Impact of season, growing condition and curing of scion on success of softwood grafting in jack fruit

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(Received: October 24, 2015; Revised received: June 07, 2016; Accepted: June 11, 2016)

Abstract: Jackfruit is a cross-pollinated crop and highly heterozygous plants. Propagation through seeds leading to immense variation in yield and fruit characters. Further, the seedlings take a long time for bearing; therefore, there is a great need to standardize suitable method of vegetative propagation for quick multiplication of selected plants. This experiment was conducted to find out best months to get highest success rate of softwood grafting in jack under different conditions (green house, mist chamber and open condition). The studies on vegetative propagation in jack plants were carried out at Gandhi Krishi Vignana Kendra (G.K.V.K), University of Agricultural Sciences Bangalore, 2011-12. The experiment was laid in a RCBD design with three replications and three grafts per replication. The grafting operation at 5 months intervals on 6 month old rootstocks was carried out. The data on various parameters like girth of rootstock, days taken for sprouting, number and length of sprouts and percentage of graft success were studied. Grafting in the month of March recorded the maximum girth of rootstock irrespective of days of grafting in mist chamber where the significantly minimum number of days was taken for sprouting in the month of January in mist chamber. During the entire growth periods, the significantly maximum number of sprouts was found in the November. Among the four months studied, the percent of graft success after 30th, 45th, 60th and 75th day after grafting, success was found maximum when performed during February (63.68 per cent). This study found that there was a significant difference among the growing condition and concluded grafts grown under mist chamber had more success of graftage and highest values for all the parameters.

Key words: Jack fruit, Growing condition, Seasoning of scion, Mist chamber

Introduction

Jackfruit is a cross-pollinated crop and highly heterozygous plants. Propagation through seeds leading to immense variation in yield and fruit characters such as density of spikes on the rind, bearing capacity, size, shape, quality and period of maturity. Further, the seedlings take a long time for bearing, therefore, there is a great need to standardize suitable method of vegetative propagation for quick multiplication of selected plants. The significant importance of vegetative propagation is maintenance of genetic uniformity and preservation of identity of a clones or cultivar is well recognized in horticultural crops. Jack fruit is successfully propagated by inarching and is only limited to small scale propagation as it is cumbersome, laborious and costly. Other known detached scion methods of grafting like veneer, wedge, side, epicotyl and softwood grafting have been practiced in jack with varying degree of success Desai and Desai (1989). The area under jack is increasing day by day as its gaining importance as desert fruit and processed products and has potential for better adaptation to diversified soil and climatic conditions. Further, there is great demand for genuine true-to-type planting materials in order to optimize production of quality fruits. Several variations exist in wild cultivars of jack fruit in the Western Ghats and are worth multiplying. But lack of information on grafting technique, scion curing period and age of rootstocks for grafting rendered the clonal multiplication impaired to produce large scale planting material to meet the growing demand. Hence, there is a need to develop suitable vegetative propagation technique for the Karnataka with an aim to multiply elite jack fruit cultivars. Keeping above in view, the present research was taken up with objective to know the impact of season, growing condition and curing of scion on success of softwood grafting in jack fruit.

Material and Methods

An experiment was conducted to standardize the best method of grafting, time and day of curing the scion. The softwood grafting was performed at different months like November, December, January, February and March under green house, mist chamber and open condition and the scions were cured was at zero, ten and twenty days prior to grafting. The studies on vegetative propagation in jack plants were carried out at the Horticultural Research Station, Gandhi Krishi Vignana Kendra (G.K.V.K). University of Agricultural Sciences Bangalore, 2011-12. The experiment was laid in a RCBD design with three replications and three grafts per replication. The rootstocks which are uniform in size and vigorously growing seedlings of specified age were selected for the study. The rootstocks were selected every month for softwood grafting. One season old, pencil thickness, free from pest and diseases were selected as scion for softwood grafting. The scion shoots were collected directly without curing from selected healthy jackfruit trees in the morning hours from 8.30 to 9.30 a.m. on the day of grafting. Periodically observations were recorded at 25th, 45th, 55th and 70th days after grafting on all the parameters Girth of rootstock, Days taken for first sprouting (after 25 days), Number of sprouts, Length of sprouts and per cent graft success.
Results and Discussion

This experiment was conducted to find out best months to get highest success rate of softwood grafting in jack under different conditions (green house, mist chamber and open condition). The grafting operation at 5 months intervals on 6 month old rootstocks was carried out. Uncured scion sticks were used for grafting purpose.

The data on various parameters like girth of rootstock, days taken for sprouting, number and length of sprouts and percentage of graft success were studied and presented. Season of grafting plays an important role in softwood grafting success. If the season is not conducive, the favourable effects of other factors are likely to be nullified, resulting in lower rate of success. The success of grafting is dependent upon the weather conditions and thus varies from region to region within a season. The seasonal influence could be ascribed to the influence of prevailing temperature and humidity.

