Yield and benefit: cost ratio of cultivation of strawberry (*Fragaria x ananassa* Duch.) cv. Nabila under net tunnel influenced by the foliar spray of calcium and micro-nutrients

Sangeeta Chandrakar, Prabhakar Singh, Hemant Kumar Panigrahi and Sarita Paikra

Abstract

The experiment was conducted with ten treatments and three replications in Randomized Completely Block Design. The treatment consisted ten different concentrations of Calcium and micro-nutrients along with recommended dose of fertilizers viz. T<sub>1</sub>: RDF + control (water spray), T<sub>2</sub>: RDF + CaCl<sub>2</sub> @ 0.4%, T<sub>3</sub>: RDF + CaCl<sub>2</sub> @ 0.6%, T<sub>4</sub>: RDF + CaCl<sub>2</sub> @ 0.8%, T<sub>5</sub>: RDF + ZnSO<sub>4</sub> @ 0.4%, T<sub>6</sub>: RDF + ZnSO<sub>4</sub> @ 0.6%, T<sub>7</sub>: RDF + ZnSO<sub>4</sub> @ 0.8%, T<sub>8</sub>: RDF + FeSO<sub>4</sub> @ 0.4%, T<sub>9</sub>: RDF + FeSO<sub>4</sub> @ 0.6% and T<sub>10</sub>: RDF + FeSO<sub>4</sub> @ 0.8%. The data revealed that the highest yield (426.14 q/ha) was obtained under the treatment T<sub>3</sub> (RDF + ZnSO<sub>4</sub> @ 0.6%), which was found 42 per cent more over control followed by treatment T<sub>5</sub> (RDF + FeSO<sub>4</sub> @ 0.6%). Similarly the highest benefit: cost ratio (4.16:1) was registered under the superiority of treatment T<sub>3</sub> whereas the minimum benefit: cost ratio (2.03:1) was noticed under the treatment T<sub>0</sub>.

Keywords: strawberry, calcium, micro-nutrients, foliar spray, benefit, cost, etc.

Introduction

Strawberry (*Fragaria x ananassa* Duch.) is one of the most important temperate fruit, belongs to the family Rosaceae but it can also be grown in tropical and sub-tropical climate. Strawberry plant shows maximum growth and development at an optimum day temperature of 22 to 23 °C and night temperature 7 to 13 °C. Frost as well as winter injury are very harmful to the plant and seriously reduces yield of berries. Sandy loam soil with a pH range of 5.5 to 6.5 is suitable for better plant growth and development.

Nutritionally, strawberry contains low calorie carbohydrate and a potential source of vitamin C and fibers. It contains more vitamin C than oranges. The chemical composition of strawberry is ascorbic acid (64.0mg), water (91.75g), protein (0.61g), fat (0.37g), carbohydrate (7.02g), fiber (2.3g), calcium (14.0mg), potassium (166.0 mg/160g) and vitamin-A (27 IU). In India the total area of strawberry is 1000 ha with production of 5000 MT (Anonymous, 2016) [1]. In India, Maharashtra is the leading State in production of strawberry fruits. It is also commercially grown in Haryana, Punjab, Uttar Pradesh, Jammu and Kashmir, Uttarakhand and lower hills of Himachal Pradesh.

The nutrition status of strawberry plant plays a vital role in determining the yield and yield attributing parameters since it is a very sensitive plant to nutrient deficiency. (Mohamed et al., 2011) [6]. An optimal fertilization is contributive in obtaining high yield of good quality and high biological value. Both calcium and micro-nutrients are well known to ameliorate plant growth, yield and quality.

Methods and Materials

The field experiment was carried out during the year 2017-18 at Research Farm of Centre of Excellence on Protected Cultivation and Precision farming under net tunnel, College of Agriculture, IGKV, Raipur (C.G.). The soil of experimental field was clay-loam having pH 7.7. Strawberry cv. Nabila was taken for experiment and planted at spacing of 30 X 30cm in raised bed inside the net tunnel. Three different concentrations of Ca and micro-nutrients were applied as foliar feeding at 30 and 60 days after planting of strawberry plants.

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The experiment was laid out in Randomized Completely Block Design with three replications and ten treatments. The treatment consisted ten different concentrations of Ca and micro-nutrients along with recommended dose of fertilizers viz. T1: RDF + Control (water spray), T2: RDF + CaCl₂ @ 0.4%, T3: RDF + CaCl₂ @ 0.6%, T4: RDF + CaCl₂ @ 0.8%, T5: RDF + ZnSO₄ @ 0.4%, T6: RDF + ZnSO₄ @ 0.6%, T7: RDF + ZnSO₄ @ 0.8%, T8: RDF + FeSO₄ @ 0.4%, T9: RDF + FeSO₄ @ 0.6% and T10: RDF + FeSO₄ @ 0.8%.

