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Research Article

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Effect of IBA on Rooting of Hardwood Cuttings of Various Peach Genotypes

Gurpiar Singh, Sunpreet Kaur and Amarjeet Kaur*

Department of Horticulture, Khalsa College, Amritsar143001, India

*Corresponding Author E-mail: dr.amarjitkaur30@gmail.com

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ABSTRACT

An investigation was conducted in the experimental plot of nursery of Department of Horticulture, Khalsa College, Amritsar during 2018-2019 consisting of hardwood cuttings of 20 cm length and 1.2cm diameter with 5-6 buds prepared from the dormant twigs of the 7-8 years old of Pratap, Florda Prince and Shan-i-Punjab peach cultivars in the second fortnight of November. The basal portion of the cuttings was dipped in different doses of IBA (1000, 1500, 2000, 2500 and 3000 ppm) and control were evaluated. On the basis of data recorded on rooting parameters after 45 days of planting, it was concluded that rooting parameters like root length, root thickness, length of main root, number of roots per cutting and root weight were found maximum in Shan-i-Punjab when treated with IBA 3000ppm. It was concluded that IBA at 3000 ppm was found to be the best treatment for propagation of peach through hardwood cuttings.

Keywords: *Dormant, Indole-3-butyric acid, Hardwood cuttings, Peach, Propagation, Rooting.*

INTRODUCTION

Peach (*Prunus persica* L. Batsch) is an important temperate fruit crop of the world. It belongs to the family Rosaceae, originated from China, is a diploid species (2n=16) having a medium stature upto 8m (Kumar et al., 2018). Its unique flavour and delicious taste with high nutritional value has popularized it across the world. Early ripening cultivars of peach like Flordaprince, Flordasun, Shan-i-Punjab, Partap and Earli Grande are grown commercially in the Punjab state due to well-adaptability in the prevailing climatic conditions, require less chilling-hours, early maturing and thus escape fruit-fly attack (Kaur & Kaur, 2019). Peaches are a rich source of carbohydrates, sugars (sucrose), proteins (all amino acids), vitamins (carotene, thiamine, niacin and riboflavin) and minerals (potassium, sodium, calcium, magnesium, iron and zinc). They are also an excellent source of antioxidants and fiber. Chlorogenic acid, an antioxidant, works as an anti-inflammatory in the body and helps in digesting food and prevents constipation. Peaches have a great importance in the processing industry as it can be used as canned and dried products, jam, nectar, juice, beverage and marmalade etc.

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They are nutritious with low calorific value. The oil from its kernels is used in cosmetics and pharmaceutical industry (Kaur, 2017). There are various methods of propagation of fruit plants. Plants raised from seeds show a great variability with respect to tree vigor, precocity and quality of fruits. Therefore, vegetative propagation is utmost desirable to propagate true to type plants. Commercially, cuttings are used for multiplication. Propagation by cuttings is considered the most simple and economical method of propagation. It is important particularly in horticulture for mass production of improved material within a short time and to perpetuate the characteristics of parent plants. Softwood and semi hard wood cuttings root easily when taken in spring or summer. Hardwood cuttings from dormant plants also root easily, although use of rooting hormones improves rooting percentages. The rooting capability of cuttings varies from cultivar to cultivar, location to location, season to season and age of branch. Propagation through cuttings is important particularly in horticulture for mass production of improved materials with in short time and to perpetuate the characteristics of the parent plant (Hartmann & Kester, 1983). Peach can also be vegetatively propagated (Gill et al., 2016) through cuttings. Growth regulators play an important role in rooting of cuttings. Indole-3-butyric acid is effective in promoting rooting of a large number of plant species when propagated through both softwood and hardwood cuttings (Hartmann & Kester, 1990). According to Hartmann et al. (2002) IBA is the best auxin for general use because it is nontoxic to plants over a wide concentration range and is effective in promoting rooting of a large number of plant species. The present study was therefore planned to induce rooting by treating the peach cuttings with IBA and sucrose with the aim of increasing the percentage of cuttings that form roots and to increase the uniformity of rooting and shoot parameters.

