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Effect of various concentration of indole butyric acid on the rooting performance of low-chilling peach (*Prunus persica* Batsch.) cultivars at Allahabad region

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ABSTRACT : The experiment was laid out Factorial Randomized Blok Design (RBD) with three variety (Saharanpur Prabhat, Pratap and sharbati), 5 different concentration of IBA (0 ppm, 500 ppm, 1000 ppm 1500 ppm and 2000 ppm.) and three replications. The cuttings were treated with IBA concentration just before planting in the month January. From the findings, it is significantly observed that the V_3 I_3 (V_3-Sharbati and I_3-1000ppm IBA) gave maximum rooting performance (58.63%), maximum number of sprout per cutting (4.30), maximum number of leaf per cutting (14.50), maximum number of primary roots per cutting (22.09), maximum length of longest root (12.17 cm), maximum diameter of root (0.333cm).

KEY WORDS : Peach, IBA, Hard wood, Rooting

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Peach (*Prunus persica*) is a temperate fruit rich in proteins, sugar, minerals and vitamins. Introduction of the cultivated peach probably took place in the latter half of the 19th century. Today it is being grown in the midhill zone of the Himalayas extending from Jammu and Kashmir to Khasi hills 1,000-2,000m above mean sea level. Peach require the humid climate with cold winter and dry summer. It is moderately winter hardy and sensitive to low temperature injury, swelling buds are injured at -6.5 0C. (Chaddha, 2003). Peach trees are generally grown for commercial production as two genetically different components consisting of a scion either budded or grafted to a rootstock. Producing own-rooted peach trees have potential benefits compared with trees that are scion budded to a rootstock. Own-rooted trees may have greater capacity to absorb soil resources, be more uniform in shoot growth, and eliminate chances of tree death due to graft incompatibility (Couvillon, 1985). Rooting of cuttings is not always successful and the reasons for rooting failure are not clearly understood. Factors such as cultivar and age of the source tree; the collection date, length, diameter, and degree of hardening of the cuttings; injury and heat treatments of the cuttings; and the treatment concentrations of auxin-like compounds can affect rooting (de Oliveira *et al.*, 2003; Tsipouridis *et al.*, 2003, 2005, 2006). The plant growth regulator indole butyric acid (IBA), a synthetic auxin, induces rooting in peach cuttings, but its effect can vary with the type of cutting used (Couvillon, 1985). Tsipouridis *et al.* (2003) found that IBA concentrations of 2000 mg/ L stimulated rooting of hardwood and semi-hardwood cuttings but rooting success varied with peach cultivar. In contrast, softwood cuttings treated for 24 h with 25 mg/ L solutions of IBA rooted (Gur *et al.*, 1986). Sharma and Dhillon (1981) reported that peach seeds, which are sown in the month of December after stratification do not attain buddable size in next May/June. Rather only few are budded during these months and ouddable size in next May/June. Rather only few are budded during these months and these seedlings are subsequently tongue grafted in December or January, which can be transplanted in the orchard in the next dormant season.

In other words, grafted plants become ready in two years. Since, availability of large number of plants at low cost would be one of the pre requisite for the success of peach orcharding. To achieve this objective, development of such a technique is of prime importance. Therefore, it was thought worthwhile to propagate peach through cutting for having clonal rootstock or plants on its own roots so that to get plants of true to type (Reddy *et al.*, 2001).

In view of above facts, the present experiment was conducted to study the effect of different concentrations of IBA on the performance of subtropical peaches under Allahabad agro-climatic conditions.

RESEARCH METHODS

The present investigation effect of various concentrations of indole butyric acid (IBA) on the rooting performance of peach *(Prunus persica* Batsch.) cultivars was under taken at research form of Horticulture Department, Sam Higginbotom Institute of Agriculture, Technology and Sciences Allahabad during the year 2011-2012. The experiment was laid out in Factorial Randomized Block Design with three cultivars *i.e.* Saharanpur Prabhat, Pratap, Sharvati and five different concentration of IBA (0 ppm, 500ppm, 1000ppm, 1500ppm, 2000ppm). The required number of one year hardwood cuttings were collected and basal portion was dipped in respective solutions having various concentrations of IBA for approximately 30 second. Treated cuttings was planted keeping 20 cm distance between row to row and within the row cuttings planted at 10 cm. After 10 weeks of planting each cutting was lifted from the nursery beds, washed well gently and studied carefully for their roots and shoots characteristics.

