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# Rooting Capacity of Cutting of Pear (*Pyrus communis* L.)

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**Abstract**

An experiment was carried out during 2004-05 with three types of cuttings viz., basal ($C_1$), semi-apical ($C_2$) and apical ($C_3$) and four IBA concentrations viz., 0 ($P_1$), 50 ($P_2$), 100 ($P_3$) and 150 ($P_4$) ppm. The number of callused cutting was significantly higher in apical cutting (74.16%) than semi-apical cutting (65.41%). Maximum callused cutting (81.38%) were obtained with 100 ppm of IBA. Number of sprouted cutting decreased with the time in all the three types of cutting. But survival in the semi-apical cutting was better than basal ones. In treatment of cutting, IBA 100 ppm proved to be most effective and maintained its superiority to rest of the concentrations. The final number of roots per cutting and percentage of rooted cutting were also significantly better in 100 ppm of IBA concentrations. Among different types of cutting, the semi-apical cutting gave better results as compared to apical and basal cuttings. Survival percentage in field condition of cutting decreased with the time in all the three types of cuttings and IBA concentrations. Maximum survival percentage in field after five months(64.58%) was observed under semi-apical cutting, Highest survival percentage of 68.61 was recorded under 100 ppm of IBA which was significantly at par with 50 ppm IBA.

**Key words : Rooting, Cutting, IBA, Pear.**

In India, pear is grown from humid sub-tropical plain to cold dry temperate region, occupying an area of 23,000 hectare with an annual production of 200,000 metric ton reported (1). The pear is a highly delicious fruit, consumed mostly as table purpose. Pear cultivars are propagated by various methods like budding, grafting, stooling, cutting and seed propagation. Among these methods of propagation, the cutting is the best method for the propagation of pear. Rooting in *Pyrus* spp. *in-vitro* has been proved difficult according to Reed (2). Plants raised through cuttings have an additional advantage that they do not produce suckers in field, which are the main problems with the budded and grafted plants. The type of wood used for propagation and the application of growth regulators have been found to affect the rooting capacity of the sand pear cuttings.

## Methods

The present experiment was conducted in the experimental plots of Department of Horticulture, Birsa Agriculture University, Kanke, Ranchi during 2004-05. The experiment was laid out in randomized block design with 12 treatments replicated thrice. The basal portion of cuttings was dipped into 50, 100 and 150 ppm concentrations of IBA solution for 24 hours. Thereafter, IBA treated cuttings were planted into sand nursery bed on 15 December 2004 and left till 15 January 2005 for callus formation. The cutting materials used in experiment were basal, semi-apical and apical cuttings. The cuttings obtained from the upper portion of the shoot, being very tender and of current shoot growth were designated as apical. On the contrary, the lower portion of shoot the hardiest one was designated as basal. The middle portion of the soft and hardwood shoots provided the semi-apical cutting. All the cuttings were of same thickness and of same age.

## Results and Discussion

### *Number of Callused and Sprouts Cutting*

Callus formations were significantly influenced by type of cutting. The percentage of callusing was significantly highest (74.16) in apical cuttings followed by semi-apical cuttings (65.41%) and it was least in basal cuttings (58.75%) (Table 1). Treatment with IBA at lower concentrations markedly favored

**Table 1.** Number of callused and sprouts cutting. Figures in parentheses are transformed values.

| Type of cuttings | No. of callused formation | | | | | No. of sprouts cutting | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $P_0$ | $P_1$ | $P_2$ | $P_3$ | Mean | $P_0$ | $P_1$ | $P_2$ | $P_3$ | Mean |
| $C_1$ | 35.00 (36.15) | 65.00 (54.17) | 73.34 (59.62) | 61.67 (51.92) | 58.75 (50.46) | 3.1 | 6.73 | 8.23 | 6.10 | 6.04 |
| $C_2$ | 42.50 (40.65) | 70.83 (57.49) | 80.84 (64.54) | 67.50 (55.34) | 65.41 (54.50) | 4.67 | 11.23 | 13.63 | 8.50 | 9.50 |
| $C_3$ | 50.00 (45.00) | 85.00 (67.67) | 90.00 (71.89) | 71.67 (57.99) | 74.16 (60.64) | 4.10 | 7.86 | 11.00 | 7.20 | 7.54 |
| Mean | 42.50 (40.65) | 73.61 (59.78) | 81.38 (65.35) | 66.94 (55.08) | – | 3.95 | 8.61 | 10.95 | 7.26 | – |

| Factors | SE | CD (5%) | SE | CD (5%) |
|---|---|---|---|---|
| C | 1.94 | 5.70 | 0.27 | 0.80 |
| P | 2.25 | 6.59 | 0.31 | 0.93 |
| C × P | 3.89 | NS | 0.55 | 1.60 |
| CV (%) | 12.21 | | 12.24 | |

callus formation, while higher concentrations had an inhibiting effect on the same. These results are in close conformity with the findings of Kahlon and Singh (3). Maximum callused cuttings (81.38%) were obtained with 100 ppm IBA, followed by 50 ppm IBA (73.61%). The interaction of different types of cuttings and IBA concentrations were found to be non-significant in respect of callusing. Maximum callused cuttings of 90.00% was obtained in $C_3P_2$ (apical cuttings treated with 100 ppm IBA), while the minimum callusing (35%) was recoded in $C_1P_0$ (basal cutting without any treatment). Higdon and Westwood (4) also reported that the juvenile cuttings had greater callus forming ability than cuttings taken from mature tree. When the number of sprouts per cuttings was noted semi-apical cutting (9.50) was found to be significantly superior to the other two types of cuttings. However, IBA at 100 ppm was proved to be most effective. Maximum number of sprouts (10.95) was recorded in 100 ppm IBA and the minimum number of sprouts (3.95) was noted under control. Interaction of type of cutting with IBA concentration was significant and maximum number of sprouts (13.63) was recorded in $C_2P_2$ (semi-apical cutting × 100 ppm IBA). While the minimum number of sprouts (3.1) was obtained in $C_1P_0$ (basal cutting without any treatment).

