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Studies on effect of different concentrations of growth regulators on rooting of air layering in pomegranate (*Punica granatum* L.) var. Super Bhagwa in Chhattisgarh plain

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Abstract
The research work entitled with "studies on effect of different concentrations of growth regulators on rooting of air layering in pomegranate (*Punica granatum* L.) Var. Super Bhagwa in Chhattisgarh plain" was conducted at experimental field PFDC (Precision Farming Development Centre), Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG), during September 2021- January 2022. The experiment was laid out in a randomized block design with 9 treatments of different concentration of plant growth regulators *i.e.* IBA (Indole Butyric Acid) and NAA (Napthalene Acetic Acid). The pomegranate propagation significantly influenced by root parameters like days taken to start root initiation (19.87), rooting per cent (93.34%), length of roots (14.83cm), diameter of roots (1.08mm), number of roots (45.6), fresh root weight (0.77g), dry root weight (0.39g). Results revealed that growth regulator IBA concentration 2500ppm (T_4) has found better effect on rooting percentage of pomegranate followed by IBA concentration 2000ppm (T_3) and NAA concentration 2500ppm (T_8).

Keywords: Pomegranate, air layering, IBA, NAA

Introduction
The Pomegranate (*Punica granatum* L.) is an ancient and highly praised preferred fruit of tropical regions. It belongs to the Punicaceae family having chromosome no. 2n=18, which comprise only one genus Punica and two species; *P. granatum* and *P. protopunica*. (Pawar and Singh, 2020) [10]. Fruit type of Pomegranate is "Balusta" and its edible portion is juicy seed coat *i.e.* Arils.

Pomegranate fruit is extremely valued for its dietary and pharmaceutical properties like high antioxidant contents, antimicrobial, anticancer, antiviral, anti-mutagenic and anti-cardiovascular disease properties etc. (Negi *et al*., 2003 and Seeram *et al*., 2005) [8, 13]. Pomegranate is a fruit that is high in nutrients. The fruit has a 68% edible part. Moisture is 78%, protein is 1.6%, carbohydrates are 14.5%, calcium is 10 mg, phosphorus is 70 mg, iron is 0.3-0.7 mg, vitamin C 16 mg and riboflavin is 0.10 mg per 100 g of fruit.

Pomegranate propagation is done by two methods sexual and asexual. In sexual propagation, it is raised through seeds, which take long period for bearing. Pomegranate seed propagation is simple, but it takes more time for flowering and fruiting, as well as genetic variability and indications to low yield and poor quality fruit. Among the different methods of vegetative propagation, pomegranate is generally propagated through air layering and hardwood cuttings. Commercially, air layering is one of the most successful method in pomegranate propagation with the advantage of being able to reproduce plants with better rooting than cuttings.

In pomegranate, air layering can be effective in reducing the period for fruiting before cutting planting and increasing the success percentage (Tomar, 2011) [15]. As a result, the farmer favours high quality planting material that has been generated through layering.

The different rooting media and plant growth regulators (PGRs) played a main role in rooting. Different rooting media like sphagnum moss, coco peat and saw dust have a better moisture holding capacity while being lighter in weight, which helps to promote root growth (Bhosale *et al*., 2009) [2]. Auxins like Indole Butyric Acid (IBA), Indole Acetic Acid (IAA), and Naphthalene Acetic Acid (NAA) are commonly used to stimulate to rooting in variety of plants. They can be used alone or in combination with auxin synergists (non auxin compounds). IBA is frequently reported to be effective among these auxins (Ram *et al*., 2005)

[11]. The exogenous application of IBA and NAA induce roots in air layers due to their potential to activate cambium regeneration, cell division and cell multiplication (Rymbai and Reddy, 2010) [12]. The application of rooting hormones can enhance the percentage of pomegranate cuttings that root by 49-70%. IBA and NAA are the most important plant growth regulators (PGR) generally employed for overview and development of rooting in air layering.

Materials and Methods

The experiment was carried out from September to January, during 2021-22, at PFDC, Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG).

The experiment was conducted on four years old of uniform size planted at a distance (3m x 3m) to serve a mother plants for preparing layers of pomegranate plants variety Super Bhagwa planted at PFDC experimental field.

The experiment required sphagnum moss as a rooting media. Matured shoots of pencil size having thickness from 1 to 1.5cm in diameter, uniform, healthy, vigorous which have developed dark brown bark color were selected for preparing air layers of variety Super bhagwa in the month of September. On the selected branches a ring bark of about 2-3 cm in length removed by use of budding knife just below the bud without injuring the under wood portion and rooting hormone (IBA or NAA) is applied evenly on all side of uppercut of the ring with hair brush. The different treatments different brushes were used. The moist rooting medium (sphagnum moss) is wrapped over the cut portion using desirable size of polythene strip (200-300µ gauge) and both the ends of the polythene strip are tied with coir/jute thread or string. Air layers were detached after 45 days and transplanted in polythene bags.

