# Differential Response of Zinc Fertilizer on Yield and Quality Parameters Of Strawberry Cv: Chandler

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**ABSTRACT**

The present study investigated the effect of different levels of Zinc fertilizer on yield and quality parameters of Strawberry Cv. Chandler. The treatments under observation were Zinc @ 0, 5, 7.5 and 10 kg/ha. Zn fertilizer application significantly enhanced Strawberry yield and quality. Maximum number of fruit per plant (28.773), fruit diameter (3.3967 cm), maximum fruit length (4.2967 cm), maximum yield per plant (264.89 g), maximum yield per plot (5.2977 kg), maximum total yield t/ha (0.0700 t/ha) and maximum TSS (10.33 Brix) were recorded in treatment supplemented with Zn @10 kg/ha, while maximum pH (3.70), maximum Ascorbic Acid (5.69) and maximum titratable acidity (16.48) were observed in Zn treatment @ 7.5kg/ha. Whereas, maximum acid sugar ratio (0.94) was noted for the Zn treatment @ 5 kg/ha. From the From the results it is concluded that Zn fertilizer application @ 10 kg/ha can notably enhanced yield and quality attributes of strawberry crop.

**Key word:** Strawberry, Zinc, Chandler, TSS, Acid sugar ration, pH, Ascorbic acid etc.



## INTRODUCTION:

Strawberry (Fragaria x sp.) is native of temperate regions, but varieties are available which can be cultivated in subtropical climate. Strawberry is a delicious fruit taken fresh in several ways. It is a soft and a highly perishable fruit, often shipped in frozen condition in Western countries. Strawberry thrives best in temperate climate. It is a short day plant; the varieties grown in milder subtropical climate do not require chilling and continue to make some growth during winter. The quality and yield of fruits depends on different attributes which are closely associated with nutrient uptake by the plant. The supply of nutrients to the plants should be balanced, ensuring not to over or under fertilize. In addition to NPK, micronutrients have a great bearing in influencing the yield attributes and fruit production. Micronutrients are involved in all metabolic and cellular functions. Micronutrients are essentially as important as macronutrients to have better growth, yield and quality in plants. In the past, there was no need of micronutrients because these trace elements were naturally supplied by soil. But due to intensive cultivation, increase in salinity and soil pH in most of soils, these nutrients are present but are not available to plants. Zinc is effective in plant nutrition for the synthesis of plant hormones and balancing intake of P and K inside the plant cells. (Ahmad et.al, 2010).

Micronutrients are vital to the growth of plants, acting as catalyst in promoting various organic reactions taking place within the plant and their deficiencies often limit crop productivity in fruit crops. Iron deficiency in strawberries can occur if soil pH is high and low zinc levels may occur on sandy low organic matter soils. Cool, wet weather enhances iron deficiencies, especially on soils with marginal levels of available iron. Poorly aerated or compact soils also reduce iron uptake by plants (Zehtab-Salmasi *et al.* 2008). Zinc deficiencies occur more often during cold, wet spring weather and are related to reduced root growth and activity as well as lower microbial activity decreases zinc release from soil organic matter. Zinc uptake by plants decreases with increased soil pH. Uptake of zinc also is adversely affected by high levels of available phosphorus and iron in soils (Mortvedt, 2011).

## OBJECTIVES:

- To find out optimum dose of Zn fertilizer for strawberry crop.

- To check the Zn fertilization effects on strawberry growth, yield and quality.

**METHOD AND MATERIAL**

To check the effect of different levels of Zinc fertilizer on growth, yield and quality of Strawberry, an experiment was conducted on the Farm of Agricultural Research Station Baffa, Mansehra during the Rabi Season of 2018-19. The experiment was laid out in Randomize Complete Block Design having four treatments i.e. control (0 Zinc), Zinc @ 5 kg/ha, Zinc @ 7.5 kg/ha and Zinc @ 10 kg/ha with three replication. The Chandler variety of strawberry was used in the experiment. The plot size was 7.5 $m^2$. Data was collected for different parameters including Number of fruits per plant, Fruit diameter (cm), Fruit length (cm), Yield per plant (kg), Yield per plot (kg), Total yield (t/ha), TSS (Brix), pH, Ascorbic acid, Titratable acid and acid sugar ratio. Collected data were statistically analyzed using statistix-8.1 computer package program. Difference between treatments was assessed by Least Significant Difference (LSD) test at 5% level of significance.

