Effect of different sources of potassium and urea on yield attributing characters of aonla (Emblica officinalis Gaertn.)

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Abstract: The present investigation was carried out in Randomized Block Design (R.B.D.) with eight treatments and replicated three times, considering one plant as a unit. The observations were recorded for yield attributing characters of aonla fruits. The significantly maximum fruit yield, fruit retention, fruit size, weight, volume and pulp: stone ratio and minimum fruit drop were recorded with the foliar applications of Potassium sulphate + Urea (2% each) followed by Potassium chloride + Urea (2% each) whereas the lowest result was recorded under the control (Water spray).

Key words: Potassium sulphate, Urea, Fruit retention and Yield

Introduction

The Indian gooseberry (Emblica officinalis Gaertn.) is an important indigenous and minor fruit, belongs to the family Euphorbiaceae and sub family Phyllathoidae. Naturally growing aonla has been reported from Cylon, Cuba, Puerto Rico, Hawaii, Florida, Iran, Iraq, Java, West Indies, Trinidad, Pakistan, Malaya and China (Benthal, 1946). It can be grown under wider edapho-climatic situations; well drained fertile loamy and moderately alkaline soils are the best for its cultivation. In Uttar Pradesh, Pratapgarh has been declared as aonla fruit belt and Agri-export zone. Aonla, being a hardy in nature, is successfully cultivated in wide range of variable soil (sodic and saline soil) and climatic condition viz., arid and semi-arid to dry hot and cold arid regions, rain fed to rainfall area. Aonla is characterized by deep root system and exhibits deciduous nature due to abscission and shedding of determinate shoot during February and March. The foliar application of micro nutrients have immense important role in improving fruit set and productivity of fruits. Aonla tree bears two types of shoots. These are indeterminate (long) and determinate (short) shoots. Indeterminate shoots are always sterile and continue to growth in the season. Determinate shoots appear on the nodes of indeterminate shoots and flower comes on determinate shoots. Among the different tradition grown clonal varieties and land races of aonla have their variation in flowering, fruiting yield and quality of fruits. The bearing behavior is also adversely affected due to variable range of soil moisture, temperature, rainfall and atmospheric humidity. In addition to these the yield in highly associated with variable sex ratio, fruit set, fruit drop, fruit retention maturation and physiological disorders. Foliar application is based on the principle that the nutrients are quickly absorbed by leaves and transported to different parts of the plant to fulfill the function requirement of nutrition (Khan et al., 2009). The intensity of damage caused by fruits dropping can be minimized by the foliar application of micro nutrients and also help to improve yield and fruit quality of the aonla. The objective of study is to find out the effect of different sources of potassium and urea on flowering and fruiting and yield attributes of aonla fruit.

Materials and Methods

The present investigation was carried out at main experimental station of university during the year 2013-14. Ten year old uniform in vigour plants of aonla cv. Narendra Aonla-6 were selected for the study. The soil of orchard was sandy loam having pH 8. The region enjoys sub-humid and sub-tropical climate receiving a mean annual rainfall of about 1200 mm, out of which about 85% is concentrated from mid June to end of September-June being the warmest month. The winter months are cool, dry and occasional frost occurs during this period. Hot wind starts from the month of March and continues up to the onset of monsoon. The experiment was laid out in randomized block design, with eight treatments, T1-Potassium sulphate (2%), T2-Potassium chloride (2%), T3-Potassium nitrate (2%), T4-Potassium sulphate (2%)+Urea (2%), T5-Potassium sulphate (2%)+Urea (2%) and Urea (2%), T6-Potassium chloride (2%)+Urea (2%) and Urea (2%), T7-Urea (2%) and T8-Control (Water Spray) replicated three times. The chemical was sprayed as aqueous solution. The uniform management practices with respect to nutrition and irrigation were adopted for experimental trees kept for observation. The first spray was done on 15th May and second spray on 15th July, 2013. The fruits were harvested during end of Dec., 2013 at the best physiological maturity. The observations were recorded on per cent fruit drop, fruit retention, fruit yield, fruit size, fruit weight and pulp: stone ratio. The data on fruit drop was recorded from five randomly pre-tagged branches, data on misshapen fruits were recorded by taking the weight of such fruits after harvesting of fruits of all the treatments under investigation separately. Size of fruit and stone was recorded with the help of vernier calipers. Statistical analyses of the data obtained in the different sets of experiments were calculated as suggested by Panse and Sukhatme (1985) and results were evaluated at 5% significance.

Results and Discussion

Observations on effect of different treatments were recorded to assess the growth behaviour under uniform management situation. Data pertaining to % fruit drop significantly recorded minimum due to foliar application of T7 at different fruit development stages showed in Table-1. The minimum 71.47% fruit drop and maximum 28.87% fruit retention were noted by combined spray of T5, followed with the spray of T4. However, the maximum 80.32% fruit drop and minimum 18.60% fruit retention were observed under control. The reason for reduction in per cent fruit drop and increment in fruit retention might be due to combined treatment of potassium sulphate and urea which might be increase the endogenous level of potassium and nitrogen. The synthesis of macro and micro nutrients and their translocation to
Effect of potassium and urea on yield of aonla

The results clearly indicated that the fruit size was markedly improved by all the treatments over control (Table-1). The maximum fruit size in terms of fruit length (3.42cm) and width (3.85cm) were recorded with combined spray of T_4, followed by T_3. The reason for increase the number and size of fruits due to potassium application may be attributed to the improvement in vegetative growth of the plant as well as efficient transfer of the photosynthates to the economic part of the plant. The zinc sulphate and urea spray has been reported to increase the size of aonla cv. NA-6 (Khan et al. 2009). These results are closely similar with the finding of (Ali et al. 2005) in guava.

