Effect of Ferti-Fortification of Iron and Zinc Fertilization on Quality Parameters of Mango Cv. Kesar

Abstract

The present research was accomplished on mango cv. Kesar to investigate the effect of foliar spray of iron and zinc fertilization on the quality parameter of mango. The experiment was conducted in a completely randomized design and replicated 3 times with 9 treatments. The The significant increase in TSS (19.35 °Brix) and ascorbic acid (36.70 mg/100 g) content were recorded with the foliar application of 0.5% $FeSO_4$ and 0.5% $ZnSO_4$ (T_9) resulted in a considerable rise in TSS and ascorbic acid content, which was comparable to treatment T_7 (0.25% $FeSO_4$ + 0.50% $ZnSO_4$).

Keywords: Mango, Kesar, iron, zinc, foliar spray, TSS, ascorbic acid content

INTRODUCTION

"The mango is a wonderful tropical fruit that ranks first among the commercial fruits grown in India. It is the national fruit of India and is a member of the annacardiacae family. In Western India, several mango varieties *viz.*, Alphonso, Kesar, Rajapuri, Pairi, Mankurad, Fernandin, Jamadar, Dadmiyo, *etc.* are commercially grown and accepted by the consumers. Out of which Kesar has been found with good yield potential, almost regular bearer, mid-season variety, having good consumers' acceptance, attractive shape, size with saffron coloured pulp and very good keeping quality. Mango play important role in balancing diet of human being by providing about 64-66 calories per 100 grams of ripe fruits. The king of fruit is nutritionally very rich, unique in flavor. From last few years, some physiological stresses and quality related issues has been raised in mango orchard. It was observed that unbalanced fertilization, micronutrient deficiencies, poor tree management and inadequate cultural practices are mainly responsible for orchard related quality issue" (Ahmad and Rashid, 2003). "Therefore food supplements and mineral supplements are necessary for healthy crops. According to horticulturists, only application of primary nutrients could not prove successful to produce high quality fruit in mango trees, the application of micronutrients is compulsory as well". (Ahmad and Rashid, 2003)

Biofortification is recent approach aimed at increasing the bioavailable nutrients, such as Fe and Zn in crops. With the progress of the time we have to advance research on fortification. There is severe need to maximize awareness regarding health and nutrition sectors at both nation and international level to mitigate this gigantic problem, especially Fe and Zn.

"Foliar spray of micronutrients is the common practice to overcome the micronutrients deficiencies in order to improve the fruit quality. Nutrients are generally quickly available to the plants by the foliar application than the soil application" (Bahadur *et al*., 1998). According to WHO and FAO, "fortification refers to the practice of deliberately increasing the content of an essential micronutrient *i.e.* minerals (including trace elements) and vitamins". There are number of iron sources available as food fortificants *e.g.* Ferrous sulphate, ferrous fumarate, iron pyrophosphate (Mehansho, 2006). The NaFe EDTA and $FeSO_4$ are effective iron fortificants for rice (Trinidad *et al.*, 2002). Zinc compounds that are suitable for use as food fortificants include the sulfate, chloride, gluconate, oxide and the stearate. Recent studies have shown that the absorption of zinc from cereal products fortified with zinc oxide is as good as that from those fortified with the more soluble zinc sulfate presumably because the oxide is soluble in gastric acid.

Therefore, the study entitled, "Effect of foliar spray of iron and zinc fertilization on yield and quality of mango cv. Kesar" has been decided to enrich the Zn and Fe content in mango fruit and that may be one step to reduce the Zn and Fe deficiency disorders in human being, was undertake.

The objective of this study is to find the effect of Fe and Zn application on quality attributes of mango cv. Kesar.

