Original Research Article

Effect of soil and foliar application of zinc sulphate and iron sulphate on growth, yield and quality of tomato (*Solanum lycopersicum* L.)

ABSTRACT

The present investigation entitled **"Effect of soil and foliar application of zinc sulphate and iron sulphate on growth, yield and quality of tomato (*Solanum lycopersicum* L.)"** was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, Uttar Pradesh during Kharif in 2022. The experiment was laid out in a randomized block design with 17 treatments and three replications with hybrid TMTH-275. Different micronutrients (Zinc Sulphate and Iron Sulphate) were used in different combinations and doses. Among the various treatments, significant results were shown by T_{10} (Soil Application of ($ZnSO_4$ @ 15Kg/ha + $FeSO_4$ @ 15 Kg/ha) as best in terms of plant height, (30, 60, 90 DAT and at harvest) (41.8 cm, 80.37cm, 110.8cm and 120.47 for 30, 60, 90 DAT and at harvest respectively.), days to first flowering (43DAT), days to 50% flowering (51.13 DAT), days to first harvest (86.13 DAT), number of flower cluster per plant (7.53), fruit set per cluster (7.43), polar diameter (63.13 mm), equatorial diameter (68.93 mm), number of fruit per plant (18.13), individual fruit weight (100.47g), average weight of 10 fruit (1004.67g), average fruit yield per plant (2.07Kg), total yield per plant (6.2 Kg), fruit yield per hectare (229.63 tonnes), TSS (6.07^0Brix) and ascorbic acid (20.3 mg/100g).

Keywords: *Zinc sulphate, Iron sulphate, micronutrients, TMTH - 275.*

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1. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) belongs to the family Solanaceae. It is a herbaceous perennial typically cultivated as an annual crop. It has sprawling stems, compound leaves, and yellow, star-shaped flowers. The fruit, a false fruit or berry, varies in shape, size, and color. Tomato plants have a fibrous root system, and their growth habits can be determinate or indeterminate(Ref/Authority). They follow a seasonal lifecycle and are treasured for their culinary versatility and nutritional value. It is a good source of vitamin A and vitamin C and minerals like calcium, potassium etc. (Ref/Authority). It also contains organic acids like citric acid, malic acid and acetic acid which are found in fresh tomato fruit (Ref/Authority). It promotes gastric secretion, acts as a blood purifier and works as an intestinal antiseptic (Ref/Authority). The nutritional value of red tomatoes (raw) per 100 g contains 18 kcal energy, 4.0 g carbohydrates, 2.6 g sugars, 1.0 g dietary fiber, 0.2 g fat, 1.0 g protein, 95 g water, 13 mg vitamin C (Ref/Authority). The antioxidant compounds present in tomatoes are lycopene, β carotene and ascorbic acid which protect against cancer and heart diseases **(Zhang *et al.*, 2009).** Micronutrients are essential elements that play a crucial role in the growth and development of plants. Although required in relatively small quantities compared to macronutrients, their significance in various physiological processes cannot be

overstated (Ref/Authority). Micronutrients include iron (Fe), zinc (Zn), manganese (Mn), copper (Cu), molybdenum (Mo), boron (B), and nickel (Ni) (Ref/Authority). Each of these micronutrients has specific functions that contribute to the overall health and productivity of plants. Application of micronutrients ($ZnSO_4$ and $FeSO_4$) significantly increased the physiological characters and reproductive characters of tomato (Ref/Authority). The use of iron sulphate and zinc sulphate on tomato plants offers several benefits to farmers. These micronutrients, essential for plant growth and development, prevent and correct deficiencies that can hamper tomato productivity (Ref/Authority).