The weight of fruit was improved appreciably by all the nutrients over control. However, the maximum 35.40g fruit weight was observed with the combined spray of T_4, followed by T_3 and the minimum were recorded under the control (Table-1). The potassium indirectly through translocation of food material might be responsible to improve the volume of fruits. Similar results were found with the spray of urea and potassium sulphate at pea stage on ber, (Yadav, 2001) and mango (Datta et al. 2005). The pulp weight, stone weight and pulp: stone ratio was improved by foliar application of nutrients. The maximum (13.33) pulp: stone ratio was recorded with the combined spray of T_4 and the value was minimum under control. However, the promoting effect was observed by almost all the treatment over control. Little information is available for pulp stone ratio of aonla but Singh et al. (2004) reported that spray of urea, muriate of potash, and zinc sulphate increase the pulp stone ratio of aonla fruit. Similar observation in respect to pulp stone ratio has also been recorded by Lal et al. (2001).

The maximum (85.46 kg/tree) fruit yield was recorded with combined sprays of T_4 and minimum (60.92 kg/tree) with control. Number of earlier reports is available to confirm the present finding that foliar feeding of potassium sulphate and urea is helpful in increasing yield in fruit crops. It is possibly due to their directly or indirectly involvement in the fruit setting, retention, reduction in fruit drops as well as in growth and development of fruits. These activities improve number of fruits, fruit length, fruit breadth and fruit weight, ultimately increasing the total yield of fruits. The maximum yield in mango has been reported with spray of potassium sulphate (Datta and Duha, 2005) as compared with other potassium sources. The foliar feeding of Potassium sulphate has given promoting effect on yield markedly in mango (Datta et al. 2011) as well as in Pear (Gill et al. 2012). Kumar et al. (2014) were also recorded significantly maximum yield with foliar application of GA @ 20ppm + NAA @ 50ppm + ZnSO_4 @ 0.4% + Urea @ 2% in phalsa fruit.

Based on present investigation it can be concluded that foliar application of Potassium sulphate and Urea (2%each) was proved to be most effective to increase fruit retention, fruit length, fruit width, fruit volume, fruit weight, pulp: stone ratio and maximum fruit yield besides, dropping of fruit was drastically reduced.

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References


Table-1: Showing the effect of different sources of potassium and urea on physical character and yield attributes of aonla

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Fruit drop (%)</th>
<th>Fruit retention (%)</th>
<th>Fruit length (cm)</th>
<th>Fruit width (cm)</th>
<th>Fruit weight (g)</th>
<th>Pulp: stone ratio</th>
<th>Yield (Kg/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T_1</td>
<td>78.36</td>
<td>23.20</td>
<td>2.93</td>
<td>3.35</td>
<td>32.70</td>
<td>11.02</td>
<td>73.37</td>
</tr>
<tr>
<td>T_2</td>
<td>79.36</td>
<td>22.01</td>
<td>2.83</td>
<td>3.28</td>
<td>32.57</td>
<td>10.71</td>
<td>66.65</td>
</tr>
<tr>
<td>T_3</td>
<td>79.98</td>
<td>21.34</td>
<td>2.81</td>
<td>3.21</td>
<td>33.22</td>
<td>10.44</td>
<td>75.98</td>
</tr>
<tr>
<td>T_4</td>
<td>71.47</td>
<td>28.87</td>
<td>3.42</td>
<td>3.65</td>
<td>35.40</td>
<td>13.33</td>
<td>85.46</td>
</tr>
<tr>
<td>T_5</td>
<td>73.70</td>
<td>26.98</td>
<td>3.32</td>
<td>3.62</td>
<td>34.10</td>
<td>12.64</td>
<td>81.35</td>
</tr>
<tr>
<td>T_6</td>
<td>76.61</td>
<td>25.84</td>
<td>3.28</td>
<td>3.71</td>
<td>33.52</td>
<td>11.51</td>
<td>74.93</td>
</tr>
<tr>
<td>T_7</td>
<td>77.01</td>
<td>24.34</td>
<td>3.04</td>
<td>3.35</td>
<td>32.90</td>
<td>11.12</td>
<td>68.95</td>
</tr>
<tr>
<td>T_8</td>
<td>80.32</td>
<td>18.60</td>
<td>2.79</td>
<td>3.13</td>
<td>30.92</td>
<td>9.75</td>
<td>60.92</td>
</tr>
</tbody>
</table>

S.E.± 1.82 1.24 0.07 0.09 0.69 0.47 1.44 4.38
C.D. at 5% 5.54 3.78 0.23 0.28 2.11 1.41 4.38

Where: T_1: Potassium sulphate 2%; T_2: Potassium chloride 2%; T_3: Potassium nitrate 2%; T_4: Potassium sulphate 2%+Urea 2%; T_5: Potassium chloride 2%+Urea 2%; T_6: Potassium nitrate 2%+Urea 2%; T_7: Urea 2%; T_8: Control (Water Spray)

growing of fruit bud. These results are in close conformity with the finding by (Sharma et al., 2011) recorded that the foliar application of zinc sulphate+ potassium sulphate increased fruit set in ber. The present finding are also in accordance to the observation recorded by Singh et al. (2001) in ber, Singh et al. (2006) in mulberry. Similar observations were found in guava fruit by (Rao et al. 2004) in ber.