MATERIALS AND METHODS

The experiment material for the present investigation was carried out on 20 year old mango orchard planted at 10m×5m distance and the site is located at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat).The experiment was conducted in completely randomized design(C.R.D) with

9 treatments and replicated 3 times. The details of experiment treatment plan employed in the present investigation are as allowed: Control (T_1), 0.25 % $FeSO_4$ (T_2), 0.50 % $FeSO_4$ (T_3), 0.25 % $ZnSO_4$ (T_4), 0.50 % $ZnSO_4$ (T_5), 0.25% $FeSO_4$ + 0.25 % $ZnSO_4$ (T_6), 0.25 % $FeSO_4$ + 0.50 % $ZnSO_4$ (T_7), 0.50% $FeSO_4$ + 0.25% $ZnSO_4$ (T_8), 0.50 % $FeSO_4$ + 0.50 % $ZnSO_4$ (T_9).The foliar spray of these nutrients was done at the time of flowering (21/12/2016), pea (17/02/2017) and egg stages (20/03/2017).For the preparation of Zn and Fe foliar spray solution, commercial grade of $ZnSO_4.7H_2O$ and $FeSO_4.7H_2O$ fertilizers were used, respectively. The required quantity of ferrous sulphate and zinc sulphate were weighed and dissolved in water and then pH of solution was adjusted to 6.0 by using saturated $CaCO_3$ solution.

The total soluble solids of the pulp were determined by using refrectometer (0-32 °Brix). For every treatment, pulp of fruit for each replication was blended in to homogeneous mixture and then this mixture used to record five reading and average of those was considered as results.

Ascorbic acid was estimated with titrimeter method described by Ranganna (2004). Ten gram of the pulp was transferred to a 100 ml volumetric flask and volume made up with 4 % oxalic acid solution. After 30 minutes, the suspension was filtered through Whatman No. 1 filter paper. Before actual titration the 2, 6 – Dichloropheno indophenol dye solution was standardized by titrating against standard ascorbic acid solution and the dye factor was calculated. Five milliliters of the aliquot was taken from the filtrate against standardized dye solution through a burette. Titration was continued till the light pink colour persisted for 15 seconds. Ascorbic acid content was calculated adopting the following formula

$$\text{Ascorbic acid}(mg/100g) = \frac{\text{Titre X Dye factor X Volume made up X 100}}{\text{Aliquot of extract taken X for estimation} \quad \text{Weight or Volume of sample taken for estimation}}$$

The shelf life of fruits was recorded by keeping the fruits at room temperature. The days taken from harvesting to the appearance of any spoilage symptoms or discolouration are considered as shelf life of fruits.

The mango fruits were evaluated organoleptically by five judges for colour, flavor, taste, texture. Oranoleptic rating was done by following Hedonic Scale (1-9) points. Data pertaining to fruit quality assesment was subjected to staistical analysis constructing as per the method prescribed by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The fruit quality parameters *viz.*, TSS and ascorbic acid of mango cv. Kesar were reached the level of significance due to different foliar application of micronutrients. Whereas, non-significant response was observed among the micronutrient treatments for shelf and orgenoleptic score.

Foliar treatment of 0.50% FeSO4 + 0.50% ZnSO4 (T9) resulted in greater TSS (19.35 °Brix) and ascorbic acid (36.70 mg/100 g). The increase in TSS and different fraction of sugar under the influence of micronutrients might be due to hydrolysis of complex polysaccharides into simple sugars synthesis of metabolites and rapid translocation of photosynthetic product and minerals from other parts of plant to developing fruits. Increased in concentration of ZnSO4 caused the increase in TSS (Anees *et al*., 2011) of mango. Several workers observed similar result as, and in mango, Kumar *et al.* (2017) in mandarin orange, Waskela *et al.* (2013) in guava, Saini, H. and Saini, P. (2019).

Ascorbic acid content improved might be due to catalytic activity of enzymes and co-enzymes that are involved in ascorbic acid synthesis. The results of present study were confirmed by finding of Nehete *et al.* (2011) and Tulsi *et al.* (2015) in mango; Shekhar *et al.* (2010) in papaya, Panigrahi *et al*. (2019) in strawberry and Meena *et al*. (2006) in ber.

