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Effect of Auxins on Rooting of Cuttings in Pear (*Pyrus communis* L.)

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ABSTRACT

This present investigation on "Effect of auxins on rooting of cuttings in Pear (*Pyrus communis* L.)" was carried out at the Brooklands Estate, Coonoor, Nilgiris district during November, 2019. This experiment was conducted in Completely Randomized Design with ten treatments and three replications. The treatments comprised of using three auxins such as IBA, IAA and NAA with three different concentrations viz., 1000, 1500 and 2000 ppm. The pear cuttings were dipped in the auxins and then planted in the polybags and kept inside the mist. The result of the experiment revealed that the root parameters viz., minimum number of days taken for rooting (20.81) and maximum value for rooting percentage (96.56%), number of roots per cutting (9.72), root length (10.92 cm), fresh weight of roots (3.51g) and dry weight of roots (0.94 g) were recorded in the treatment where the cuttings treated with IBA @ 2000 ppm (T_3). This was followed by IBA @ 1500 ppm (T_2) which recorded the minimum number of days taken for rooting (23.15) and maximum value for rooting percentage (93.02%), number of roots per cutting (9.21), root length (9.89 cm), fresh weight of roots (3.32 g) and dry weight of roots (0.81 g). The least value for root parameters were observed in control. Hence, from this above experiment, it is concluded that the auxin with IBA @ 2000 ppm followed by IBA @ 1500 ppm performed the best compared with other treatments.

***Key words*:** *Pyrus communis*, Auxin, Cutting, Rooting, Root characters

Pear (*Pyrus communis* L.) is a temperate fruit crop belongs to the family Rosaceae. It is native to coastal and mildly temperate regions from mountainous regions of Western China. It is a medium-sized tree, reaching 10–17 m (33–56 ft) tall, often with a tall, narrow crown; a few species are shrubby. Presently pear is next to apple in importance of acreage, production and varietal wealth among temperate fruits in India. It is less winter hardy due to which it can be grown in a wide range of climatic conditions, even in the warmer climates of subtropical regions.

Pear is a highly delicious fruit, can be consumed even by diabetic patients due to low sugar content. Like majority of other fruits in India, pear is mostly used for table purpose. It is rich source of carbohydrate (sugar, starch, cellulose is the major constituents), proteins (all the essential amino acids except tryptophan), vitamins, organic acids (maleic and citric acid are predominant), tannins (leuco-anthocyanins), and aroma constituents (ethyl and methyl esters of trans-2 cis-4 decadienoic acid etc.) [1].

Pear cultivars are propagated by various methods like budding, grafting, stooling, cutting and seed propagation. Seed propagation creates variability and the seed propagated progenies are not true to type and hence vegetative method of propagation is generally followed in pears. They may be commercially propagated by cutting or grafting on seedling rootstock because of easy availability. Both scion and rootstock are propagated by hardwood, semi-hardwood and softwood cuttings. Plants raised through cuttings have an added advantage that they do not produce suckers in field, which is the main problem with the budded and grafted plants [2].

Plant growth regulators are the organic chemical compounds, which modify or regulate physiological processes in an appreciable measure in the plants when used in small concentrations. Auxins were the group of growth regulators to be discovered in the late 1800's by Charles Darwin. Auxins play a major role in stem elongation and apical dominance. The application of root promoting growth regulatory substances, especially auxins is the most common treatment to enhance rooting in stem cuttings. The discovery that auxins such as Indole-3-Butyric Acid (IBA), Indole-3-Acetic Acid (IAA) and Naphthalene Acetic Acid (NAA) stimulated the production of adventitious roots in cuttings. Typically, cuttings treated with auxins root more rapidly and produce more roots with a higher percentage of rooted cuttings. Indole-3-Butyric Acid (IBA) is generally used because it is non-toxic to plants over a wide concentration

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range and is effective in root promotion of a large number of plant species. It is relatively a stable compound. It is also probably the most effective treatment to achieve successful propagation [3]. A considerable percent of success can be increased in rooting with the use of IBA and other growth regulators [4]. The use of NAA stimulated the development of more fertile branches [5]. NAA have been freely used hormone to boost vegetative propagation of plants specially rooting of cutting and IAA also belongs to the auxin family, and they are commonly used for root initiation [6]. With is in view, an experiment was carried out to study the effect of auxin on rooting of cuttings in pear.

MATERIALS AND METHODS

This investigation was carried out to study the effect of growth regulators on rooting of cuttings in pear (*Pyrus communis* L.) in the Brookland Estate at Coonoor taluk, Nilgiris district during 2019-2021. Nilgiris district which is located at 11º35' North latitude, 76º82' East longitude and at an altitude of 1850 meters above mean sea level. The experiment laid out in Completely Randomized Block Design with ten treatments with three replications. The rooting hormones viz., IBA, IAA and NAA with three different concentrations viz., 1000, 1500 and 2000 ppm were used for treating the hardwood cuttings at different concentrations with quick dip methods. Healthy and uniformly thick shoots of 12 months old wood from the branch of 12 years old tree were selected. From selected branches past season growth at the upper portion was selected and 15 cm long hardwood cuttings with 3-4 nodes was made from middle portion of the shoot. The cuttings were washed in distilled water and kept in shade for 10 minutes before giving hormonal treatments. The cuttings were given slant cut at the base and circular cut at the top. The prepared cuttings of base were kept dipped in the growth regulator solution as per the quick dip method period of 30 secs. The treated cuttings were planted singly in the polybags of 15 cm size filled with prepared rooting medium containing sand. Observations were recorded daily up to 90th day after planting (DAP).