2. MATERIALS AND METHODS

The investigation was done to study the effect of soil and foliar application of zinc sulphate and iron sulphate on growth, yield and quality of tomato (*Solanum lycopersicum* CV. TMTH-275)**.** The investigation was carried out at Horticultural Research Farm (HRF), Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj during *Kharif* season in 2022. The experiment was conducted in factorial randomized block design with 17 treatments in three replications viz. **T_0** (Control), **T_1** (Soil application of $ZnSO_4$@15Kg/ha.), **T_2** (Soil application of $ZnSO_4$@20kg/ha.), **T_3** (Soil application of $FeSO_4$@10Kg/ha.), **T_4** (Soil application of FeSO4@15 kg/ha.), **T_5** (Foliar application of 0.5%$ZnSO_4$), **T_6** (Foliar application of 1%$ZnSO_4$), **T_7** (Foliar application of 0.5%$FeSO_4$), **T_8** (Foliar application of 1%$FeSO_4$), **T_9** (Soil application of ($ZnSO_4$@15kg/ha. + $FeSO_4$@10Kg/ha), **T_{10}** (Soil Application of ($ZnSO_4$@15Kg/ha + $FeSO_4$@15Kg/ha), **T11** (Soil Application of ($ZnSO_4$@20Kg/ha + $FeSO_4$@10kg/ha), **T12** (Soil Application of ($ZnSO_4$@20kg/ha + $FeSO_4$@15kg/ha), **T13** (Soil Application of ($ZnSO_4$@15kg/ha + Foliar Application of 0.5%$FeSO_4$), **T14** (Soil Application of (($ZnSO_4$@15kg/ha + Foliar Application of 1%$FeSO_4$), **T15** (Soil Application of ($ZnSO_4$@20Kg/ha + Foliar Application of 0.5%$FeSO_4$), **T16** (Soil Application of ($ZnSO_4$@20kg/ha + Foliar Application of 1%$FeSO_4$) with tomato hybrid TMTH-275 (Trimurti plant science pvt. Ltd.). The crop was transplanted with the spacing of 60cm X 45cm (RxP). The observation of randomly five selected plants from each plot was measured in cm by a 100 cm scale from ground level to tip of the shoot at 90 DAT stage. Observation were recorded at different stages of growth periods and studied for growth parameters like plant height (cm), days to first flowering, days to 50% flowering, days to first harvest, number of flower cluster per plant, fruit set per cluster, polar diameter (mm), equatorial diameter (mm), number of fruits per plant, individual fruit weight (g), average weight of 10 fruits (g), average fruit yield per plant (Kg), total yield per plant (Kg), fruit yield per hectare (tha^{-1}), T.S.S.(°Brix) and ascorbic acid (mg/100g).

3. RESULTS AND DISSCUSSIONS

3.1. Growth Parameters

3.1.1. Plant Height for 30 DAT, 60 DAT, 90 DAT and harvest (cm)

Analysis of plants showed a significant effect on plant height (cm) at 30, 60 and 90 DAT and harvest. The maximum plant height (41.8cm, 80.37 cm, 110.8 cm and 120.47cm respectively) were observed with treatment T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15 Kg/ha) and the minimum plant height (30.4cm,

60.37cm, 90.47cm and 100.47cm) was observed in T_0 (control) (Table:01). Iron sulphate ($FeSO_4$) and zinc sulphate ($ZnSO_4$) are commonly used as micronutrient fertilizers in agriculture. Iron plays a crucial role in the synthesis of chlorophyll, which is responsible for photosynthesis and overall plant growth. Zinc is required for proper plant growth and development. It is involved in various enzymatic activities and plays a crucial role in hormone regulation, protein synthesis, and carbohydrate metabolism. Some research confirming these findings were reported by Ali et al., (2015), Basavarajeshwari et al., (2008), Sivaiah et al., (2013) and Dixit et al., (2018)

3.2. Earliness parameters

3.2.1. Days to first flowering (DAT), days to 50% flowering (DAT) and days to first harvest (DAT)

Analysis shows a significant effect with minimum days to first flowering, days to 50% flowering and days to first harvest was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15 Kg/ha) with 43, 51.13 and 86.13 respectively. While the maximum days to first flowering, days to 50% flowering and days to first harvest were recorded for T_0 (Control) with 52.6, 60.6 and 95.6 respectively (Table:02). Application of iron sulphate and zinc sulphate enhanced photosynthesis, which is crucial for the production of energy and carbohydrates. Improved photosynthesis can lead to increased vegetative growth, ultimately resulting in earlier and more robust flowering in tomato plants. With an earlier onset of flowering, there is a higher likelihood of early fruit set and subsequent development. Some research confirming these findings were reported by Haleema et al., (2017), Kuamr et al., (2017) and Singh et al., (2018).