**Girth of rootstock:** The girth of rootstock after 25th, 40th, 55th and 70th days of grafting recorded significant difference among the months of grafting, growth conditions and their interaction. The mean girth of rootstock of graft after 25, 40, 55 and 70 days after grafting, exhibited no definite pattern of growth among different months of grafting. Grafting in the month of March recorded the maximum girth of rootstock followed by January in all the treatments (Table-1) and the least girth of rootstock was found with grafting in the month of December. Similar results have been reported by Sarada et al. (1991). Further with respect to conditions, the result indicates that the mist chamber had highest girth of rootstock followed by green house and open condition. Over the period of 25 to 70 days there is an increase in the girth of rootstock under all the three condition of study. Similarly, Selvi et al. (2008) reported that girth of the root stock was highest under agro-shade net compared to open condition.

**Days taken for first sprouting:** The number of days taken for sprouting which is influenced by the month of grafting and growth conditions indicates that there was significant difference between month of grafting, growth conditions and their interaction. The significantly minimum number of days was taken for sprouting in the month of January, this might be due to the optimal environmental condition inside controlled condition. While the maximum number of days taken was in the month of December, it may be due to the frost and cold in December. A similar opinion was expressed by Raju (2000) in custard apple under controlled condition and Hartman et al. (1997) in mango. The minimum number of days taken for sprouting was recorded in mist chamber followed by green house and open condition. This might be due to the relative humidity and temperature inside the mist chamber. A similar opinion was expressed by Raju (2000).

**Number of sprouts per graft:** The number of sprouts after 25th, 40th, 55th and 70th day of grafting varied significantly among the months of grafting, growth conditions and their interactions. During the entire growth periods, the significantly maximum number of sprouts was found in the November treatment followed by January for all the periods of growth. This may be attributed to moderately high temperature coupled with high humidity, less fluctuation in maximum and minimum temperatures, adequate supply of healthy and matured scion sticks, because the mother trees resume the active growth phase after the onset of monsoon with adequate supply of moisture and nutrients, fast cambial activity and high accumulation of carbohydrates in scion shoots and the sprouting of dormant bud observed during November month which is contributed for the increased number of sprouts. The lowest number of sprouts was observed in the month of February. These results are in line with Raghavendra et al. (2011) results, he recorded maximum number of sprouts under poly mist house condition and less number of sprouts was reported under open conditions for woodapple.

**Length of sprouts:** The length of sprouts after 25th, 40th, 55th and 70th days of grafting recorded significant difference among the treatments. The mean length of sprouts of grafts after 25th, 40th, 55th and 70th days of grafting showed the definite pattern of growth among different months of grafting. Grafting in the month of November recorded the maximum length of sprouts followed by January and the shortest length of sprouts was recorded in March. Similarly, Bandenawaj (2007) observed lowest sprouts length observation in March for Jamun and highest in September. This might be attributed to the factor that easy swelling of buds (both axillary and apical) would have caused quick healing of graft union, leading to better sprouting and growth of sprouts. However, there is an increase in the length of sprouts as days increase in all the treatments. These results are in line with Gangamma aralikatti (2005), he reported sprout length per graft in jack was

### Table-1: Influence of different months and growing conditions on girth of rootstock (cm) of jackfruit

<table>
<thead>
<tr>
<th>Treatments (T)</th>
<th>25 DAG Condition (C)</th>
<th>40 DAG Condition (C)</th>
<th>55 DAG Condition (C)</th>
<th>70 DAG Condition (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green house</td>
<td>Mist chamber</td>
<td>Open condition</td>
<td>Green house</td>
</tr>
<tr>
<td>T1</td>
<td>1.21</td>
<td>1.72</td>
<td>1.24</td>
<td>1.42</td>
</tr>
<tr>
<td>T2</td>
<td>1.19</td>
<td>1.22</td>
<td>1.19</td>
<td>1.39</td>
</tr>
<tr>
<td>T3</td>
<td>1.20</td>
<td>1.25</td>
<td>1.21</td>
<td>1.44</td>
</tr>
<tr>
<td>T4</td>
<td>1.21</td>
<td>1.22</td>
<td>1.21</td>
<td>1.40</td>
</tr>
<tr>
<td>T5</td>
<td>1.26</td>
<td>1.31</td>
<td>1.24</td>
<td>1.46</td>
</tr>
<tr>
<td>Mean</td>
<td>1.22</td>
<td>1.25</td>
<td>1.21</td>
<td>1.42</td>
</tr>
<tr>
<td>F-value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM ±</td>
<td>0.004</td>
<td>0.003</td>
<td>0.006</td>
<td>0.003</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>0.014</td>
<td>0.011</td>
<td>0.025</td>
<td>0.014</td>
</tr>
</tbody>
</table>

NS: Non significant, Note: DAG- Days after grafting, T1 – November, T2 – December, T3 – January, T4 – February, T5 – March

*Research in Environment and Life Sciences* 977 August, 2016
The results of present investigation revealed that the season of grafting significantly influenced the success of softwood grafting under growth conditions. This might be due to the presence of controlled conditions inside mist chamber (higher temperature and relative humidity) leading to better sprouting and the extension of sprouts.

