STUDIES ON PROPAGATION TECHNIQUE IN PHALSA (GREWIA SUBINAEQUALIS DC) THROUGH STOOL LAYERING

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INTRODUCTION

Phalsa is indigenous to India and thrives well in tropical and sub-tropical regions of the country (Firminger, 1947), which can withstand in saline and alkali soils. Inspite of its wider adaptability, it has not been taken as commercial crop. It may be due to only sexual propagation and poor genetic stocks. A sexually propagated plants vary in their genetic uniformity, vigour, bearing, productivity and fruit quality. Since, little emphasis has been given on vegetative propagation, the present study was carried out to propagate phalsa through stool layering. Stooling has earlier been adopted for quick multiplication of clones in temperate fruit crops (Tukey and Brase, 1935; Pathak et al., 1978). Whereas, few attempts have been made in India for propagation of mango, guava and litchi through stooling (Mukherjee and Majumder, 1963; Ram and Majumder, 1982).

MATERIALS AND METHODS

Two years old established plants in stool beds were headed back to about 5-8 cm above the ground level in the month of Feb-March to produce more number of Juvenile shoots from the base. Shoots of about 45-60 cm in length were selected for stool layering in the month of July. A ring of bark was removed from the base of shoots and upper portion of bark was treated with different concentrations of IBA and phenolic compounds. There were ten treatment combinations and each treatment was replicated thrice. After treatment of shoots, these were earthen up and irrigated shortly. Roots were visible within 45-60 days after stooling operations. Rooted shoots were separated out from the stool mother plants and observations on rooting (per cent), number of root per cutting, root length, survival and anatomical structure were made.

RESULTS

Rooting: The data presented in Table 1 showed that maximum rooting (75 per cent) was obtained with 10,000 ppm IBA followed by 5000 ppm IBA + Catechol (72.70 per cent) as compared to other treatment combinations. This combined application of IBA + Ethrel and phenolic compound (Catechol) were at par to each other, which varied from 45.00 to 65.00 per cent.

Root number: It is evident from the Table 1 that the shoots treated with different concentrations of IBA alone did not show beneficial effect on increasing the root number. When it was combined with NAA, Ethrel and Catechol proved very
**TABLE 1**

Effect of different treatments of Auxins, Ethrel and Phenolic compounds on rooting and survival of phalsa shoots

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rooting (%)</th>
<th>Average number of root/shoot</th>
<th>Average length of root (cm)</th>
<th>Survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500 ppm IBA</td>
<td>52.50</td>
<td>21.25</td>
<td>11.03</td>
<td>40.47</td>
</tr>
<tr>
<td>5000 ppm IBA</td>
<td>62.50</td>
<td>21.75</td>
<td>11.63</td>
<td>44.00</td>
</tr>
<tr>
<td>10,000 ppm IBA</td>
<td>75.00</td>
<td>22.25</td>
<td>11.73</td>
<td>56.66</td>
</tr>
<tr>
<td>2500 ppm IBA + 2500 ppm NAA</td>
<td>55.00</td>
<td>22.75</td>
<td>11.50</td>
<td>40.91</td>
</tr>
<tr>
<td>5000 ppm IBA + 5000 ppm NAA</td>
<td>65.00</td>
<td>30.25</td>
<td>13.13</td>
<td>46.15</td>
</tr>
<tr>
<td>2500 ppm IBA + 2500 ppm Catechol</td>
<td>60.00</td>
<td>30.00</td>
<td>24.63</td>
<td>50.00</td>
</tr>
<tr>
<td>5000 ppm IBA + 5000 ppm Catechol</td>
<td>72.70</td>
<td>31.00</td>
<td>30.06</td>
<td>54.38</td>
</tr>
<tr>
<td>2500 ppm IBA + 2500 ppm Ethrel</td>
<td>45.00</td>
<td>21.75</td>
<td>29.00</td>
<td>38.88</td>
</tr>
<tr>
<td>5000 ppm IBA + 5000 ppm Ethrel</td>
<td>50.00</td>
<td>30.75</td>
<td>27.00</td>
<td>40.00</td>
</tr>
<tr>
<td>Control</td>
<td>30.00</td>
<td>19.00</td>
<td>10.00</td>
<td>29.17</td>
</tr>
<tr>
<td>S. Em ±</td>
<td>4.40</td>
<td>0.44</td>
<td>1.42</td>
<td>0.32</td>
</tr>
<tr>
<td>C. D. at 5%</td>
<td>12.76</td>
<td>1.28</td>
<td>4.18</td>
<td>0.74</td>
</tr>
</tbody>
</table>