3.2.2. Number of flower clusters per plant and fruit set per cluster

A maximum number of flower clusters per plant was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + FeSO4@15 Kg/ha) with 7.87 and 7.43 respectively while the minimum number of flower clusters per plant was recorded under T_0 (Control) with 1.27 and 2.07 respectively, shown in (Table:02). Applying ferrous sulphate and zinc sulphate to tomato plants promoted the formation of flower clusters. Adequate iron levels enhance the plant's metabolic processes, including hormone synthesis and regulation, leading to improved flower development. This, in turn, can increase the number of flower clusters on the tomato plants. While zinc promote hormone production and metabolic processes involved in flower bud initiation and development, leading to an increased number of flower clusters which ultimately end up with increased number of fruit set. Some research confirming these findings were reported by Pandiyan et al., (2018) and Sathyamurthy et al., (2017).

3.3. Yield parameters

3.3.1. Polar diameter (mm) and equatorial diameter (mm)

Maximum polar diameter and equatorial diameter were observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15 Kg/ha) with 63.13 and 68.93 respectively While the minimum polar diameter and equatorial diameter were recorded under T_0 (Control) with 53.63 and 60.13 respectively (Table:03). The micronutrients like iron and zinc promote the cell expansion and elongation, potentially leading to an increase in both polar and equatorial fruit diameter. Micronutrients involved in fruit setting and development, such as zinc can influence hormonal balances and signaling pathways

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that impact fruit growth. Some research confirming these findings were reported by Ali et al., (2015) and Haleema et al., (2017).

3.3.2. Number of fruits per plant

A maximum number of fruits per plant was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15 Kg/ha) with 18.13 while the minimum number of fruits per plant was recorded under T_0 (Control) with 10.23 are shown in Table:03. The application of Iron sulphate and zinc sulphate can improve fruit set and increase the number of fruits per plant. Adequate iron levels enhance flower development, pollen viability, and fertilization, resulting in improved fruit set and increased fruit production. Some research confirming these findings were reported by Singh et al., (2018) and Meena et al., (2015).

3.3.3. Individual fruit weight (g) and Average weight of 10 fruits (g)

Maximum individual fruit weight and average weight of 10 fruits was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15 Kg/ha) with 114.1g and 1141g respectively while the minimum was recorded under T_0 (Control) with 94.13g and 941.33g respectively (Table:03). Both zinc sulphate ($ZnSO_4$) and ferrous sulphate ($FeSO_4$) can positively affect the weight of tomato fruits. Zinc promotes cell division, elongation, and carbohydrate metabolism, leading to larger and heavier tomatoes. Iron ensures proper metabolic processes and chlorophyll synthesis, enhancing fruit development and weight. Applying these compounds helps address nutrient deficiencies and optimize the growth and size of tomato fruits. Some research confirming these findings were reported by Saravaiya et al., (2014) and Sathyamurthy et al., (2017).

3.3.4. Average fruit yield per plant (Kg), Total fruit yield per plant (Kg) and Fruit yield per hectare (t)

Maximum average fruit yield per plant**,** total fruit yield per plant and fruit yield per hectare was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15Kg/ha) with 2.07 Kg, 6.2 Kg and 229.63t respectively while minimum was recorded T_0 (Control) with 0.96 Kg, 2.89 Kg and 107.04t respectively (Table:04). Both zinc sulphate ($ZnSO_4$) and iron sulphate ($FeSO_4$) enhanced the yield of tomato crops. Zinc promotes root development, flower initiation, and fruit set, resulting in increased yield potential. Iron ensures proper chlorophyll synthesis and overall plant growth, leading to improved photosynthesis and higher yield. Applying these compounds addresses nutrient deficiencies and supports the growth and productivity of tomato plants, ultimately resulting in a higher yield.Similar findings were reported by Kumar et al., (2016), Habibullah et al., (2017) and Reddy et al., (2018).

3.4. Qualitative parameters

3.4.1. Total Soluble Solid (^{0}Brix) and Ascorbic acid (mg/100g)

Maximum Total Soluble Solid and ascorbic acid was observed in T_{10} (Soil Application of $ZnSO_4$@15Kg/ha + $FeSO_4$@15Kg/ha) with 6.07 ^{0}Brix and 20.3 mg/100g respectively while Total Soluble Solid was recorded under T_0 (Control) with 1.33 ^{0}Brix and 12.87 mg/100g respectively (Table:04). Both zinc sulphate ($ZnSO_4$) and iron sulphate ($FeSO_4$) can positively impact the quality of tomatoes. Zinc contributes to the synthesis of sugars, vitamins, antioxidants, and pigments, resulting in sweeter, more nutritious, and visually appealing tomatoes. Iron plays a role in chlorophyll synthesis,