MATERIALS AND METHODS

The experiment was carried out in the nursery of Department of Horticulture, Khalsa College, Amritsar during the year 2018-2019 All the trees were maintained under uniform cultural practices during the course of investigation. Hard wood cuttings of 20 cm length and 0.9-1.2 cm in diameter having 4-5 buds were prepared from dormant twigs. The basal portion of the cuttings of three peach cultivars (Pratap, Florda Prince and Shan-i-Punjab) was dipped in IBA (1000, 1500, 2000, 2500 and 3000ppm) for 10sec. In control, the cuttings were dipped in distilled water for the same period of time. After that data on rooting parameters like root number, root length, root girth, root length were recorded and analysed with Completely Randomized Block Design. After that data on rooting parameters like root number, root length, root girth, root fresh and dry weight were recorded and analysed with Completely Randomized Block Design.

RESULTS AND DISCUSSION

Number of roots per cutting

According to the data the number of roots per cutting was found highest (12.69) in Shan-i-Punjab treated with IBA-3000ppm followed by (12.02) with IBA-2500ppm. This increase in root number might be due to the fact that auxins promoted cell division and their elongation led to differentiation of cambial initials into root primordia and in the mobilization of reserve food material to sites of root initiation there by giving higher number of roots per cutting. It also 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 results of the present study are in agreement with the findings of Rufato and Kersten, (2000) in Esmeralda Peach, Swedan et al. (1993) in hardwood cuttings of plum, peach and GF677 peach rootstock, Tajbakhsh et al. (2009) and Iqbal et al. (1999) in apple cuttings, Bal et al. (2000) in Plum, Mirabdulbaghi et al. (2011) in natural plum-apricot hybrid and Ahmed et al. (2003) in peach rootstock.

Root length (cm)

It is clear from the data that the highest root length (8.81 and 8.59 cm) was recorded in the

cuttings of Shan-i-Punjab treated with IBA (3000 and 2500 ppm) respectively as compared to other cultivars tried and IBA treatments. Increased root length might be due to the treatment of IBA promoted the cell elongation leading to an increase in root length. Also the mobilization of the reserved food material, elongation of meristematic cells and differentiation of cambial initials into root primordial through IBA caused an increase in length of the roots. The enhanced hydrolysis of carbohydrates, synthesis of new proteins, cell enlargement and cell division induced by the auxins also increased the root length. The present results corroborates the findings of Kumar et al. (2018) in peach varieties, Tajbakhsh et al. (2009) in apple cuttings, Bal et al. (2000) in Plum, Mirabdulbaghi et al. (2011) in natural plum- apricot hybrid and Ahmed et al. (2003) in peach rootstock.

Root girth (mm)

Among peach cultivars the highest root girth (2.98) was registered in the cuttings of Shan-i-Punjab when treated with IBA 3000 ppm than Pratap and Florda Prince. The increase in root thickness might be due to more vegetative growth and accumulation of carbohydrates. Due to the effect of IBA cell wall plasticity and cell division might have increased which stimulated callus development and root growth. These results are similar to the findings of Bal et al. (2000) in Plum and Kumar et al. (2018).

Length of the longest root (cm)

The length of the longest root was recorded to be the highest (11.64 cm) under the treatment of IBA 3000 ppm in the cuttings of Shan-i-Punjab. This might be due to the fact that IBA produced healthier lengthy roots. These results are in conformity with the findings of Kumar et al. (2018) and Kaur, (2015) in peach.

Root fresh weight (g)

It was noted from the data that the maximum fresh weight (0.69 g) was recorded in the cuttings of Shan-i-Punjab peach cultivar than others under study when treated with IBA 3000 g. This may pertains to the fact that that auxins naturally occurring or exogenously applied are for initiation and growth of roots. Low auxin activity and its slow degradation by auxin destroying enzyme led to the growth and vigour of roots. This might also be due to the reserved food in the cuttings. PGRs cause initial meristematic activity and stimulate the growth and development of the formed roots. Transferring rhizocalines and combined compound improve rooting indices such as fresh weight[4]. In the present study, the use of auxin improved root fresh weight (g). The higher fresh weight of roots might be attributed to the increased number of roots and roots length (Ingle & Venugopal, 2009). The present findings are in line with the research study of Kumar et al. (2019) in peach and Bal et al. (2000).