**RESULTS:**

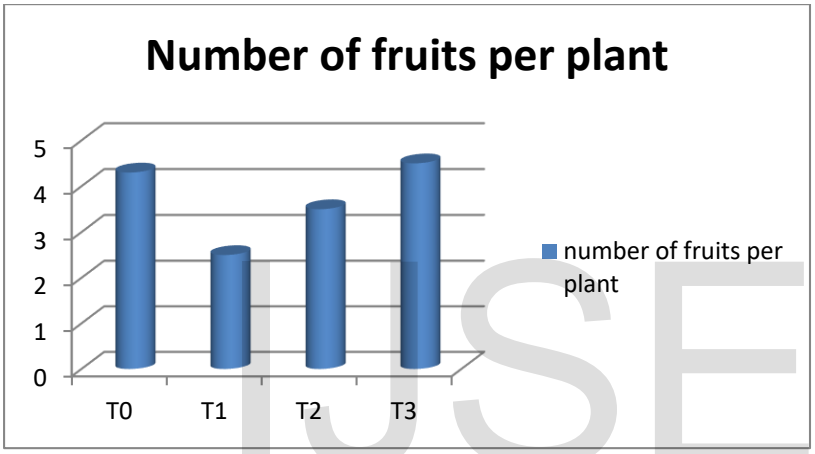
The mean data revealed that the strawberry growth is significantly increased by the application of Zn fertilizer. According to the mean data the maximum number of fruit per plant (28.773) was noted for treatment $T_3$ (Zn 10 kg/ha), whereas the minimum number of fruit per plant (10.217) was observed for control treatment. The maximum fruit diameter (3.3967 cm) was noted for $T_3$ (Zn 10 kg/ha) which is at par with $T_2$ (Zn 7.5kg/ha) 3.3200 cm, while the minimum fruit diameter (2.3767cm) was noted for control treatment. The maximum fruit length (4.2967 cm) was noted for $T_3$ (Zn 10 kg/ha), while the minimum fruit length (2.9967cm) was noted for control treatment. The maximum yield per plant (264.89 g) was noted for $T_3$ (Zn 10 kg/ha), while the minimum yield per plant (63.66 g) was noted for control treatment. The maximum yield per plot (5.2977 kg) was noted for $T_3$ (Zn 10 kg/ha) while the minimum fruit diameter (1.2733 kg) was noted for control treatment. The maximum total yield t/ha (0.0700 t/ha) was noted for $T_3$ (Zn 10 kg/ha), while the minimum total yield t/ha (0.0167 t/ha) was noted for control treatment. The mean data quality parameters of effect of different levels of Zn fertilizers on strawberry revealed that the maximum TSS (10.33 Brix) was noted for treatment $T_3$ (Zn 10 kg/ha), while the minimum TSS (9.20 Brix) was noted for the $T_0$ (control treatment). The maximum pH (3.70) was noted for treatment $T_2$ (Zn 7.5kg/ha) whereas the minimum pH (3.60) was noted for $T_0$ (control) which is at par with treatments $T_1$ (Zn 5 kg/ha) and $T_3$ (Zn 10 kg/ha). The maximum Ascorbic Acid (5.69) was noted for the treatment $T_2$ (Zn 7.5kg/ha), whereas the minimum Ascorbic Acid (2.88) was observed for treatment $T_3$ (Zn 10 kg/ha). The maximum titratable acidity (16.48) was noted for the treatment $T_2$ (Zn 7.5kg/ha), while the minimum titratable acidity (10.88) was observed for treatment $T_1$ (Zn 5 kg/ha). The maximum acid sugar ratio (0.94) was noted for the treatment $T_1$ (Zn 5 kg/ha), while the minimum acid sugar ratio (0.62) was observed for the treatment $T_2$ (Zn 7.5kg/ha).