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flavor development, and overall fruit quality. Applying these compounds can enhance the taste, nutritional value, color, and flavor profile of tomatoes, ultimately improving their overall quality. Some research confirming the findings were reported by **Meena et al., (2015), Pandiyan et al., (2018) and Swetha et al., (2019).**

4. CONCLUSION

It is concluded that T_{10} (Soil Application of ZnSO4 @ 15Kg/ha + FeSO4 @ 15 Kg/ha) was best in terms of plant height, days to first flowering, days to 50% flowering, days to first harvest, number of flower cluster per plant, fruit set per cluster, polar diameter, equatorial diameter, number of fruits per plant, individual fruit weight, the average weight of 10 fruits, the average fruit yield per plant, total yield per plant, fruit yield per hectare, TSS and ascorbic acid.

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TABLE 1: Plant height (cm) at 30 DAT, 60 DAT, 90 DAT and at harvest.

Treatment Notation	Treatment Details	Plant height [30 DAT]	Plant height [60 DAT]	Plant height [90 DAT]	Plant height [At Harvest]
T_0	Control	30.4	60.37	90.47	100.47
T_1	Soil Application of $ZnSO_4$@15Kg/ha.	31.7	61.5	91.93	101.93
T_2	Soil Application of $ZnSO_4$@ 20kg/ha.	32.53	62.5	93.27	103.27
T_3	Soil Application of $FeSO_4$@ 10Kg/ha.	33.43	63.23	93.97	103.97
T_4	Soil Application of FeSO4@ 15 kg/ha.	33.83	63.87	94.73	104.73
T_5	Foliar Application of 0.5%$ZnSO_4$	34.33	64.77	95.43	105.43
T_6	Foliar Application of 1% $ZnSO_4$	34.73	65.87	96.63	106.63
T_7	Foliar Application of 0.5% $FeSO_4$	35.2	67.5	97.93	107.93
T_8	Foliar Application of 1% $FeSO_4$	35.67	68.9	99.33	109.33
T_9	Soil Application of ($ZnSO_4$@ 15kg/ha. + $FeSO_4$@ 10Kg/ha.	36.33	69.77	100.2	110.53
T_{10}	Soil Application of ($ZnSO_4$ @ 15Kg/ha + $FeSO_4$@ 15 Kg/ha)	41.8	80.37	110.8	120.47
T_{11}	Soil Application of ($ZnSO_4$ @ 20 Kg/ha+ $FeSO_4$ @10kg/ha)	37.2	71.93	102.37	112.37
T_{12}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ $FeSO_4$ @ 15kg/ha)	37.8	73.33	104.03	114.03
T_{13}	Soil Application of ($ZnSO_4$ @ 15kg/ha+ Foliar Application of 0.5% $FeSO_4$)	38.37	74.53	104.97	114.97
T_{14}	Soil Application of (($ZnSO_4$ @ 15kg/ha+ Foliar Application of 1% $FeSO_4$)	38.87	75.77	106.2	116.37
T_{15}	Soil Application of ($ZnSO_4$ @ 20Kg/ha+ Foliar Application of 0.5% $FeSO_4$)	39.4	77.33	107.43	117.43
T_{16}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ Foliar Application of 1% $FeSO_4$)	39.87	78.4	108.83	118.83
F- TEST		**S**	**S**	**S**	**S**
S.E. (d) ±		**0.15**	**0.21**	**0.29**	**0.27**
C.D. $_{0.05}$		**0.3**	**0.42**	**0.58**	**0.55**
C.V.		**0.51**	**0.37**	**0.35**	**0.3**

TABLE 2: Days to first flowering (DAT), days to 50% flowering (DAT), days to first harvest (DAT), number of flower cluster per plant and fruit set per cluster.