**Table 2.** Number of roots per cutting and percentage of rooted cutting.

| Type of cuttings | No. of roots per cutting | | | | | % age of rooted cutting | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $P_0$ | $P_1$ | $P_2$ | $P_3$ | Mean | $P_0$ | $P_1$ | $P_2$ | $P_3$ | Mean |
| $C_1$ | 1.20 | 2.50 | 5.0 | 3.30 | 3.00 | 13.34 (21.14) | 26.67 (30.99) | 33.34 (34.92) | 20.00 (26.56) | 23.34 (28.40) |
| $C_2$ | 3.10 | 8.20 | 12.40 | 7.00 | 7.67 | 23.40 (28.77) | 56.67 (48.84) | 60.00 (50.85) | 53.34 (46.92) | 48.34 (43.85) |
| $C_3$ | 3.00 | 6.00 | 9.50 | 5.46 | 5.99 | 16.67 (23.85) | 40.00 (39.23) | 50.00 (45.00) | 30.00 (33.21) | 34.16 (35.32) |
| Mean | 2.43 | 5.56 | 8.96 | 5.25 | – | 17.78 (24.59) | 41.11 (39.69) | 47.78 (43.59) | 34.44 (35.56) | – |

| Factors | SE | CD (5%) | SE | CD (5%) |
|---|---|---|---|---|
| C | 0.20 | 0.59 | 1.46 | 4.29 |
| P | 0.23 | 0.68 | 1.69 | 4.96 |
| C × P | 0.40 | 1.18 | 2.92 | NS |
| CV (%) | 12.57 | | 14.15 | |

**Table 3.** Survival percentage of cutting in field conditions. CV (%) = 6.02. Figures in parentheses are transformed value.

| Type of cuttings | Survival (%) $P_0$ | $P_1$ | $P_2$ | $P_3$ | Mean |
|---|---|---|---|---|---|
| $C_1$ | 34.16 (35.75) | 57.50 (47.32) | 60.00 (50.77) | 54.16 (45.39) | 51.45 (44.81) |
| $C_2$ | 40.00 (42.10) | 71.67 (57.90) | 77.50 (61.71) | 69.16 (56.30) | 64.58 (54.50) |
| $C_3$ | 35.00 (36.26) | 65.00 (53.74) | 68.33 (55.78) | 63.33 (52.75) | 57.91 (49.63) |
| Mean | 36.38 (38.04) | 64.72 (53.00) | 68.61 (56.09) | 62.22 (51.48) | – |

| Factors | SE | CD (5%) |
|---|---|---|
| C | 0.86 | 2.53 |
| P | 1.00 | 2.92 |
| C × P | 1.72 | NS |

The result is supported by the finding of Lakra (5).

### *Number of Roots per Cutting and Percentage of Rooted Cutting*

After 150 days of planting, IBA at 100 ppm proved efficacious and maintained its significant superiority in producing the maximum number of roots (8.96), 50 ppm of IBA gave second highest number of roots (5.56), which was at par with 150 ppm (5.25). The semi-apical cuttings gave significantly highest number of roots (7.67) as compared to the other two types of cuttings. Interaction studies revealed that significantly highest number of roots (12.40) per cutting was recorded with $C_2P_1$ (semi-apical cutting × 100 ppm IBA), the next superior (9.50) was recorded when apical cutting was treated with 100 ppm IBA. Type of cuttings, concentration of IBA and their interaction significantly increased rooting percent which are presented in Table 2. The data revealed concentration of IBA also significantly influenced percentage of rooted cuttings after 150 days planting. In the present study IBA at 100 ppm was found to be most efficacious for rooted cutting (47.78%). The control showed minimum (17.75%) rooting. Of the four concentrations, 100 ppm IBA proved to be optimum for rooting but when the concentration was increased above 100 ppm, its inhibitory effect was observed. Three types of cuttings apical, semi-apical and basal cuttings were statistically significant, while semi-apical cutting obtained significantly highest value of rooted cutting (48.34%). The minimum percentage of rooted cutting (23.34) was observed in basal cutting. However, maximum percentage of rooted cuttings (60.00) was observed in $C_2P_2$ (semi-apical cutting treated with 100 ppm IBA), the minimum percentage of rooted cutting (13.34) was recorded in $C_1P_0$ (basal cutting without any treatment). The results of the present investigation support the conclusion drawn by Sandhu et al. (6).

### *Survival Percentage of Cutting in Field Conditions*

Table 3 shows that the survival percentage in field condition of cutting decreased with the time in all the three types of cutting and IBA concentrations. Maximum survival percentage in field after 150 days (64.58%) was obtained in semi-apical cutting. Among concentrations, 100 ppm IBA gave significantly maximum field survival (68.61%). However, the maximum field survival (77.50%) was recorded in $C_2P_2$ (semi-apical cutting treated with 100 ppm of IBA). Because January-February planting passed through the period of high humidity and high temperature which favored better growth of plant. This confirms the finding of Singh (7).

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