**DISCUSSION:**

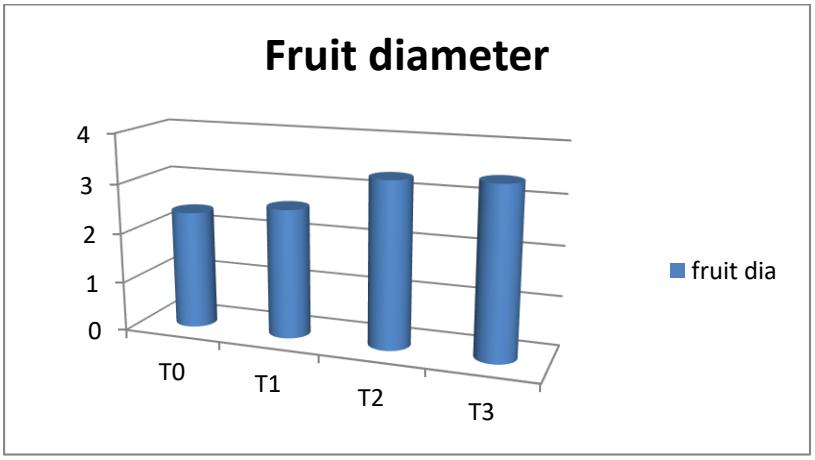
Zinc is involved in the biosynthesis of plant hormone IAA and plays a vital role in nucleic acid and protein synthesis (Nawaz *et al.,* 2012). Zinc works as stimulant of amino acids and appears to be helpful in the process of photosynthesis and accumulation of carbohydrates. improved the early yield, marketable yield, total yield and yield/plant in strawberry with the application of higher rates of Zn (Mohamed *et al.,* 2011). The effects of foliar application with micronutrients (Zn and Fe) played critical role in crop growth, involving in photosynthesis processes, respiration and other biochemical and physiological activities and their importance in achieving higher yields. Zinc is a component of carbonicanhydrase as well as several dehydrogenases and auxin production which in turn enhance plant growth and iron is necessary for the biosynthesis of chlorophyll and cytochrome, leading to increase in the biosynthesis of materials and growth. Zn application increased strawberry vegetative growth and fruit yield. Zinc had positive effects on reproductive growth including number of inflorescence and yield. Zinc plays vital role in cell division and photosynthesis that improves reproductive growth of the plant, hence number of flowers increased. Application of ZnSO4 increased number, size and quality of strawberry fruits. Foliar application of zinc improved the internal physiology of developing fruit in terms of better supply of water, nutrients, and other compounds for their proper growth and development, thus size of fruits was increased. (Abdollahi *et al.,* 2012). Application of ZnSO4, a prerequisite of auxin, is potentially useful in increasing fruit size as well as its quality. (Dreher and Poovaiah, 1982). Similar findings in respect of fruit length were also observed from (Dutta and Banik, 2007). Application of Zn as foliar spraying not only increased the number of leaves but also reduced the leaf drop in papaya plant (Sing *et al.,* 2010). Application of zinc had positive effect on the reproductive growth of plant and increased number of flowers in strawberry

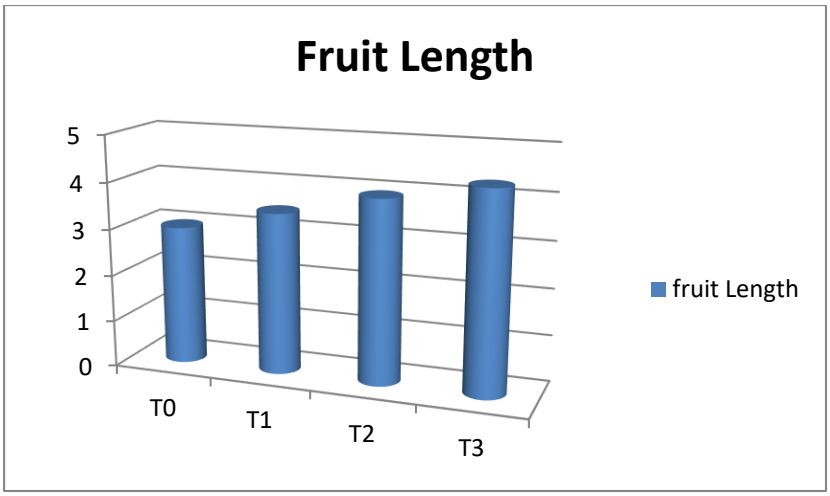
(Kazemi 2014). Application of zinc increased diameter of fruits (Etehadnejad and Aboutalebi 2014). Similar findings in terms of fruit diameter were also found from (Naga *et al.,* 2013). Zinc promotes TSS of fruits, thus percentage of brix increased. Application of zinc sulfate increased TSS in fruit of guava. Zinc has also shown to have an important role in photosynthesis and enzyme activation, resulting in increasing sugar and decreasing acidity (Abedy, 2001). The increased in fruit weight might be due to the enhanced in cell size and intercellular space in fruits (Shivanandam et al., 2007) zinc has as component of almost 60 enzymes and it has a role in synthesis of growth promoter hormone (auxin) which directly associated with improvement of fresh weight of fruits. Zinc played vital role in increasing number of fruits and fruit weight of strawberry through normal growth and development as it is the component of many essential enzyme and proteins (Marschner *et al.,* 1995). Zinc treated strawberry plant produced maximum and large sized fruits which stimulated better yield. The application of zinc as a micronutrients increased plant growth and fruit yield in tomato plants (Gurmani et. al., 2012).