Treatment Notation	Treatment Details	Days to first flowering	Days to 50% flowering	Days to first harvest	Number of flower cluster per plant	Fruit set per cluster
T_0	Control	52.6	60.6	95.6	1.27	2.07
T_1	Soil Application of $ZnSO_4$ @15Kg/ha.	51.77	59.77	94.77	2.13	2.5
T_2	Soil Application of $ZnSO_4$ @ 20kg/ha.	51	59	94	2.53	2.87
T_3	Soil Application of $FeSO_4$ @ 10Kg/ha.	50.23	58.23	93.23	2.87	3.13
T_4	Soil Application of FeSO4@ 15 kg/ha.	49.67	57.67	92.67	3.2	3.43
T_5	Foliar Application of 0.5%$ZnSO_4$	49.13	57.13	92.13	3.47	3.77
T_6	Foliar Application of 1% $ZnSO_4$	48.57	56.57	91.57	3.8	4.13
T_7	Foliar Application of 0.5% $FeSO_4$	48.07	56.07	91.07	4.13	4.57
T_8	Foliar Application of 1% $FeSO_4$	47.53	55.53	90.53	4.43	4.8
T_9	Soil Application of ($ZnSO_4$ @ 15kg/ha. + $FeSO_4$ @ 10Kg/ha.	47.13	55.13	90.13	4.87	5.13
T_{10}	Soil Application of ($ZnSO_4$ @ 15Kg/ha + $FeSO_4$ @ 15 Kg/ha)	43	51.13	86.13	7.53	7.43
T_{11}	Soil Application of ($ZnSO_4$ @ 20 Kg/ha+ $FeSO_4$ @10kg/ha)	46.67	54.67	89.67	5.73	5.53
T_{12}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ $FeSO_4$ @ 15kg/ha)	46.13	54.13	89.13	6.07	5.8
T_{13}	Soil Application of ($ZnSO_4$ @ 15kg/ha+ Foliar Application of 0.5% $FeSO_4$)	45.73	53.73	88.73	6.43	6.13
T_{14}	Soil Application of (($ZnSO_4$ @ 15kg/ha+ Foliar Application of 1% $FeSO_4$)	45.3	53.3	88.3	6.77	6.4
T_{15}	Soil Application of ($ZnSO_4$ @ 20Kg/ha+ Foliar Application of 0.5% $FeSO_4$)	44.37	52.37	87.37	7.13	6.73
T_{16}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ Foliar Application of 1% $FeSO_4$)	43.63	51.73	86.73	7.53	7.13
F- TEST		**S**	**S**	**S**	**S**	**S**
S.E. (d) ±		**0.12**	**0.12**	**0.11**	**0.08**	**0.06**
C.D. $_{0.05}$		**0.24**	**0.24**	**0.23**	**0.15**	**0.13**
C.V.		**0.29**	**0.25**	**0.15**	**1.94**	**1.56**

TABLE 3: Polar diameter (mm), Equatorial diameter (mm), Number of fruits per plant, Individual fruit weight (g) and Average weight of 10 fruits (g)

Treatment Notation	Treatment Details	Polar Diameter	Equatorial Diameter	Number of fruits per plant	Individual fruit weight	Average weight of 10 fruits
T_0	Control	53.63	60.13	10.23	90.4	904
T_1	Soil Application of $ZnSO_4$@15Kg/ha.	54.87	60.6	10.87	93.2	932
T_2	Soil Application of $ZnSO_4$@ 20kg/ha.	55.33	61.13	11.47	92.37	923.67
T_3	Soil Application of $FeSO_4$@ 10Kg/ha.	55.73	61.53	11.87	94.13	941.33
T_4	Soil Application of FeSO4@ 15 kg/ha.	56.13	62.13	12.37	95.2	952
T_5	Foliar Application of 0.5%$ZnSO_4$	56.8	62.53	12.87	96.23	962.33
T_6	Foliar Application of 1% $ZnSO_4$	57.13	63.13	13.37	98.07	980.67
T_7	Foliar Application of 0.5% $FeSO_4$	57.53	63.53	13.87	98.6	986
T_8	Foliar Application of 1% $FeSO_4$	58.13	63.93	14.3	99.37	993.67
T_9	Soil Application of ($ZnSO_4$@ 15kg/ha. + $FeSO_4$@ 10Kg/ha.	58.6	64.53	14.8	99.87	998.67
T_{10}	Soil Application of ($ZnSO_4$ @ 15Kg/ha + $FeSO_4$@ 15 Kg/ha)	63.13	68.93	18.13	100.47	1004.67
T_{11}	Soil Application of ($ZnSO_4$ @ 20 Kg/ha+ $FeSO_4$ @10kg/ha)	60.13	65.67	15.43	101.33	1013.33
T_{12}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ $FeSO_4$ @ 15kg/ha)	60.6	66.3	15.93	105.133	1051.33
T_{13}	Soil Application of ($ZnSO_4$ @ 15kg/ha+ Foliar Application of 0.5% $FeSO_4$)	61.13	66.93	16.33	103.47	1034.67
T_{14}	Soil Application of (($ZnSO_4$@ 15kg/ha+ Foliar Application of 1% $FeSO_4$)	61.53	67.43	16.73	102.57	1025.67
T_{15}	Soil Application of ($ZnSO_4$ @ 20Kg/ha+ Foliar Application of 0.5% $FeSO_4$)	62.13	67.87	17.27	107.57	1075.67
T_{16}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ Foliar Application of 1% $FeSO_4$)	62.53	68.43	17.67	108.5	1085
F- TEST		**S**	**S**	**S**	**S**	**S**
S.E. (d) ±		**0.08**	**0.09**	**0.12**	**0.16**	**1.61**
C.D. $_{0.05}$		**0.16**	**0.19**	**0.24**	**0.32**	**3.3**
C.V.		**0.14**	**0.16**	**1.01**	**0.19**	**0.19**

