000 ppm IBA (75.00 %), while the minimum rooting successwas in control(63.33). The longest root was recorded in T_4(6.17cm)followedbyT_3(5.62cm).Whereas, thelowestrootlengthwasrecordedinT_1(4.36cm). The results from the Table 1 indicates that the maximumdiameterofthelongestrootwasrecorded in T_4 (1.50 mm) followed by T_3 (1.45 cm) as comparedtocontrol(T_1).Themaximumnumbers ofprimaryandsecondaryadventitiousrootswere observed in T_4 followed by $T_3$and minimum was observed in T_1. This result may be for the use of Indole-3-butyric acid which may stimulate the translocationofphotosynthatesfromtheleavesto rootgrowingzoneandthusencouragethegrowth anddevelopmentofair-layeredjackfruitplantsto produce quality planting materials (Rymbai and Reddy, 2010). The combination of IBA @ 5000 ppm and NAA @ 5000 ppm has also showed the best effect on the rooting of the air layers of jackfruit asreportedbySinghandSingh(2004).Previously, it has been shown that the application of IBA at different concentrations significantly increases the rooting,numberofprimary,secondary,andtertiary roots as compared to the control (0 ppm IBA) treatment.Tomar(2011)hasfoundthattheuseof IBA@10000ppmhasresultedhigherpercentage of rooted air layers and a maximum survival percentageinjackfruitwhenlayeringdoneduring the month of July.

Table1:EffectofdifferentIBAconcentrationsonrootingsuccessandrootgrowthinair-layeringof jackfruit

Treatments (Concentration of IBA)	Success percentage of rooted layers(%)	Length of thelongest root (cm)	Diameterof the longest root (mm)	Number of primaryand secondary roots	Daysto rooting	Rootfresh weight (g)	Rootdry weight (g)	Lengthof the new growth (cm)
T_1-Control(0 ppm)	63.33	4.36	1.28	34.75	56.45	0.68	0.22	1.50
T_2-1000ppm	67.50	5.21	1.34	43.00	50.90	0.75	0.31	2.02
T_3-5000ppm	78.33	5.62	1.45	52.25	37.10	0.96	0.45	2.88
T_4-10000ppm	82.50	6.17	1.50	62.75	33.40	0.98	0.48	3.38
T_5-15000ppm	75.00	5.44	1.39	48.50	45.40	0.81	0.34	2.39
S.Em.(±)	**0.98**	**0.82**	**0.01**	**0.77**	**0.88**	**0.02**	**0.01**	**0.05**
CD(0.05)	**3.05**	**2.54**	**0.03**	**2.41**	**2.73**	**0.05**	**0.03**	**0.15**

The minimum days taken to produce rooting was recorded in T_4 (33.40 days) followed by T_3(37.10 days). Whereas, maximum days taken to produce rooting was recorded in T_1(56.45 days).

Theresultsindicatedthatrootfreshanddryweight was significantlyaffectedby different concentration of IBA in jackfruit (Table 1). The maximumrootfreshweight(0.98g)wasrecorded in T_4 followed by T_3 (0.96 g) as compared to T_1(0.68 g). The maximum root dry weight (0.48 g) wasrecordedinTfollowedbyT(0.45g),T(0.34 g), T_2(0.31 g). Whereas, the minimum root dry weight(0.22g)wasrecordedinT_1(0ppmIBA).The maximumlengthofthenewgrowth(3.38cm)was recorded in T_4 followed by T_3 (2.88 cm), T_5 (2.39 cm),T_2(2.02 cm). Whereas, the minimum length ofthenewgrowth(1.50cm)wasrecordedinT_1(0 ppmIBA).Theincreaseinshootandrootbiomass withtheuseofauxinsisconsistentwiththefindings of Chander and Kumar (2023). Application of Indole-3-Butyric Acid (IBA) and using proper rooting for air layering of wax apple has been resultedthemaximumrootinitiation,growthofthe layers and their survivability. Khandaker *et al.* (2022) reported that the application of IBA with rootingmedia,promotedthe formationof adventitious roots, increased chlorophyll content in leaves, higher vegetative growth and better survival rate of air layers of wax apple.

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