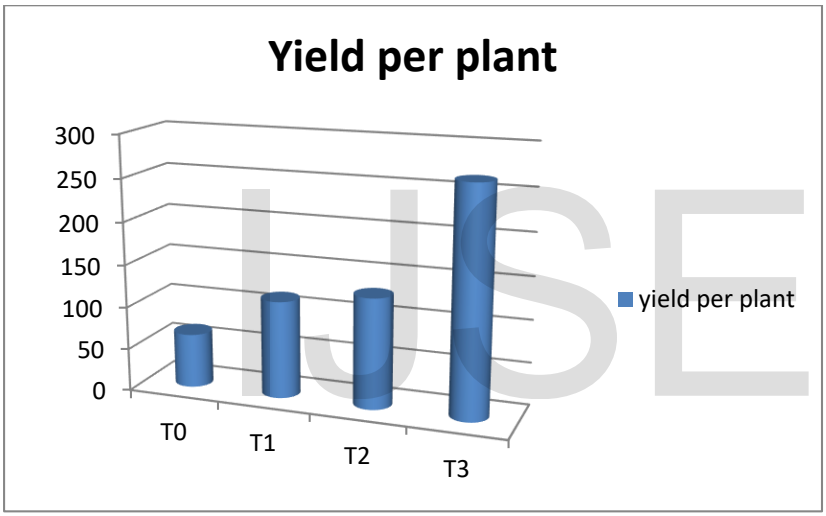
**PRESENTATION OF THE RESULTS**

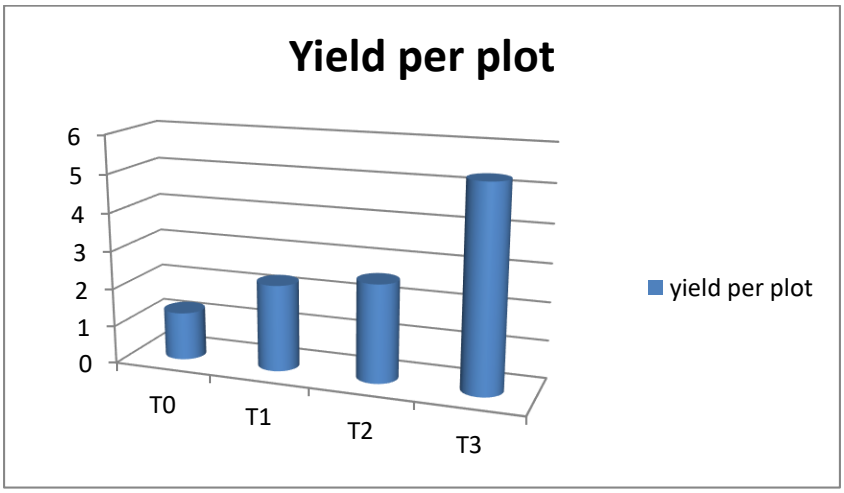


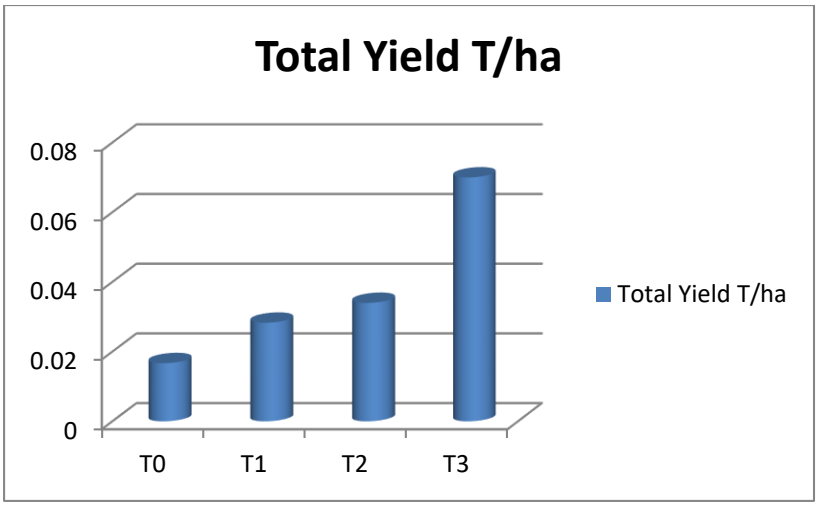


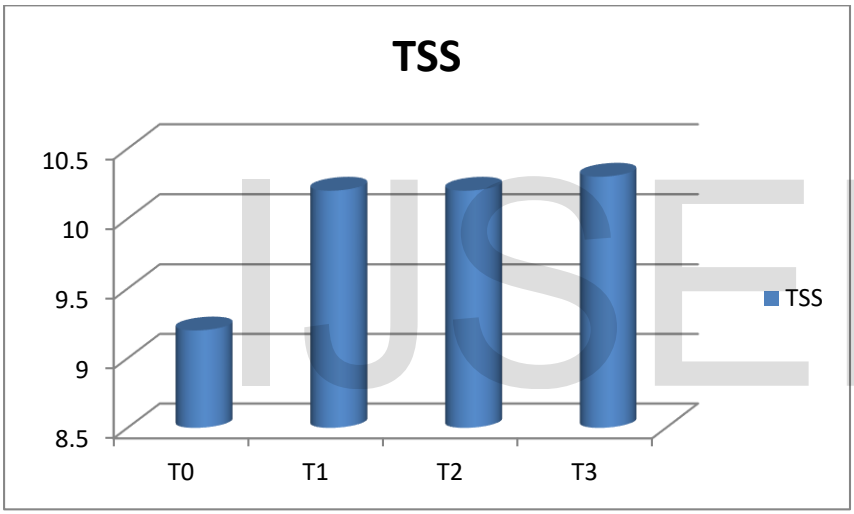



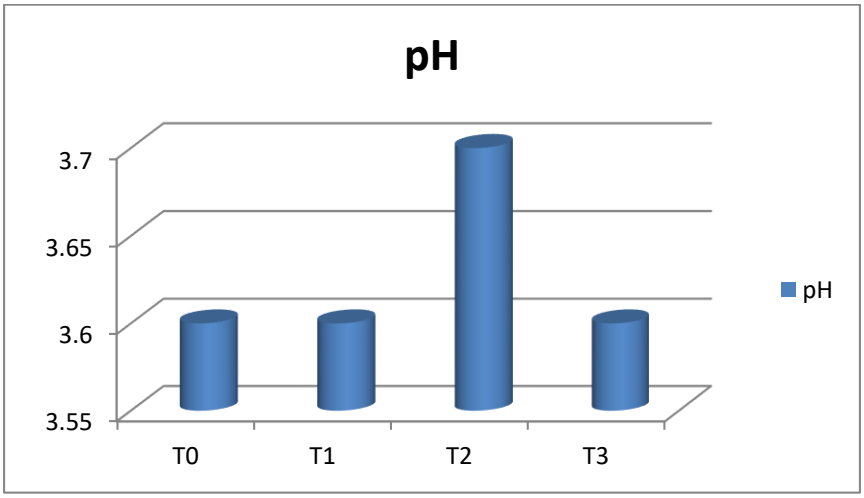

Fruit Length
5
4
3
2
1
0
T0
T1
T2
T3
fruit Length

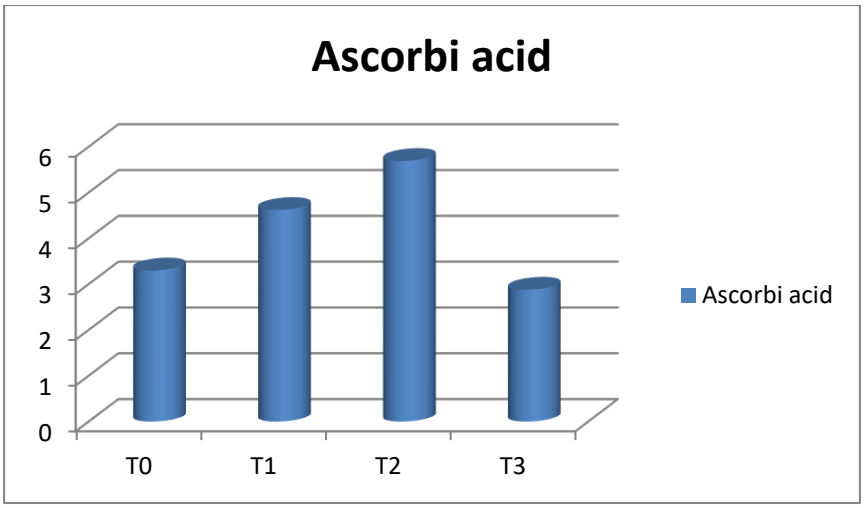

Yield per plant
300
250
200
150
100
50
0
T0
T1
T2
T3