effective in increasing the number of roots. The differences among these treatments were found significantly higher over other treatments.

**Root length**: The significant variations were recorded in root length due to different treatments as shown in Table 1. Maximum root length was recorded (30.00 cm) with 5000 ppm IBA + Catechol which was significantly higher over other treatments. Shoots treated with IBA alone did not show influence on increasing the root length.

**Establishment**:

It is clear from the data presented in Table 1 that maximum survival of rooted shoots (56.66 per cent) was recorded with treatment of 1000 ppm IBA. However, the combined treatment of IBA + Catechol (2500 and 5000 ppm of each) had also shown considerable effect on increase of percentage of establishment (54.38 and 50.00 per cent, respectively). On the other hand, its combination with Ethrel reduced the per cent of survival under field conditions.

**Anatomical study**:

It is appeared from the transverse section of rooted shoots that distinct callus formation took place with activity of cork cambium cells during root initiation. Callusing extended towards inner part of the secondary phloem. Differentiation of callus started from the lower end with elongation of cells, which was extended up to pith region. The strands of three annular thickening along with cell wall and finally differentiated into xylem tissues. The newly formed xylem tissues developed their
vascular connection with existing secondary xylem and along with xylem medullary rays. After getting vascular connection, root primordium initiated and emerged from callus tissues by rupturing the bark.

**Discussion**

The results described above indicated that there was pronounced effect of 10,000 ppm IBA on increase in rooting of stool layered shoots. However, the promotory effect on rooting also recorded with other treatments over control. These findings are in agreement with the results obtained by Pathak *et al.* (1977) and Pathak *et al.* (1982) in temperate fruits. The combined treatment of IBA, Ethrel and NAA had shown reduction in per cent of rooting which might be due to the fact that NAA oxidise more quickly as compared to IBA. The synergistic effect of IBA and phenolic compounds was also recorded by Prasad and Pathak (1981), Chauhan and Reddy (1977). Number of roots were improved with 5000 ppm IBA + Catechol as compared to other treatments. Least number of roots was recorded with 10,000 ppm IBA. It is clear from the results that the higher concentration of IBA (10,000 ppm) proved to be supra-optimal concentration and caused production of less number of roots per shoot. Treatment of IBA + Catechol was also found superior over IBA + NAA in respect to increase of root length. Thus, the present observation seems to be in accordance with findings of Sinha *et al.* (1962). Shoots rooted with 10,000 ppm IBA showed the highest percentage of survival under field conditions. The possible explanation for better survival might be due to less brittle, longer and fibrous roots with deep brown in colour. The anatomical study of phalsa shoots showed that it is difficult-to-root because of the secondary sclerenchymatus tissues are either scantily distributed or in the form of patches of fibrous tissues and connected with ring of collenchymatus hypodermal cells. Presence of fibrous and hypodermal ring may therefore act as a barrier to penetrate water, auxins and emergence of root initials. Which show inverse relationship between the sclerification of primary phloem (Beakbane, 1961 and Garner and Hatcher, 1955).

**Summary**

In present investigation, the effect of different concentrations of IBA, NAA, Ethrel and phenolic compounds on rooting of phalsa through stool layering revealed that 10,000 ppm IBA showed pronounced effect on rooting, whereas, combined effect of IBA (5000 ppm) and Catechol (5000 ppm) produced more number of roots and also increased the root length significantly. Anatomical study showed that the root primordia were initiated from secondary phloem and Cork Cambium during the regeneration process in phalsa shoots.

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**Literature Cited**


