EFFECT OF NUTRIENT MANAGEMENT THROUGH BIO-ORGANIC MANURES ON FRUIT SETTING, FRUIT DROP AND FRUIT RETENTION OF ACID LIME (CITRUS AURANTIFOLIA SWINGLE)

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Abstract

Acid lime (Citrus aurantifolia Swingle) is an important fruit crop in citrus group which belongs to the family Rutaceae. It occupies a vital place in the fruit industry, but yield levels of citrus orchards are still very low. There are several factors responsible for low yield in acid lime and among these the inadequate supply of inorganic fertilizers and organic manures are the major one. Thus, an investigation was undertaken on the “Effect of nutrient management through bio-organic manures on reproductive growth and development of acid lime (Citrus aurantifolia Swingle)” in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2016-2018. The experiment was conducted with organic manures and biofertilizers along with inorganic fertilizers which were applied with different treatment combinations viz., T₁ – Control, T₂ – 100% RDF (400:200:220 g/ plant), T₃ – 75% RDF, T₄ – 50% RDF, T₅ – 75% RDF + 100% FYM (20 kg/plant), T₆ – 75% RDF + 50% FYM + 50% Vermicompost (10 kg/plant), T₇ – 75% RDF + 50% FYM + 50% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM), T₈ – 50% RDF + 100% FYM, T₉ – 50% RDF + 75% FYM + 75% Vermicompost, T₁₀ – 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB +150g VAM). There were twelve treatments replicated thrice in Randomized block design (RBD). The reproductive parameters of plant were significantly influenced by the use of organic manures and biofertilizers with inorganic fertilizers. The maximum fruit setting (72.73 %), fruit retention (73.73 %) and the minimum fruit drop (30.48 %) were recorded under T₁₂ – 50% RDF + 75% FYM + 75 % Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB +150g VAM). The least value for reproductive character under control may be due to lack of nutrients supply.

Key words: Citrus aurantifolia, biofertilizers, vermicompost, Azotobacter.

Introduction

A successful cultivation of any crop envisages sufficient knowledge about the nutritional requirements of the plant. The response and requirement of various nutrients differ widely on the agro-climatic conditions and management practices. A plant absorbs a large number of elements from the soil and atmosphere. Some of these elements are directly involved in the nutrition of the plant and deficiency of these makes it impossible for the plant to complete its life cycle. These elements are known as essential elements for plant life (Arnon, 1950).

Application of organic manures is known to improve soil fertility and productivity besides providing stability in crop production. But they are required in large quantities to meet the nutrient requirement of crops owing to their low nutrient content. On the other hand, continuous use of inorganic fertilizers leads to deleterious effects on physical, chemical and biological properties of the soil which in turn reflects on yield. Apart from these organic manures and inorganic fertilizers, bio fertilizers like Azotobacter, Phosphate Solubilising Bacteria and Vesicular Arbuscular Mycorrhizae also contribute to improved crop production through eco-friendly nutrient supply (Bagyaraj, 1991).

Therefore, it has become necessary to integrate organic manures and biofertilizers with inorganic fertilizers in crop production to maintain soil health and yield of crops at higher levels. Information on these aspects in acid lime is lacking. Hence, an attempt has been made to study the effect of nutrient management through bio-
organic manures on reproductive growth and development of acid lime.

Materials and Methods

The experiment was conducted in the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar, Tamil Nadu, India during 2016-2018. The treatment consisted with organic manures and biofertilizers along with inorganic fertilizers which were applied with different treatment combinations viz., T<sub>1</sub> - Control, T<sub>2</sub> - 100% RDF (400:200:220 g/plant), T<sub>3</sub> - 75% RDF, T<sub>4</sub> - 50% RDF, T<sub>5</sub> - 75% RDF + 100% FYM (20 kg/plant), T<sub>6</sub> - 75% RDF + 50% FYM + 100% Vermicompost (10 kg/plant), T<sub>7</sub> - 75% RDF + 50% FYM + 50% Vermicompost, T<sub>8</sub> - 75% RDF + 50% FYM + 50% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM), T<sub>9</sub> - 50% RDF + 100% FYM, T<sub>10</sub> - 50% RDF + 100% Vermicompost, T<sub>11</sub> - 50% RDF + 75% FYM + 75% Vermicompost, T<sub>12</sub> - 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM). There were twelve treatments replicated thrice in Randomized block design (RBD). The observations were recorded on reproductive parameters viz., fruit setting (%), fruit drop (%) and fruit retention (%) The data generated through this investigation was analyzed by the statistical method of Panse and Sukhatme (1985).

Results and Discussion

The reproductive parameters of plant were significantly influenced by the use of organic manures and biofertilizers with inorganic fertilizers. The maximum fruit setting (72.73 %), fruit retention (73.73 %) and fruit drop (30.48 %) were recorded under T<sub>12</sub> - 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM). The least value for reproductive character under control may be due to lack of nutrients supply.

The optimum dose of nutrient combinations (NPK) accelerates the metabolic activities of the plant by increasing the meristematic activities which in turn increases the vegetative growth and ultimately lead to increase flowering, maximum fruit setting percent and maximum fruit retention percent. Similar results have also been reported by Zang and Lei (2000) and Uma Shankar et al., (2002) in guava.

The highest fruit set and retention might be due to supply of nutrients in adequate proportion right from starting of the experimentation to the harvesting of crop, which induces more flowering and retention of fruit due to production and supply of photosynthates at critical requirement. The results are also in close conformity with the findings of Singh et al., (2010) in ber, Goswami et al., (2012) in guava and Singh et al., (2014) in bael.

