Foliar Application of Seaweed Extract and Micronutrients on Plant Growth and Yield of Strawberry (Fragaria X Annanassa Duch) CV. Winter Dawn

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ABSTRACT

The study investigates the potential benefits of integrating seaweed extracts and micronutrients into the cultivation practices of strawberries to enhance overall plant performance and fruit production. Seaweed extracts are known to contain bioactive compounds, including plant growth regulators, amino acids, and minerals, which have been reported to positively influence various physiological processes in plants. Additionally, micronutrients play a crucial role in the plant's metabolic activities, and deficiencies can lead to reduced growth and yield. The synergistic effects of seaweed extract and micronutrients present an intriguing avenue for improving the overall health and productivity of strawberry crops. The review summarizes the findings from recent studies, assessing the impact of foliar application of seaweed extracts and micronutrients on strawberry plants. Improvements in growth parameters, nutrient uptake, TSS, and yield attributes were observed.

Keywords: - Seaweed extract, Micronutrients, Growth Parameters, TSS

INTRODUCTION

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The strawberry, scientifically known as Fragaria × ananassa, is a hybrid species that belongs to the Rosaceae family. The optimum temperature for the growth of perennial strawberry lies between 7°C and 13°C at night and 22°C to 25°C during the day. It is a cultivated garden strawberry that originated from a cross between the Virginia strawberry (Fragaria virginiana) and the Chilean strawberry (Fragaria chiloensis).The genus Fragaria includes several species that produce strawberries, and they are collectively referred to as strawberries. The cultivation of strawberries, particularly the Winter Dawn variety, is of significant agricultural interest due to the economic importance and widespread consumption of this fruit. Due to the regress loss of firm texture, they have a shorter shelf life. Low calcium levels have a significant impact on all of the cell wall characteristics of fruit that includes, cell wall thickness, strength of cell wall, turgor, and pectate lyase enzyme. The foliar application of seaweed extract and micronutrients has gained attention as a potential strategy to enhance plant growth, improve nutrient uptake, and ultimately increase crop yield. Seaweeds are macroscopic algae growing in the marine and shallow coastal waters and on rocky shores. Seaweed extract are the biostimulants, that accounts for more than 33 % of the global market and by 2022, its value reached to 894 million euros. Seaweed extract is known for its rich content of bioactive compounds, such as auxins, cytokines, and other growth-promoting substances .These compounds have been reported to positively influence various physiological processes in plants, including seed germination, root development, and flowering. Micronutrients, essential elements required by plants in small quantities, play a crucial role in various metabolic processes. Their deficiency can significantly impact plant growth and yield. The foliar application of micronutrients aims to address such deficiencies and optimize the overall nutritional status of the plants. The study reviews existing literature, synthesizes research findings, and critically evaluates the effectiveness of foliar application of seaweed extract and

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micronutrients on strawberry plants. It explores the physiological mechanisms underlying the observed effects, considering factors such as nutrient absorption, photosynthesis, and stress tolerance.

MATERIALS AND METHODS

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The details of the various materials used and methods adopted in carrying out the experiment are presented below:

EXPERIMENTAL SITE:

The present investigation entitled **"Effect of different concentration of seaweed extract and micronutrients on plant growth, yield and quality of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter Dawn**" was carried out during the year 2023-2024 in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences Prayagraj in the months of October 2023 to February 2024. The experiment was conducted on strawberry cv. Witner down. All the facilities necessary for cultivation, including labour were made in the department.

Layout and treatment combination

Studies on effect of seaweed extract and micronutrients on growth and yield of strawberry was carried out on cv. Winter dawn during 2023-24 at Horticulture Research Farm of Naini Agricultural Institute, SHUATS, Prayagraj, (Uttar Pradesh). The experiment was laid out in RBD viz. Treatments at 13 levels viz. T0: control, T1: SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%, T2: SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%, T3: SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, T4: SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%, T5: SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%, T6: SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%, T7: SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, T8: SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%, T9: SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%, T10: SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%, T11: SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, T12: SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. The transplanting was done on 28/10/2023 in field condition.

CLIMATE:

The prayagraj District comes under subtropical belt in the southeast of U.P. which experience extremely hot summer and fairly cold winter. During the winter months (Dec.-Jan) temperature falls 2-5^{0}C or even low, while in summer months (May-June) it reaches as high as 49^{0}C. Hot blowing winds are regular feature during the summers and an occasional spell of frost may be during winters. Most of the rainfall is received in the middle of July to end of September after which the intensity of rainfall decreases. The mean annual rainfall is about 850-1100mm. However, occasional precipitation is also not uncommon during winter months.