Dry weight of roots (g)

The maximum dry weight (6.47 g) was registered in the cuttings of Shan-i-Punjab peach with IBA 3000 ppm. Increase in dry weight of roots might be due to the fact that the increase in the root number and length of roots resulted in higher accumulation of dry matter. Results are in agreement with the findings of Rufato and Kersten (2000) in Esmeralda Peach, Swedan et al. (1993) in hardwood cuttings of plum, peach and GF677 peach rootstock, Tajbakhsh et al. (2009) and Iqbal et al. (1999) in apple cuttings.

Table 1: Effect of IBA on the root number of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	4.55	10.02	11.50
T_2- IBA 1500 ppm	4.68	10.23	11.61
T_3- IBA 2000 ppm	4.88	10.47	11.89
T_4- IBA 2500 ppm	4.97	10.64	12.03
T_5 -IBA 3000 ppm	5.12	10.80	12.69
T_6-Control	0.00	0.00	0.00
CD (%)	0.06	0.02	0.03
CV (%)	0.66	0.14	0.15

Table 2: Effect of IBA on the root length (cm) of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	4.21	7.03	7.93
T_2- IBA 1500 ppm	4.91	7.81	8.07
T_3- IBA 2000 ppm	5.00	8.02	8.31
T_4- IBA 2500 ppm	6.08	8.28	8.58
T_5 -IBA 3000 ppm	6.49	8.40	8.80
T_6-Control	0.00	0.00	0.00
CD (%)	0.16	0.03	0.01
CV (%)	1.62	0.28	0.11

Table 3: Effect of IBA on the root girth (mm) of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	1.94	2.73	2.85
T_2- IBA 1500 ppm	2.01	2.80	2.93
T_3- IBA 2000 ppm	2.04	2.83	2.94
T_4- IBA 2500 ppm	2.06	2.86	2.95
T_5 -IBA 3000 ppm	2.08	2.91	2.98
T_6-Control	0.00	0.00	0.00
CD (%)	0.02	0.03	0.03
CV (%)	0.54	0.61	0.57

Table 4: Effect of IBA on the length of the longest root (cm) of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	4.13	7.47	10.83
T_2- IBA 1500 ppm	4.26	7.59	10.91
T_3- IBA 2000 ppm	4.35	7.71	11.08
T_4- IBA 2500 ppm	4.49	7.79	11.23
T_5 -IBA 3000 ppm	4.68	7.93	11.65
T_6-Control	0.00	0.00	0.00
CD (%)	0.03	0.10	0.03
CV (%)	0.39	0.73	0.16

Table 5: Effect of IBA on root fresh weight (g) of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	0.44	0.54	0.58
T_2- IBA 1500 ppm	0.49	0.57	0.63
T_3- IBA 2000 ppm	0.52	0.58	0.64
T_4- IBA 2500 ppm	0.54	0.63	0.67
T_5 -IBA 3000 ppm	0.56	0.65	0.68
T_6-Control	0.00	0.00	0.00
CD (%)	0.03	0.04	0.03
CV (%)	3.32	4.05	2.50

Table 6: Effect of IBA on root dry weight (mg) of cuttings of peach cultivars at 45 days

Treatments	Pratap	Florda Prince	Shan-i-Punjab
T_1-IBA 1000 ppm	5.25	5.25	6.03
T_2- IBA 1500 ppm	5.39	5.39	6.25
T_3- IBA 2000 ppm	5.46	5.46	6.30
T_4- IBA 2500 ppm	5.52	5.52	6.39
T_5 -IBA 3000 ppm	5.59	5.59	6.47
T_6-Control	0.00	0.00	0.00
CD(%)	0.04	0.03	0.03
CV (%)	0.40	0.29	0.27

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