The fact that combined application of nitrogen and FYM enhances leaf expansion and its dark green colour, which favours photosynthesis and respiration; hence, growth is enhanced by application nitrogen and balanced nutrition provided by FYM. It does not only add organic matter and macro and micro nutrients to soil, but also improves the physico-chemical properties of soil, which provides better conditions for plant growth and development. The findings are in line with the results obtained in kinnow (Garwal et al., 2014).

Vermicompost has very high porosity, aeration, drainage and water holding capacity and have a vast surface area, providing strong absorbability and retention of nutrients for longer period of time hence maximizing fruit setting percentage and fruit retention percentage. Singh et al., (2008) in aonla and Dhomane et al., (2011) in guava also reported similar results.

Presence of B group vitamins, plant hormones and chemical exudates released during

<table>
<thead>
<tr>
<th>Tr. No.</th>
<th>Treatment</th>
<th>Fruit setting(%)</th>
<th>Fruit drop(%)</th>
<th>Fruit retention (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Control</td>
<td>35.06</td>
<td>61.74</td>
<td>30.04</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>100% RDF (400:200:220 g/plant)</td>
<td>45.79</td>
<td>53.74</td>
<td>41.78</td>
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<tr>
<td>T&lt;sub&gt;3&lt;/sub&gt;</td>
<td>75% RDF</td>
<td>42.11</td>
<td>56.47</td>
<td>37.49</td>
</tr>
<tr>
<td>T&lt;sub&gt;4&lt;/sub&gt;</td>
<td>50% RDF</td>
<td>38.64</td>
<td>59.13</td>
<td>33.81</td>
</tr>
<tr>
<td>T&lt;sub&gt;5&lt;/sub&gt;</td>
<td>75% RDF + 100% FYM (20 kg/plant)</td>
<td>52.89</td>
<td>48.02</td>
<td>50.21</td>
</tr>
<tr>
<td>T&lt;sub&gt;6&lt;/sub&gt;</td>
<td>75% RDF + 100% Vermicompost (10 kg/plant)</td>
<td>58.83</td>
<td>42.64</td>
<td>57.32</td>
</tr>
<tr>
<td>T&lt;sub&gt;7&lt;/sub&gt;</td>
<td>75% RDF + 50% FYM + 50% Vermicompost</td>
<td>62.35</td>
<td>39.47</td>
<td>61.73</td>
</tr>
<tr>
<td>T&lt;sub&gt;8&lt;/sub&gt;</td>
<td>75% RDF + 50% FYM + 50% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM)</td>
<td>68.56</td>
<td>33.85</td>
<td>69.34</td>
</tr>
<tr>
<td>T&lt;sub&gt;9&lt;/sub&gt;</td>
<td>50% RDF + 100% FYM</td>
<td>49.55</td>
<td>50.90</td>
<td>46.32</td>
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<tr>
<td>T&lt;sub&gt;10&lt;/sub&gt;</td>
<td>50% RDF + 100% Vermicompost</td>
<td>55.42</td>
<td>45.73</td>
<td>53.45</td>
</tr>
<tr>
<td>T&lt;sub&gt;11&lt;/sub&gt;</td>
<td>50% RDF + 75% FYM + 75% Vermicompost</td>
<td>66.39</td>
<td>36.26</td>
<td>66.40</td>
</tr>
<tr>
<td>T&lt;sub&gt;12&lt;/sub&gt;</td>
<td>50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25g Azotobacter + 25g PSB + 150g VAM)</td>
<td>72.73</td>
<td>30.48</td>
<td>73.73</td>
</tr>
</tbody>
</table>

S. Ed | 1.55 | 1.27 | 1.78 |
| CD(P=0.05) | 3.12 | 2.58 | 3.59 |
biological activity promoted by the vermicompost in the soil and retention of nutrients for longer period of time in combination with optimum level of recommended dose of NPK accelerates the process of synthesis and accumulation of food materials and application of biofertilizers increase the rootlet density and branching of roots resulting increased nutrient status as well as their uptake by the plants, they promote hormonal activity and induce their synthesis, reduce the flower and fruit drop caused by hormonal imbalance, hence maximizing fruit setting and fruit retention percentage which ultimately leads to increase in yield and other yield parameters. The present findings are in accordance with the results reported by Yadav et al., (2011) in mango and Binepal et al., (2013) in guava.

Increased nutrient availability from NPK, Farm Yard Manure, Vermicompost and biofertilizers like Azotobacter, Phosphate Solubilizing Bacteria and Vesicular Arbuscular Mycorrhizae which have increased various endogenous hormonal levels in plant tissue which might be responsible for enhancing flowering pollen germination and pollen tube which might have ultimately increased fruit set and higher fruit retention. The results of present findings are confirmed due to findings of earlier workers Shukla et al., (2009) in guava and Godage et al., (2013) in guava.

Thus, it could be seen that the application of organic manures at the rate of 15 kg FYM + 7.5 kg Vermicompost and Biofertilizers at the rate of 25 g Azotobacter + 25 g PSB + 150 g VAM can reduce the inorganic fertilizations to at extent of 50 percent (200 g nitrogen, 100 g phosphorus and 110 g potassium per tree) increasing the reproductive growth and development of acid lime.

Conclusion

The reproductive characters of plant were significantly influenced by the nutrient management through bio-organic manures. The maximum increase in the reproductive parameters viz., The maximum fruit setting (%), fruit retention (%) and the minimum fruit drop (%) were observed with the application of 50% RDF + 75% FYM + 75% Vermicompost + Biofertilizers (25 g Azotobacter + 25 g PSB + 150 g VAM) which was significantly superior than control. This may be due to acceleration of metabolic activity of the plant by increasing the meristematic activities and more photosynthates which ultimately leads to increase in flowering, maximum fruit setting percent and maximum fruit retention percent.

References


Waltham, Mss. Chronica Botanica. 31-39.