RUNNING STATUS -

1. Growth Parameter

• Plant Height (cm)

• Plant Spread (cm)

• Chlorophyll Content

2. Leaf Parameter

• Number of leaves per plant

• Leaf area (sq. cm)

• Petiole length (cm)

3. Flower Parameter

• Days taken to flower

4. Fruit Parameter

• Berry weight (g)

• Berry Length (cm)

• Berry diameter (mm)

5. Yield Parameter

• Total Yield per plant (kg) (Yield/ha)

6. Quality Parameter

• Total Soluble Solids (Brix)

• Vitamin C content (mg/100 g of fresh fruit)

• Total sugar (%)

7. Economics

• Cost of cultivation (Rs)

RESULTS AND DISCUSSIONS

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During the present investigation, observations on various plant characteristics were recorded to evaluate the **"Effect of different concentration of seaweed extract and micronutrients on plant growth, yield and quality of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter**

Dawn". The tabulated data were statistically analyzed with a view to find out the significant effect of different factors which are present in the appendix 1. The data present in the tabular forms shows the relevant standard error of mean deviation S. (±) and the critical difference (C.D) at 5% level of significance, wherever necessary. The results emanating from the present studies are presented under appropriate heading:

TABLE 1: Effect of different concentration of seaweed extract and micronutrients on plant height (cm) of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter dawn

Treatment No.	Treatments details	Plant height (cm)			
		30 DAT	60 DAT	90 DAT	120 DAT
T0	Control	7.20	10.47	16.50	20.97
T1	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	8.43	15.46	20.36	27.86
T2	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	8.57	17.29	24.86	27.85
T3	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	8.67	16.95	24.14	27.80
T4	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	9.12	18.17	27.21	30.30
T5	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	8.63	14.80	24.98	29.90
T6	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	8.07	15.49	23.98	27.22
T7	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	8.07	15.43	24.28	27.66
T8	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	9.19	18.31	27.35	31.15
T9	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	8.64	16.89	23.10	27.95
T10	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	8.32	16.00	24.20	28.11
T11	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	9.23	18.57	27.46	31.25
T12	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	9.31	18.68	27.57	32.31
	F-Test	**S**	**S**	**S**	**S**
	S.Ed.	**0.189**	**0.328**	**0.820**	**0.879**
	CD at 0.5%	**0.390**	**0.677**	**1.692**	**1.815**
	CV	**2.701**	**2.459**	**4.131**	**3.780**

At 30 days after transplanting, maximum plant height (cm) (9.31) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant height (cm) (7.20) was found recorded in T_0 Control respectively

At 60 days after transplanting, maximum plant height (cm) (18.68) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant height (cm) (10.47) was found recorded in T_0 Control respectively.

At 90 days after transplanting, maximum plant height (cm) (27.57) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant height (cm) (16.50) was found recorded in T_0 Control respectively.

At 120 days after transplanting, maximum plant height (cm) (32.31) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Followed by, SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% and SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% .Where as the minimum plant height (cm) (20.97) was found recorded in T_0 Control respectively.

TABLE 2: Effect of different concentration of seaweed extract and micronutrients on plant spread (cm) of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter dawn

Treatment No.	Treatments details	Plant spread (cm)			
		30 DAT	60 DAT	90 DAT	120 DAT
T0	Control	9.54	13.79	17.31	26.64
T1	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	11.40	21.18	27.79	33.64
T2	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	10.76	21.03	26.94	30.57
T3	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	11.07	20.94	24.08	31.10
T4	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	12.14	24.20	29.46	36.12
T5	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	12.03	20.52	24.72	32.05
T6	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	11.19	20.94	26.68	33.83
T7	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	11.08	22.36	24.64	31.60

T8	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	12.26	24.83	29.68	36.24
T9	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	11.22	22.40	25.38	31.95
T10	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	11.07	21.45	24.97	33.10
T11	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	12.44	25.28	30.00	37.14
T12	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	12.54	25.42	31.10	37.01
F-Test		**S**	**S**	**S**	**S**
S.Ed.		**0.179**	**0.372**	**0.741**	**0.896**
CD at 0.5%		**0.370**	**0.767**	**1.528**	**1.849**
CV		**1.918**	**2.082**	**3.440**	**3.309**

At 30 days after transplanting, maximum plant spread (cm) (12.54) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant spread (cm) (9.54) was found recorded in T_0 Control respectively.