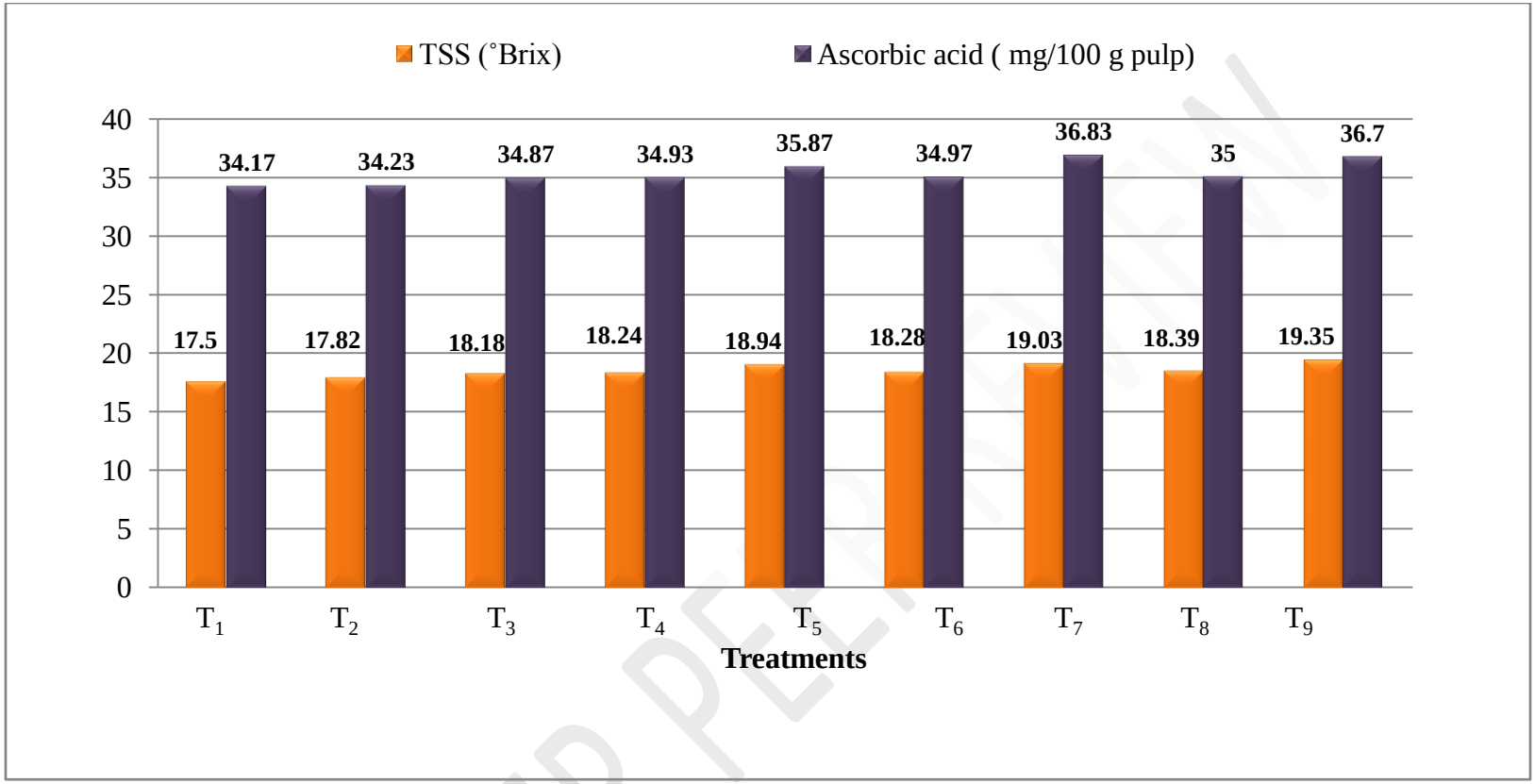

Fig. 1. Effect of foliar spray of Zn and Fe on TSS and Ascorbic acid of mango cv. Kesar

CONCLUSION

It is concluded from the present study that the foliar application of 0.50 % $FeSO_4$ and 0.50 % $ZnSO_4$ can be done at flowering, pea and egg stage of fruit for getting higher TSS and ascorbic acid.

Finally, these initiatives can contribute to the further understanding of foliar spray effect on mango. Success in improving micronutrient content *i.e.* iron and zinc in mango could substantially enhance sustainable micronutrient intake for humans which may help to eradicate malnutrition problem worldwide and particularly its boon for India.

Conference disclaimer:

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