yield per plant

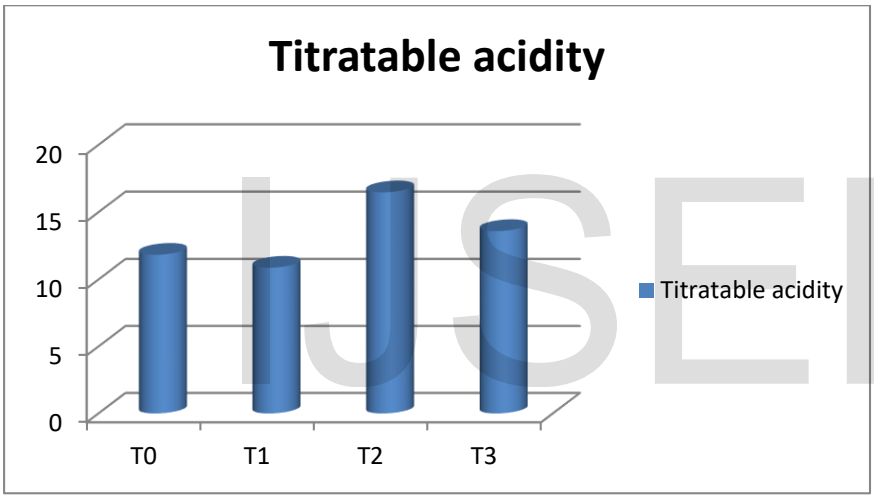

Yield per plot
6
5
4
3
2
1
0
T0
T1
T2
T3
yield per plot


Total Yield T/ha
0.08
0.06
0.04
0.02
0
T0
T1
T2
T3
Total Yield T/ha

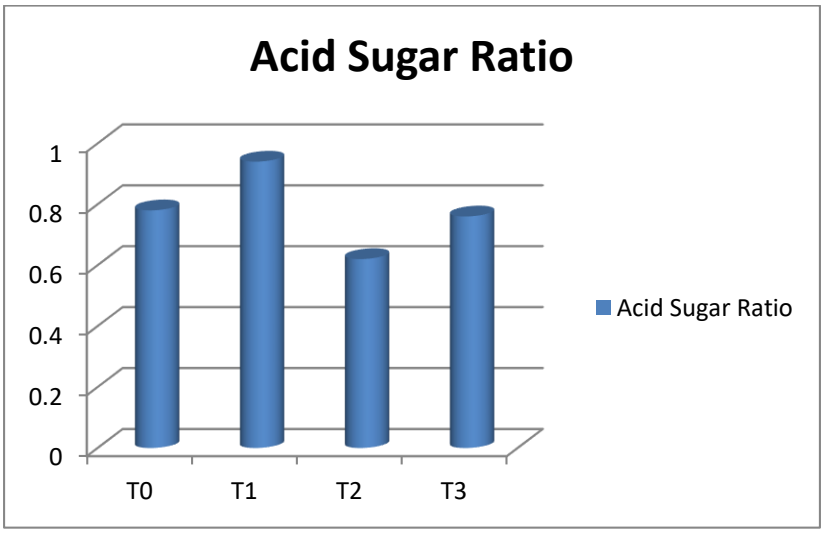

TSS
10.5
10
9.5
9
8.5
T0
T1
T2
T3
TSS


pH
3.7
3.65
3.6
3.55
T0
T1
T2
T3
pH






**CONCLUSION:**

From the experimental results it is concluded that:

The application of Zn fertilizer @ 10 kg/ha significantly increased the growth, yield and quality parameters of strawberry crop including number of fruits per plant, fruit diameter, fruit length, yield per plant, yield per plot and total yield t/ha and TSS. Hence Zn @ 10 kg/ha is recommended for strawberry production under the agro-climatic conditions of Mansehra.

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