The study was carried out with two growth regulators *viz*. IBA (Indole Butyric Acid) and NAA (Naphthalene Acetic Acid) with four concentration of each (1000ppm, 1500ppm, 2000ppm and 2500ppm) with control as no application of growth regulators *i.e.* untreated. Totally nine treatments were used for this study which were replicated thrice in randomized block design (RBD).

Result and Discussion

The result obtained from the present investigation as well as relevant discussion have been summarized under following given in table 1. The data obtain from root growth parameters of air layers. The air layers made with IBA 2500 ppm (T_4) showed early root initiation *i.e.* required minimum number of days (19.87). The maximum number of days (29.47) required for root ignition was observed in treatment T_0 (control). This is due to increase the concentration IBA results in decrease in the number of days due to better utilization of stored carbohydrates, nitrogen and other factors. The results are conformity with those reported by Bhosale *et al.* (2009) [2], Patel *et al.* (2012) [9] Bhosale *et al.* (2014) [3] in pomegranate.

Rooting percentage of air layers on mother plant showed the significance effect. The maximum rooting per cent (93.34%) was observed in treatment T_4 IBA 2500 ppm. The minimum root per cent (65.34) was recorded in treatment T_0 (control). IBA had a superior effect on rooting, and larger concentration of the highest rooting percentage. Auxin administration increased the concentration of auxin in the cell and boosted cell division resulting in quick callus formation (Hartman *et al*. 1989) [5]. This result is in close conformity with the earlier finding by Tryamabke and Patil (2002) [17], Tomar and Tomar (2012) [16] in pomegranate.

The maximum length of root was observed in treatment T_4 IBA 2500 ppm (14.83 cm). This could be attributable to auxin activity which induced carbohydrate and nitrogenous material breakdown and translocation at the cellular level, resulting in rapid cell elongation and division. Similar results were reported by Patel *et al.* (2012) [11] Bhosale *et al.* (2014) [3].

Diameter of Root per air layers at 45 days was significantly influenced by different treatments. The mean diameter of root ranged from 1.08mm to 0.31mm. The maximum diameter of root was observed in treatment T_4 IBA 2500 ppm (1.08mm). The minimum diameter of root (0.31mm) was observed in treatment T_0 (control). This is most likely due to the fact that higher IBA concentration increased with width of primary rooster cells.

Number of Roots per air layers the maximum number of root was observed in treatment T_4 IBA 2500 ppm (45.6) and the minimum root length (23.54) was observed in treatment T_0 (control). This could be due to quicker rooting in the layering, since greater IBA concentration enhances cell wall flexibility, resulting in accelerated cell division and, as a result, an increase in the number of roots up to a certain point

Fresh Root weight of air layers the maximum root weight was observed in treatment T_4 IBA 2500 ppm (0.77g) followed by treatment T_3 IBA 2000 ppm (0.73g) and treatment T_8 NAA 2500 ppm (0.64g). The minimum root length (0.27g) was observed in treatment T_0 (control). When applied exogenously, natural and synthetic auxin promotes the growth of pre-existing root systems. The rise in the number, length and diameter of per air air layers could have had a direct influenced the fresh weight of the roots.

Dry weight of root air layers the maximum dry root weight was observed in treatment T_4 IBA 2500 ppm (0.39g). The minimum root length (0.13g) was observed in treatment T_0 (control).

It is evident that the use of IBA 2500 ppm as a best for air layering in pomegranate cv. Super bhagwa resulted in maximum rooting of air layers was obtained with the use of this treatment.

Table 1: Effect of IBA and NAA on root growth of air layers on pomegranate

Notations	Treatments	Days taken to rooting	Rooting percent (%)	Length of root (cm)	Diameter of root (mm)	Number of roots	Fresh root weight (g)	Dry root weight (g)
T_0	Control (untreated)	29.47	65.34	6.79	0.31	23.54	0.27	0.13
T_1	IBA 1000ppm	24.47	76.62	9.12	0.70	34.31	0.51	0.25
T_2	IBA 1500ppm	22.61	80.57	10.50	0.84	38.36	0.60	0.30
T_3	IBA 2000ppm	20.74	83.31	13.40	1.02	45.6	0.73	0.37
T_4	IBA 2500ppm	19.87	93.34	14.83	1.08	49.92	0.77	0.39
T_5	NAA 1000ppm	22.14	72.31	9.14	0.58	32.08	0.41	0.22
T_6	NAA 1500ppm	24.86	75.01	10.46	0.61	35.60	0.50	0.25
T_7	NAA 2000ppm	26.29	77.68	11.81	0.74	40.79	0.59	0.29
T_8	NAA 2500ppm	21.94	81.02	12.94	0.91	41.83	0.64	0.32
SEm ±		0.70	2.34	0.36	0.03	1.17	0.02	0.01
CD at 5%		2.10	7.02	1.08	0.07	3.49	0.06	0.03