### Percent of Graft Success

The rate of graft union success was recorded on 30th, 45th, 60th and 75th day after grafting exhibit the significant difference among the different months of grafting, growth conditions and their interactions. Among the four months studied, the percent of graft success after 30th, 45th, 60th and 75th day after grafting, success was found maximum when performed during February (53.68 per cent) followed by January. Similarly, Desai and Desai (1989) stated that softwood grafting in Jack was simple and rapid method and recorded success rate from 33.3 to 80.0 per cent. Reddy and Melanta, 1988 obtained highest success of 80 per cent in mango for commercial multiplication. Khan et al. (1986) reported that the availability of desired scion rendered success of 70 to 80 per cent in cashew during the period from February to May. Sulikeri et al. (1997) worked on softwood grafting technique in sapota and obtained maximum success of 61.83 per cent at Dharwad. The maximum percentage of success obtained during February may be related to

### Table 2: Influence of different months and growing conditions on days taken for sprouting in softwood grafting of jackfruit

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Condition</th>
<th>25 DAG Mean</th>
<th>40 DAG Mean</th>
<th>55 DAG Mean</th>
<th>70 DAG Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T)</td>
<td>(C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green house</td>
<td>Mist chamber</td>
<td>Open condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>21.47</td>
<td>19.8</td>
<td>22.53</td>
<td>21.27</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>22.40</td>
<td>20.50</td>
<td>23.53</td>
<td>22.14</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>20.67</td>
<td>18.57</td>
<td>21.70</td>
<td>20.31</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>21.57</td>
<td>19.63</td>
<td>22.67</td>
<td>21.29</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>21.73</td>
<td>20.37</td>
<td>23.30</td>
<td>21.90</td>
<td></td>
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<tr>
<td>Mean</td>
<td>21.57</td>
<td>19.77</td>
<td>22.75</td>
<td>21.57</td>
<td></td>
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</tbody>
</table>

### Table 3: Influence of different months and growing conditions on number of sprouts per graft in softwood grafting of jackfruit

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Condition</th>
<th>25 DAG Mean</th>
<th>40 DAG Mean</th>
<th>55 DAG Mean</th>
<th>70 DAG Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T)</td>
<td>(C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green house</td>
<td>Mist chamber</td>
<td>Open condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>2.07</td>
<td>2.28</td>
<td>1.05</td>
<td>1.80</td>
<td>2.14</td>
</tr>
<tr>
<td>T2</td>
<td>1.35</td>
<td>1.55</td>
<td>0.58</td>
<td>1.16</td>
<td>1.22</td>
</tr>
<tr>
<td>T3</td>
<td>1.08</td>
<td>1.31</td>
<td>0.53</td>
<td>0.98</td>
<td>1.19</td>
</tr>
<tr>
<td>T4</td>
<td>1.01</td>
<td>1.25</td>
<td>0.47</td>
<td>0.90</td>
<td>1.06</td>
</tr>
<tr>
<td>T5</td>
<td>1.07</td>
<td>1.28</td>
<td>0.53</td>
<td>0.96</td>
<td>1.10</td>
</tr>
<tr>
<td>Mean</td>
<td>1.31</td>
<td>1.53</td>
<td>0.63</td>
<td>1.38</td>
<td>1.71</td>
</tr>
</tbody>
</table>

### Table 4: Influence of different months and growing conditions on length (cm) of sprouts in softwood grafting of jackfruit

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Condition</th>
<th>25 DAG Mean</th>
<th>40 DAG Mean</th>
<th>55 DAG Mean</th>
<th>70 DAG Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T)</td>
<td>(C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green house</td>
<td>Mist chamber</td>
<td>Open condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>3.34</td>
<td>3.51</td>
<td>2.61</td>
<td>3.15</td>
<td>3.51</td>
</tr>
<tr>
<td>T2</td>
<td>1.73</td>
<td>1.82</td>
<td>1.52</td>
<td>1.69</td>
<td>1.94</td>
</tr>
<tr>
<td>T3</td>
<td>2.33</td>
<td>2.40</td>
<td>2.03</td>
<td>2.25</td>
<td>2.49</td>
</tr>
<tr>
<td>T4</td>
<td>2.45</td>
<td>2.51</td>
<td>1.98</td>
<td>2.31</td>
<td>2.51</td>
</tr>
<tr>
<td>T5</td>
<td>2.04</td>
<td>2.15</td>
<td>1.61</td>
<td>1.94</td>
<td>2.33</td>
</tr>
<tr>
<td>Mean</td>
<td>2.38</td>
<td>2.48</td>
<td>1.95</td>
<td>2.56</td>
<td>3.12</td>
</tr>
</tbody>
</table>

Note: DAG- Days after grafting. T1 - November, T2 - December, T3 - January, T4 - February, T5 - March
the prevailing optimum maximum and minimum temperatures coupled with higher humidity experienced in the February month.