RESULTS AND DISCUSSION

The result of the experiment revealed that the root parameters viz., minimum number of days taken for rooting (20.81) and maximum value for rooting percentage (96.56%), number of roots per cutting (9.72), root length (10.92 cm), fresh weight of roots (3.51g) and dry weight of roots (0.94 g) were recorded in the treatment where the cuttings treated with IBA @ 2000 ppm (T_3). This was followed by IBA @ 1500 ppm (T_2) which recorded the minimum number of days taken for rooting (23.15) and maximum value for rooting percentage (93.02%), number of roots per cutting (9.21), root length (9.89 cm), fresh weight of roots (3.32 g) and dry weight of roots (0.81 g) (Table 1).

Table 1 Effect of auxin on rooting of cuttings in pear

Treatment details	Days taken for rooting	Rooting percentage	Number of roots per cutting	Root length (cm)	Fresh weight of roots per cutting (g)	Dry weight of roots per cutting (g)
T_1: IBA @ 1000ppm	29.95	81.82	7.46	6.78	2.68	0.55
T_2: IBA @ 1500ppm	23.15	93.02	9.21	9.89	3.32	0.81
T_3: IBA @ 2000ppm	20.81	96.56	9.72	10.92	3.51	0.94
T_4: IAA @ 1000ppm	36.75	70.53	5.82	3.69	2.01	0.29
T_5: IAA @ 1500ppm	32.21	78.01	6.91	5.74	2.45	0.45
T_6: IAA @ 2000ppm	25.40	89.06	8.71	8.85	3.11	0.70
T_7: NAA @ 1000ppm	39.01	67.03	5.21	2.62	1.80	0.16
T_8: NAA @ 1500 ppm	34.49	74.35	6.35	4.71	2.20	0.38
T_9: NAA @ 2000 ppm	27.69	85.51	8.12	7.83	2.89	0.64
T_{10}: Control	41.28	63.53	4.72	1.56	1.59	0.09
S. Ed.	1.12	1.74	0.24	0.56	0.09	0.02
C.D (P=0.05)	2.24	3.48	0.48	1.01	0.18	0.04

The cuttings treated with IBA @ 2000 ppm (T_3) (20.81) took minimum number of days followed by T_2 -IBA @ 1500 ppm (23.15). The maximum number of days (41.28) taken for rooting recorded in control (T_{10}. Auxins are known to increase the cell division by increasing the level of endogenous cytokinin's resulting in induction of a greater number of roots primordia, exogenous application of auxins hastened the process of root initials. Early and better rooting might be due to early sprouting and higher shoot parameters in initial stages. Further, stored food materials with in the aid of growth regulators have hastened the rooting [7-9].

Higher rooting percentage was recorded in IBA @ 2000 ppm. This may be due to the fact that optimum concentration of IBA leads to mobilization and exploitation of carbohydrate and amino acids. The higher rooting due to its effect on increasing the cell wall plasticity and cell division, stimulation of callus development and root growth. The applied auxin increases the concentration of endogenous auxin and accumulates itself in the basal region of the cuttings, which acts as a metabolizing agent that induces signal for rooting [10-12].

Maximum number of roots per cutting was obtained in cuttings treated with IBA @ 2000 ppm which was followed by IBA @ 1500ppm. The number of roots per cutting was significantly lowest in control. This might have been due to the increased cell division and their differentiation under the influence of rooting chemicals, enhanced hydrolysis of nutritional reserves resulting into the increased root formation zone. The production of higher number of roots might be due to the influence of auxin in increasing hydrolysis of reverse materials [13-14].

The effect of auxin on the length of root was observed in the hardwood cuttings treated with IBA @ 2000 ppm concentration recorded the maximum root length. The

increase in length of the root with auxin treatment might be due to enhanced hydrolysis of carbohydrates leading to accumulation of metabolites at the site of application of auxins. Auxin application has been found to enhance the histological features like formation of callus, tissue and differentiation of vascular tissue, synthesis of new proteins, cell enlargement and cell division [15]. Application of IBA @ 2000 ppm produced the maximum fresh weight this might be due to the fresh weight of roots is directly proportional to number of roots in each cutting and maximum root weight due to the fact that auxins either naturally occurring or exogenously applied are inducing the initiation and growth of roots [16-18]. Cuttings treated with IBA @ 2000 ppm produced the maximum dry weight. This might be due to the factors leading to better development of roots including the influence of IBA which helps in promoting root formation [19].

CONCLUSION

Hence, from this above experiment, it is concluded that the auxin with IBA @ 2000 ppm followed by IBA @ 1500 ppm performed the best compared with other treatments.

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