At 60 days after transplanting, maximum plant spread (cm) (25.42) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant spread (cm) (13.79) was found recorded in T_0 Control respectively.

At 90 days after transplanting, maximum plant spread (cm) (31.10) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant spread (cm) (17.31) was found recorded in T_0 Control respectively.

At 120 days after transplanting, maximum plant spread (cm) (37.01) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Followed by SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, T_8 SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% and SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum plant spread (cm) (26.64) was found recorded in T_0 Control respectively.

TABLE 3: Effect of different concentration of seaweed extract and micronutrients on number of leaves per plant of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter dawn

Treatment No.	Treatments details	Number of leaves per plant			
		30 DAT	60 DAT	90 DAT	120 DAT

T0	Control	5.35	12.38	20.19	30.08
T1	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	6.34	19.66	24.93	34.69
T2	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	6.24	19.53	26.43	34.64
T3	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	6.16	19.60	29.13	33.75
T4	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	7.04	21.16	31.15	40.86
T5	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	6.49	19.12	26.78	32.36
T6	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	6.41	19.68	28.43	34.91
T7	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	6.26	19.47	26.99	33.11
T8	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	7.11	22.73	31.84	41.37
T9	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	6.49	20.12	27.47	34.59
T10	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	6.43	20.26	26.93	33.72
T11	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	7.17	22.83	32.52	43.35
T12	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	7.31	24.64	34.66	45.43
F-Test		**S**	**S**	**S**	**S**
S.Ed.		**0.124**	**0.743**	**0.708**	**1.250**
CD at 0.5%		**0.256**	**1.533**	**1.461**	**2.579**
CV		**2.333**	**4.527**	**3.067**	**4.208**

At 30 days after transplanting, maximum Number of leaves per plant (7.31) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Number of leaves per plant (5.35) was found recorded in T_0 Control respectively.

At 60 days after transplanting, maximum Number of leaves per plant (24.64) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. followed by with SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% and SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% Where as the minimum Number of leaves per plant (12.38) was found recorded in T_0 Control respectively.

At 90 days after transplanting, maximum Number of leaves per plant (34.66) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. followed by withy SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%, T_8 SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% and SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% Where as the minimum Number of leaves per plant (20.19) was found recorded in T_0 Control respectively.

At 120 days after transplanting, maximum Number of leaves per plant (45.43) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Number of leaves per plant (30.08) was found recorded in T_0 Control respectively.

TABLE 4: Effect of different concentration of seaweed extract and micronutrients on petiole length (cm) of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter dawn

Treatment No.	Treatments details	Petiole length (cm)			
		30 DAT	60 DAT	90 DAT	120 DAT
T0	Control	4.09	6.19	7.16	9.41
T1	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	5.41	7.47	9.41	12.29
T2	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	5.08	7.17	8.56	10.36
T3	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	4.66	7.23	9.14	11.35
T4	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	6.63	8.07	10.16	13.14
T5	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	5.22	7.18	8.79	12.53
T6	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	4.71	7.50	8.56	12.43
T7	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	5.58	8.29	9.76	12.01
T8	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	6.83	8.28	11.14	13.24
T9	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	4.85	6.86	8.28	12.21
T10	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	5.87	7.87	9.87	12.23
T11	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	7.02	8.61	12.24	13.45
T12	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	7.07	8.77	12.51	14.42
F-Test		**S**	**S**	**S**	**S**
S.Ed.		**0.201**	**0.192**	**0.234**	**0.233**
CD at 0.5%		**0.416**	**0.396**	**0.483**	**0.480**
CV		**4.390**	**3.074**	**2.964**	**2.330**

At 30 days after transplanting, maximum Petiole length (cm) (7.07) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Petiole length (cm) (4.09) was found recorded in T_0 Control respectively.

At 60 days after transplanting, maximum Petiole length (cm) (8.77) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Petiole length (cm) (6.19) was found recorded in T_0 Control respectively.

At 90 days after transplanting, maximum Petiole length (cm) (12.51) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Petiole length (cm) (7.16) was found recorded in T_0 Control respectively.

At 120 days after transplanting, maximum Petiole length (cm) (14.42) was recorded in T_{12} SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%. Where as the minimum Petiole length (cm) (9.41) was found recorded in T_0 Control respectively.

TABLE 5: Effect of different concentration of seaweed extract and micronutrients on Days to first flowering, Days to first fruiting, Number of flower per plant, Number of fruit per plant, Fruit weight (gm) of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Winter dawn.