Conclusion

Pomegranate can generally be defined as species which root easily, which can also be observed from this investigation. However, the IBA and NAA treatments have been essential for the obtaining of high rooting percentage. IBA is better than NAA, IBA with 2500ppm (T_4) has maximum percentage of rooting *i.e.* 93.34%. IBA had a superior effect on rooting, and larger concentration of the highest rooting percentage.

References

1. Anonymous. Horticulture Statistics at a Glance-2020-21. Ministry of Agriculture & Farmers Welfare, New Delhi. 2020-21, 148&192.
2. Bhosale VP, Jadhav RG, Masu MM. Response of different media and PGRs on rooting and survival of air layers in pomegranate (*Punica granatum* L.) Cv. Sindhuri. The Asian J of Hort. 2009;4(2):494-497.
3. Bhosale VP, Shinde SM, Turkhade PD, Deshmukh SB, Sawant SN. Response of different media and PGRs on rooting and survival of air layers in pomegranate (*Punica granatum* L.) Cv. Sindhuri Ann. of Hort. 2014;7(1):73-77.
4. Hore JK, Sen SK. Root formation in pomegranate (*Punica granatum* L.) air layering of pomegranate with NAA and auxin synergists. Ann. Agric. Res. 1993;15(3):310-314.
5. Hartman HT, Kester DE, Davies FT. Plant propagation principle and practice. 5ed.Prentice Hall Pub., 1989, 623.
6. Karimi HR, Afzalifar M, Mansouri MZ. The effect of IBA and salicylic acid on rooting and vegetative parameters of pomegranate cuttings. Int. J Agric. Res and Review. 2012;2(5):1085-1091.
7. Munde GR, Nainwad RV, Maske SN, Pawar JV. Effect of IBA and other chemicals on air layering in pomegranate Cv. Bhagwa. BIOINFOLET. 2016;13(2A):291-293.
8. Negi PS, Jayaprakasha GK, Jena BS. Antioxidant and antimutagenic activities of pomegranate peel extracts. Food Chemistry. 2003;80:393-397.
9. Patel DM, Nehete DS, Jadav RG, Satodiya BN. Effect of PGR's and rooting media on air layering of different pomegranate (*Punica granatum* L.) cultivars, Asian J Hort. 2012;7(1):89-93.
10. Pawar YD, Pushpraj Singh. Advances in Propagation Techniques of Pomegranate. Int. J Curr. Microbiol. App. Sci. 2020;9(06):2122-2137.
11. Ram RB, Kumar P, Kumar A. Effect of IBA and PHB on regeneration of pomegranate (*Punica granatum* L.) through stem cuttings. New Agriculturist. 2005;16(1,2):113-12.
12. Rymbai H, Reddy GS. Effect of IBA, time of layering and rooting media on air layers and plantlets survival under different growing nursery condition in guava (*Psidium gujava* L.) Ind. J Hort. 2010;67:99-104.
13. Seeram NP, Adams LS, Henning SM, Niu Y, Zhang G, Nair MG, *et al*. *In vitro* antiproliferative apoptotic and antioxidant activities of punicalagin, ellagic acid and total pomegranate tannin content are enhanced in combination with other polyphenols as found in pomegranate juice. J Nutri. Biochem. 2005;16:360-367
14. Seiar YA. Effect of Growth Regulators on Rooting of Cuttings in Pomegranate (*Punica granatum* L.) Cv. 'Bhagwa'. Journal of Horticultural Sciences. 2016;11(2):156-160
15. Tomar KS. Effect of different concentrations of growth regulators on rooting and survival percentage of pomegranate (*Punica granatum* L.) air layers. Prog. Agric. 2011, 431-433.
16. Tomar KS, Tomar SS. Effect of different dosage of growth regulators on rooting & survival percentage of pomegranate (*Punica granatum* L.) air layers. Green Farming. 2012;3(6):701-703.
17. Trymbake SK, Patil MT. Effect of different substrate on rooting and survival of air layers in pomegranate. M.Sc. (Agri) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, MS, (India), 2002.