RESEARCH FINDINGS AND DISCUSSION

Number of sprouts per cutting (Table 1) revealed that the maximum number of sprouts per cutting (3.28) was recorded with Sharbati, which was significantly higher than Pratap (3.06).All the cutting treated with IBA concentrations produced more number of sprouts, which was significantly higher in comparison to control. However, the maximum number of sprouts per cutting was exhibited with IBA 1000 ppm (4.07), which was significantly better in comparison to the rest of the concentrations of IBA. Untreated cutting produced minimum number of sprouts *i.e.* 2.51. However, like other characters, the interaction effect on the number of sprouts per cutting in different cultivars were found to be significant. It was found that there was a varietal difference in the rooting of pear cuttings, although there anatomical structure did not differ (Andreeva, 1989). It is very clear from the data that there was considerable variations in number of leaves produced in all the three cultivars of peach (Table 2). Sharbati produced the maximum number of leaves *i.e.* 11.23 per cutting, which was significantly higher in comparison to other two cultivars experimented. Pratap produced the maximum number of leaves *i.e.* 10.77, which was superior than Sharanpur Prabhat 10.22 leaves. All the concentrations of IBA proved significantly better than the control. The successive increase in IBA concentration form 1000 ppm, the number of leaves per cutting decreased, it was further observed that number of leaves per cutting with different concentration of IBA, there was significant difference among themselves. However, the maximum number of leaves per cutting was recorded in cutting treated with 1000 ppm (13.48) followed by 1500 ppm (11.78) while it was minimum in control (8.92). The interaction effect of cultivars and concentrations of IBA on number of leaves per cutting was found to be-significant. Similar beneficial effect of 1BA was also reported by Howard (1968) in apple rootstock hardwood cuttings and by Zyl and Zolly (1971), Slack (1978) in peach. Similar result was found by Riaz *et al.* (2007) that number of leaves was significantly enhanced with different IBA concentrations, in both sexes.Maximum number of leaves (11 and 13) for male and female cuttings, respectively was recorded with 4000ppm. It may be due to

Table 1 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on number of sprouts per cutting of Peach (*Prunus persica* Batsch)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	2.47	2.50	2.57	2.51
I_1 (500 ppm)	2.63	2.87	2.87	2.79
I_2 (1000 ppm)	3.77	4.13	4.30	4.07
I_3 (1500 ppm)	3.40	3.47	3.50	3.46
I_4 (2000 ppm)	3.03	3.07	3.17	3.09
Mean (V)	3.06	3.21	3.28	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.01	0.02
Variety (V)		S	0.01	0.02
Interaction (I x V)		S	0.02	0.04

vigorous root system which enhanced the absorption of mineral and water from the soil and enhanced the vegetative growth. It is clearly indicated that rooting success in the three cultivars of peach differed significantly from each other (Table 3). However, Sharbati gave the maximum rooting percentage *i.e.* (50.46%) followed by Pratap (48.73%) and Saharanpur Prabhat(47.45%). The performance of Saharanpur Prabhat was found to be poorest. All the cuttings treated with different concentrations of IBA performed significantly superior over control. However, the highest rooting percentage (57.06%) was recorded in cuttings treated with 1000 ppm IBA, which was significantly superior

Table 2 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on number of leaves per cutting of Peach (*Prunus persica* Batsch.)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	8.60	9.07	9.10	8.92
I_1 (500 ppm)	9.27	9.67	9.67	9.53
I_2 (1000 ppm)	12.93	13.00	14.50	13.48
I_3 (1500 ppm)	10.40	12.13	12.80	11.78
I_4 (2000 ppm)	9.90	10.00	10.07	9.99
Mean (V)	10.22	10.77	11.23	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.03	0.07
Variety (V)		S	0.03	0.05
Interaction (I x V)		S	0.06	0.12

Table 3 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on percent rooting of Peach (*Prunus persica* Batsch.)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	40.43	41.07	42.43	41.31
I_1 (500 ppm)	42.90	43.77	46.23	44.30
I_2 (1000 ppm)	55.87	56.67	58.63	57.06
I_3 (1500 ppm)	51.83	53.23	53.33	52.80
I_4 (2000 ppm)	46.23	48.90	51.67	48.93
Mean (V)	47.45	48.73	50.46	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.04	0.09
Variety (V)		S	0.03	0.07
Interaction (I x V)		S	0.07	0.15

Table 4 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on number of primary roots per cutting of Peach (*Prunus persica* Batsch.)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	4.13	4.27	4.60	4.33
I_1 (500 ppm)	13.30	14.87	14.87	14.34
I_2 (1000 ppm)	19.23	19.32	22.09	20.21
I_3 (1500 ppm)	17.20	17.27	18.30	17.59
I_4 (2000 ppm)	15.93	16.10	16.97	16.33
Mean (V)	13.96	14.36	15.36	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.02	0.04
Variety (V)		S	0.02	0.03
Interaction (I x V)		S	0.03	0.07