Among three conditions, the graft success was relatively higher in mist chamber followed by green house and the least success was observed under open condition for the periods under study. This trend is similar with number of days taken to graft union. The uniform micro-climate prevailing and the minimal variation in the temperature in mist chamber might be the possible reason for obtaining better success. Specific environmental conditions during and following grafting must be for callus tissue development and leading to better graft union. Grafting showed maximum graft success under controlled condition. Similar findings were also reported by Jose and Valsalakumari (1991) in jack. In cashewnut, Muniswami (1979) documented better results in mist house and Sulikeri et al., (1997) also reported the beneficial effect of mist house in sapota. The beneficial effect could be attributed to high humidity stretched for longer period which prevents of the scion. The environmental conditions during grafting for mist house grafts can be readily controlled, thereby permitting greater reliability of grafting over long period, when compared to outdoor grafting operation (Hartman et al. 1997) in mango. The poor percentage of grafting in open condition might be due to lack of control on environment. Study conducted at Kerala by Jose and Valsalakumari (1991) revealed that the absence of callus resulted in wide gap between scion and stock of dried grafts in jack.

The softwood grafting carried out in different months, among the different months of grafting February month was recorded the highest graft union success followed by January, December, November months. The highest girth of rootstock was recorded in the month of March. While the minimum number of days taken for bud break (or) first sprouting was recorded in January month. The maximum number of sprouts, length of sprouts and plant height (above graft union) was recorded in the month of November, followed by January and February. The highest percent of graft survival was recorded in the month of February, followed by January and all the parameters was found to be maximum in plants under mist chamber followed by green house and open condition.

### References


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**Table 5: Influence of different months and growing condition on percentage of graft success (%) in softwood grafting of jackfruit**

<table>
<thead>
<tr>
<th>Treatments (T)</th>
<th>25 DAG Condition (C)</th>
<th>40 DAG Condition (C)</th>
<th>55 DAG Condition (C)</th>
<th>70 DAG Condition (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green house</td>
<td>Mist chamber</td>
<td>Open condition</td>
<td>Green house</td>
</tr>
<tr>
<td>T1</td>
<td>46.17</td>
<td>50.40</td>
<td>40.33</td>
<td>45.63</td>
</tr>
<tr>
<td>T2</td>
<td>48.20</td>
<td>52.23</td>
<td>42.60</td>
<td>47.68</td>
</tr>
<tr>
<td>T3</td>
<td>48.10</td>
<td>52.87</td>
<td>42.13</td>
<td>47.70</td>
</tr>
<tr>
<td>T4</td>
<td>54.07</td>
<td>58.70</td>
<td>48.27</td>
<td>53.67</td>
</tr>
<tr>
<td>T5</td>
<td>43.33</td>
<td>47.57</td>
<td>41.67</td>
<td>44.19</td>
</tr>
<tr>
<td>Mean</td>
<td>47.97</td>
<td>52.36</td>
<td>43.00</td>
<td>46.58</td>
</tr>
<tr>
<td>T</td>
<td>46.17</td>
<td>50.40</td>
<td>40.33</td>
<td>45.63</td>
</tr>
<tr>
<td>C</td>
<td>40.17</td>
<td>44.40</td>
<td>39.33</td>
<td>43.63</td>
</tr>
<tr>
<td>T×C</td>
<td>46.17</td>
<td>50.40</td>
<td>40.33</td>
<td>45.63</td>
</tr>
<tr>
<td>Mean</td>
<td>46.17</td>
<td>50.40</td>
<td>40.33</td>
<td>45.63</td>
</tr>
<tr>
<td>SEm ±</td>
<td>0.459</td>
<td>0.356</td>
<td>0.795</td>
<td>0.037</td>
</tr>
<tr>
<td>F-Value</td>
<td>* * NS</td>
<td>* * NS</td>
<td>* * NS</td>
<td>* * NS</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>1.881</td>
<td>1.457</td>
<td>0.153</td>
<td>0.118</td>
</tr>
</tbody>
</table>

NS: Non significant; DAG- Days after grafting. T1 - November, T2 – December, T3 – January, T4 - February, T5 - March.