TABLE 4: Average fruit yield per plant (Kg), Total fruit yield per plant (Kg), Fruit yield per hectare (t), Total Soluble Solid (^{0}Brix) and Ascorbic acid (mg/100g).

Treatment Notation	Treatment Details	Average fruit yield per plant	Total fruit yield per plant	Fruit yield per hectare	Total Soluble Solid	Ascorbic acid
T_0	Control	0.96	2.89	107.04	1.33	12.87
T_1	Soil Application of $ZnSO_4$@15Kg/ha.	1.04	3.11	115.18	1.77	13.73
T_2	Soil Application of $ZnSO_4$@ 20kg/ha.	1.1	3.31	122.59	2.07	14.13
T_3	Soil Application of $FeSO_4$@ 10Kg/ha.	1.17	3.5	129.63	2.2	14.57
T_4	Soil Application of FeSO4@ 15 kg/ha.	1.22	3.66	135.56	2.47	14.87
T_5	Foliar Application of 0.5%$ZnSO_4$	1.28	3.83	141.85	2.87	15.47
T_6	Foliar Application of 1% $ZnSO_4$	1.34	4.01	148.52	3.3	15.87
T_7	Foliar Application of 0.5% $FeSO_4$	1.4	4.19	155.18	3.63	16.27
T_8	Foliar Application of 1% $FeSO_4$	1.45	4.35	161.11	3.8	16.67
T_9	Soil Application of ($ZnSO_4$@ 15kg/ha. + $FeSO_4$@ 10Kg/ha.	1.52	4.56	168.89	4.07	17.13
T_{10}	Soil Application of ($ZnSO_4$ @ 15Kg/ha + $FeSO_4$@ 15 Kg/ha)	2.07	6.2	229.63	6.07	20.3
T_{11}	Soil Application of ($ZnSO_4$ @ 20 Kg/ha+ $FeSO_4$ @10kg/ha)	1.6	4.8	177.78	4.23	17.53
T_{12}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ $FeSO_4$ @ 15kg/ha)	1.67	5.02	185.93	4.47	17.87
T_{13}	Soil Application of ($ZnSO_4$ @ 15kg/ha+ Foliar Application of 0.5% $FeSO_4$)	1.76	5.27	195.19	4.73	18.33
T_{14}	Soil Application of (($ZnSO_4$@ 15kg/ha+ Foliar Application of 1% $FeSO_4$)	1.82	5.45	201.85	5.13	18.87
T_{15}	Soil Application of ($ZnSO_4$ @ 20Kg/ha+ Foliar Application of 0.5% $FeSO_4$)	1.9	5.7	211.11	5.43	19.33
T_{16}	Soil Application of ($ZnSO_4$ @ 20kg/ha+ Foliar Application of 1% $FeSO_4$)	1.99	5.97	221.11	5.63	19.67
F- TEST		**S**	**S**	S	**S**	**S**
S.E. (d) ±		**0.01**	**0.04**	**1.45**	**0.06**	**0.08**
C.D. $_{0.05}$		**0.03**	**0.08**	**2.96**	**0.11**	**0.16**
C.V.		**1.07**	**1.07**	**1.07**	**1.83**	**0.59**