Treatment No.	Fruit weight (gm)	Number of fruit per plant	Number of flower per plant	Days to first fruiting	Days to first flowering
T0	15.16	10.18	23.83	61.98	54.13
T1	22.93	15.63	27.5	58.27	49.76

T2	22.95	16.43	30.43	54.77	46.62
T3	22.3	15.32	29.95	53.42	45.76
T4	25.79	17.07	33.07	52.01	43.76
T5	22.3	16.03	29.44	53.43	45.55
T6	23.96	15.96	28.83	55.94	47.79
T7	22.03	15.44	27.1	58.76	50.1
T8	25.64	17.32	33.44	49.78	41.63
T9	22.03	15.29	27.97	55.89	47.44
T10	22.33	16.54	26.35	54.24	45.61
T11	26.12	17.4	33.71	56.45	48.2
T12	27.12	18.43	34.64	46.34	39.81
F-Test	**S**	**S**	**S**	**S**	**S**
S.Ed.	**0.342**	**0.49**	**0.631**	**1.161**	**1.158**
CD at 0.5%	**0.706**	**1.011**	**1.302**	**2.396**	**2.39**
CV	**1.812**	**3.766**	**2.6**	**2.598**	**3.042**

TABLE 6: Effect of different concentration of seaweed extract and micronutrients on TSS, Acidity, Ascorbic acid, Specific gravity, pH.

Treatment No.	TSS 0Brix	Acidity (%)	Ascorbic acid (mg/100g)	Specific gravity	pH
T0	7.58	0.61	51.17	1.09	3.93
T1	8.16	0.79	54.78	1.31	3.77
T2	8.43	0.86	55.85	1.18	3.75
T3	9.13	0.88	55.03	1.32	3.7
T4	9.23	1.07	57.09	1.35	3.64

T5	8.16	1.05	54.34	1.18	3.73
T6	8.47	0.92	53.54	1.14	3.74
T7	8.48	0.91	55.17	1.23	3.78
T8	9.77	1.1	57.2	1.31	3.47
T9	8.39	0.84	52.3	1.14	3.81
T10	9.07	1.03	55.31	1.29	3.54
T11	10.14	1.18	57.43	1.53	3.37
T12	10.29	1.3	58.41	1.63	3.27
F-Test	**S**	**S**	**S**	**S**	**S**
S.Ed.	**0.156**	**0.037**	**0.533**	**0.055**	**0.084**
CD at 0.5%	**0.322**	**0.076**	**1.099**	**0.114**	**0.174**
CV	**2.152**	**4.655**	**1.182**	**5.252**	**2.82**

TABLE 7: Overall expendiiture, profit and B:C ratio.

Symbols	Treatment Combination	Fruit yield (t ha-)	Total cost of cultivation	Gross return (Rs.ha-1)	Net return (Rs. ha-1)	B:C ratio
T_0	Control	8.94	419856	895215.5	475359.5	1.12
T_1	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	13.46	422392.05	2078650.787	1656258.737	3.59

T_2	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	14.66	424484.25	2184698.76	1760214.51	3.97
T_3	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	11.67	426576.45	1982144.2	1555567.75	2.93
T_4	SWE 1ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	15.77	428668.65	2553868.953	2125200.303	4.30
T_5	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	12.31	423279.75	2076274.333	1652994.583	3.19
T_6	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	14.98	425371.95	2217902.987	1792531.037	4.07
T_7	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	9.67	427464.15	1972300.633	1544836.483	2.25
T_8	SWE 3ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	16.59	429556.35	2575608.707	2146052.357	4.56
T_9	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.2%	9.24	424180.9	1953804.24	1529623.34	2.13
T_{10}	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.4%	14.04	426273.1	2141744.733	1715471.633	3.75
T_{11}	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.6%	16.97	428365.3	2635871.287	2207505.987	4.70
T_{12}	SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8%	17.48	430457.5	2899861.187	2469403.687	4.84

CONCLUSION

From the current investigation, it is concluded that treatment combination T12 : SWE 5ml/l+(ZnSO4, H3BO3, FeSO4) 0.8% is the best treatment for growth, yield and fruit quality viz, plant height (cm) (32.31), plant spread (cm) (37.01), number of leaves per plant (45.43) , petiole length (cm) (14.42) , days to first flowering (39.81) , days to first fruiting (46.34), number of flower per plant (34.64), number of fruit per plant (18.43), fruit weight (gm) (27.12),fruit per plant (g)

(499.98) , fruit yield t ha^{-1} (17.48) , TSS ^{0}brix (10.29), juice content (%) (94.59) and pH(3.27) of strawberry.

The highest benefit cost ratio was also found in the same treatment with 1:4.84

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