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Sangeeta Chandrakar
Department of Fruit Science,
College of Agriculture,
Indira Gandhi Krishi
Viswavidyalaya, Krishak Nagar,
Raipur, Chhattisgarh, India

Prabhakar Singh
Department of Fruit Science,
College of Agriculture,
Indira Gandhi Krishi
Viswavidyalaya, Krishak Nagar,
Raipur, Chhattisgarh, India

Hemant Kumar Panigrahi
Department of Fruit Science,
College of Agriculture,
Indira Gandhi Krishi
Viswavidyalaya, Krishak Nagar,
Raipur, Chhattisgarh, India

Sarita Paikra
Department of Fruit Science,
College of Agriculture,
Indira Gandhi Krishi
Viswavidyalaya, Krishak Nagar,
Raipur, Chhattisgarh, India

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. T₀: RDF + control (water spray), T₁: RDF + CaCl₂ @ 0.4%, T₂: RDF + CaCl₂ @ 0.6%, T₃: RDF + CaCl₂ @ 0.8%, T₄: RDF + ZnSO₄ @ 0.4%, T₅: RDF + ZnSO₄ @ 0.6%, T₆: RDF + ZnSO₄ @ 0.8%, T₇: RDF + FeSO₄ @ 0.4%, T₈: RDF + FeSO₄ @ 0.6% and T₉: RDF + FeSO₄ @ 0.8%. The data revealed that the highest yield (426.14 q/ha) was obtained under the treatment T₅ (RDF + ZnSO₄ @ 0.6%), which was found 42 per cent more over control followed by treatment T₈ (RDF + FeSO₄ @ 0.6%). Similarly the highest benefit: cost ratio (4.16:1) was registered under the superiority of treatment T₅ whereas the minimum benefit: cost ratio (2.03:1) was noticed under the treatment T₀.

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 nutritional balance (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.

Correspondence
Sangeeta Chandrakar
Department of Fruit Science,
College of Agriculture,
Indira Gandhi Krishi
Viswavidyalaya, Krishak Nagar,
Raipur, Chhattisgarh, India

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. T₀: RDF + Control (water spray), T₁: RDF + CaCl₂ @ 0.4%, T₂: RDF + CaCl₂ @ 0.6%, T₃: RDF + CaCl₂ @ 0.8%, T₄: RDF + ZnSO₄ @ 0.4%, T₅: RDF + ZnSO₄ @ 0.6%, T₆: RDF + ZnSO₄ @ 0.8%, T₇: RDF + FeSO₄ @ 0.4%, T₈: RDF + FeSO₄ @ 0.6% and T₉: RDF + FeSO₄ @ 0.8%.

All the experimental plants were uniformly maintained and same cultural 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 of different treatments 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 T₈ (RDF + FeSO₄ @ 0.6%) 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 fruits 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 Mehraj *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 T₉ & T₄ having respective B: C ratio of 2.28:1 & 2.12:1 under the present investigation. The treatments T₃ & T₈ and T₁, T₂, T₆ & T₇ having respective B: C ratio of 3.51: 1 & 3.52: 1 and 2.65: 1, 2.82: 1, 2.83: 1 & 2.67:1 were found statistically 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.

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

Treatments	Yield (q/ha)	B:C ratio
RDF + Water spray (Control)	273.65 ^a	2.03:1 ^a
RDF + CaCl ₂ @ 0.4%	299.74 ^b	2.65:1 ^b
RDF + CaCl ₂ @ 0.6%	362.49 ^f	2.82:1 ^b
RDF + CaCl ₂ @ 0.8%	310.09 ^c	3.51:1 ^c
RDF + ZnSO ₄ @ 0.4%	341.86 ^d	2.12:1 ^a
RDF + ZnSO ₄ @ 0.6%	426.14 ^h	4.16:1 ^d
RDF + ZnSO ₄ @ 0.8%	302.61 ^b	2.83:1 ^b
RDF + FeSO ₄ @ 0.4%	356.75 ^e	2.67:1 ^b
RDF + FeSO ₄ @ 0.6%	379.76 ^g	3.52:1 ^c
RDF + FeSO ₄ @ 0.8%	302.33 ^b	2.28:1 ^a
SE(m) ±	1.14	0.11
C.D. at 5%	3.42	0.31

1. RDF – Recommended dose of fertilizers
2. The superscript letter indicates that the treatment means with same letters are at par at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD- value comparison of treatment means.

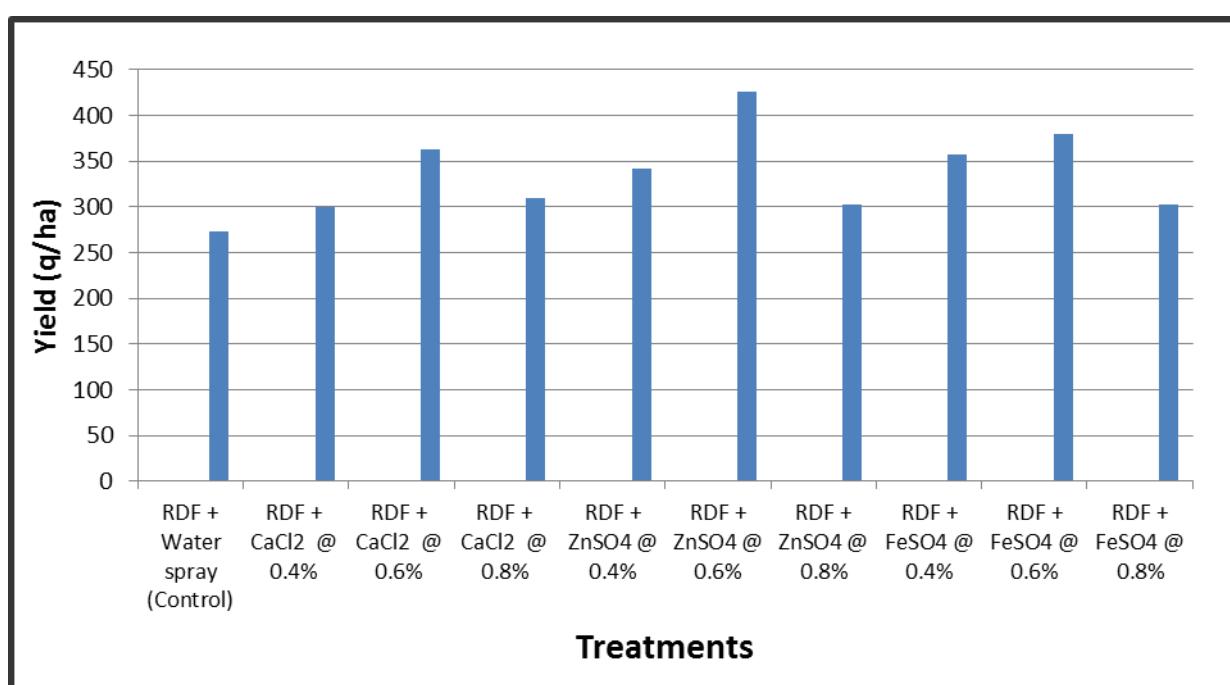


Fig 1: Yield (q/ha) per plant as influenced by foliar feeding of Ca and micro-nutrients on strawberry cv. Nabila under net tunnel

Conclusions

The highest yield per plant in strawberry (cv. Nabila) was recorded under the treatment T₅ (RDF + ZnSO₄ @ 0.6%) which was recorded 42 per cent higher as compared to control. The treatment T₅ (RDF + ZnSO₄ @ 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 ZnSO₄ @ 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.

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