All the experimental plants were uniformly maintained and same cultured practices were provided i.e. fertilization, irrigation and plant protection measures during whole period of investigation. Irrigation and fertilizers has been provided to the plants through the drip system of irrigation. The yield (q/ha) and benefit: cost ratio was recorded and analyzed.

Results Findings and Discussion

The results pertaining to the yield and benefit: cost ratio is summarized as follows:

Yield (q/ha)

The highest yield (426.14 q/ha) was recorded under the treatment T5 (RDF + ZnSO₄ @ 0.6%), followed by T6 (RDF + FeSO₄ @ 0.4%) having an average fruit yield of 379.76 q/ha. All the treatments were found significantly different with each other. The minimum fruit yield (273.65 q/ha) was recorded under the treatment RDF + Control (T0).

Significantly the highest yield (426.14 q/ha) was obtained from the plants treated with RDF + ZnSO₄ @ 0.6% compared to all other treatments. However the lowest yield (273.65 q/ha) was observed under control. The increase in fruit yield could be attributed to increased size, diameter and fruit weight. Moreover, probably there was a greater diversion of photosynthates to sink (Fruit), which ultimately added to the fruit yield. Similar results were also obtained by Bakshi et al. (2013a) [2], Bakshi et al. (2013b) [3] and Mehrraj et al. (2015) [5] in strawberry.

Benefit: Cost ratio

The highest Benefit: Cost ratio (4.16:1) was recorded under the treatment T5 (RDF + ZnSO₄ @ 0.6%), followed by T8 (3.52:1). However the lowest Benefit: Cost ratio (2.03:1) was registered under T0 (RDF + Control) which were at par with treatment T3 & T7 having respective B: C ratio of 2.81:1 & 2.67:1.

Table 1: Effect of foliar feeding of Ca and micro-nutrients on yield, yield attributing parameters and benefit: cost ratio of strawberry cv. Nabila under net tunnel

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Yield (q/ha)</th>
<th>B: C ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDF + Water spray (Control)</td>
<td>273.65</td>
<td>2.03:1</td>
</tr>
<tr>
<td>RDF + CaCl₂ @ 0.4%</td>
<td>299.74</td>
<td>2.65:1</td>
</tr>
<tr>
<td>RDF + CaCl₂ @ 0.6%</td>
<td>362.49</td>
<td>2.82:1</td>
</tr>
<tr>
<td>RDF + CaCl₂ @ 0.8%</td>
<td>310.09</td>
<td>3.51:1</td>
</tr>
<tr>
<td>RDF + ZnSO₄ @ 0.4%</td>
<td>341.86</td>
<td>2.12:1</td>
</tr>
<tr>
<td>RDF + ZnSO₄ @ 0.6%</td>
<td>426.14</td>
<td>4.16:1</td>
</tr>
<tr>
<td>RDF + ZnSO₄ @ 0.8%</td>
<td>302.61</td>
<td>2.83:1</td>
</tr>
<tr>
<td>RDF + FeSO₄ @ 0.4%</td>
<td>356.75</td>
<td>2.67:1</td>
</tr>
<tr>
<td>RDF + FeSO₄ @ 0.6%</td>
<td>379.76</td>
<td>3.52:1</td>
</tr>
<tr>
<td>RDF + FeSO₄ @ 0.8%</td>
<td>302.33</td>
<td>2.28:1</td>
</tr>
</tbody>
</table>

1. RDF – Recommended dose of fertilizers
2. The superscript letter indicates that the treatment means with same letters are at par with each other. This result collaborates with the result of Patel et al. (2010) [7] and Geetha Shetty et al. (2010) in banana.

Fig 1: Yield (q/ha) per plant as influenced by foliar feeding of Ca and micro-nutrients on strawberry cv. Nabila under net tunnel
Conclusions
The highest yield per plant in strawberry (cv. Nabila) was recorded under the treatment $T_5$ (RDF + ZnSO$_4$ @ 0.6%) which was recorded 42 per cent higher as compared to control. The treatment $T_5$ (RDF + ZnSO$_4$ @ 0.6%), recorded highest Benefit: Cost ratio under the present study, which will be beneficial for the strawberry cultivation. Based on the results of the present investigation, it can be concluded that the foliar application of ZnSO$_4$ @ 0.6% along with recommended dose of fertilizers was found best treatment, by which yield and benefit: cost ratio of strawberry cultivation can be significantly influenced.

References