over 500 ppm, 1500 ppm and 2000 ppm IBA.It was very interesting to note that there was increase in rooting performance with successive increase in the concentration of IBA. The interaction effect of indole butyric acid on per cent rooting in different cultivars of peach was found to be significant. It was found that the relative amount of auxin present, indigenous or applied was associated with the formation of root primordia (Thiman and Went, 1934). The maximum number of primary roots recorded in sharbati cultivar of peach (15.36) followed by Pratap (14.36) and Saharanpur Prabhat (13.96) (Table 4). Even Sharbati and Saharanpur Prabhat cultivars performed differently. All the concentrations of IBA in comparison to control, significantly increased the number of primary roots per cutting. The maximum number of primary roots per cutting was associated with IBA 1000 ppm, (20.21) which was significantly superior over 500 ppm, 1500 ppm and 2000 ppm IBA but there were no significant difference within the last two concentration of IBA. The cuttings, which were not treated with IBA gave poorest performance *i.e.* 4.33 primary roots per cutting. The interaction effect of cultivars and different concentrations of IBA on number of primary roots per cutting was found to be significant. It was found that cuttings of pear var. Santa Maria and Quince, variety Gigante di Vrania produce no roots, but those of the Quince variety lepage E. rooted readily when treated with IBA 1000ppm (Scaramnzzi, 1960). IBA concentrations also increase cell walls elasticity and thus accelerate cell division which lead to the production of more number of roots. These results are in agreement with Bal *et al*. (2000) who reported that plum cuttings treated with IBA at 3000 mg/l gave best rooting. Perusal of data (Table 5) on the effect of IBA on length of the roots in different cultivars of peach clearly indicated that 9.08 cm long root was produced by the Sharbati cultivar of peach, which was the longest and significantly superior over Pratap and Saharanpur Prabhat, while comparing Pratap and Sharanpur Prabhat cultivar of peach, there was no significant difference in the performance of longest root. Length of the longest root decreased with increase in concentrations of IBA. All the concentrations of IBA significantly affected the longest roots length of cutting over control. The maximum root length was recorded with IBA 1000 ppm, which was significantly better than rest of the concentrations of IBA. The performance of cultivars and different

Table 5 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on length of root (cm) of Peach (*Prunus persica* Batsch.)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	5.97	6.63	6.77	6.46
I_1 (500 ppm)	7.27	7.57	7.80	7.54
I_2 (1000 ppm)	10.93	11.27	12.17	11.46
I_3 (1500 ppm)	9.47	9.47	10.06	9.66
I_4 (2000 ppm)	8.13	8.17	8.60	8.30
Mean (V)	8.35	8.62	9.08	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.01	0.02
Variety (V)		S	0.01	0.02
Interaction (I x V)		S	0.02	0.04

Table 6 : Effect of different concentrations of Indole Butyric Acid (IBA), varieties and their interaction on diameter of root (cm) of Peach (*Prunus persica* Batsch.)

Concentration of IBA (I)	Varieties (V)			Mean (I)
	V_1 (Saharanpur Prabhat)	V_2 (Pratap)	V_3 (Sharbati)	
I_0 (0 ppm)	0.093	0.093	0.110	0.099
I_1 (500 ppm)	0.113	0.127	0.150	0.130
I_2 (1000 ppm)	0.213	0.223	0.333	0.257
I_3 (1500 ppm)	0.187	0.187	0.203	0.192
I_4 (2000 ppm)	0.150	0.171	0.173	0.165
Mean (V)	0.151	0.160	0.194	
		F-test	S. Ed. (±)	C. D. (P=0.05)
Indole Butyric Acid (IBA) (I)		S	0.004	0.009
Variety (V)		S	0.003	0.007
Interaction (I x V)		S	0.008	0.016

concentrations of IBA interacting with each other were found to be significant Results thus obtained in this experiment are in conformity of the previous findings as reported by Jauanda *et al.* (1979), in which he compared Flordasun and Matchless cultivars of peach and concluded that Flordasun rooted better than cv. Matchless when treated with 1000 ppm IBA. Pervez *et al*. (2007) found that IBA concentrations, 2000 ppm IBA promoted early rooting, quick cell division as compared to other concentrations and hence, lengthy roots. These results are in agreement with Panwar *et al*. (1999) who reported that IBA at 2000 ppm increased root length in Bougainvillea cuttings. An examination of data furnished in Table 6 on diameter of root revealed that diameter of thickest root in different cultivars was significantly superior from one another. The maximum diameter *i.e.* 0.194 cm was found in sharbati followed by pratap (0.160 cm) and it was minimum in Saharanpur Prabhat (0.151 cm). The successive increase in concentrations of IBA decreased the diameter of the thickest root. All the concentrations of IBA significantly differed from each other in relation to diameter of the thickest roots. However, the maximum diameter was recorded with IBA 1000 ppm (0.257 cm) followed by 0.192 cm in 1500 ppm IBA concentration. The minimum diameter of thickest root was found in control. The interaction effect on diameter of the thickest root was found to be significant. Out of all the treatment, IBA at the rate of 1000 ppm was found to be best treatment in inducing the highest per cent rooting and other root growth in all cultivars, IBA in promoting to rooting was also recorded by Roy *et al.* (1972) in rooting of tomato cuttings and by Sadhu and Bose (1978) in mango, guava, wood apple cuttings and air layers. Riaz *et al.* (2007) revealed that root diameter was significantly affected by different concentrations of IBA. The increase in root diameter may be due to more vegetative growth and accumulation of carbohydrates

Conclusion:

On the basis of result obtained, it is concluded that the I_3 (1000 ppm IBA) treatment proved as one of the most suitable treatment for inducing rooting and total growth of peach hard wood cuttings and also concluded that the V_3(Sharbati) cultavar of peach rooted significantly more in comparison to other cultivars. Due to climatic variations, success in performance of rooting of cuttings varied slightly.

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