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Short communication

Effect of micronutrients on yield and fruit quality of fig on Inceptisol

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ABSTRACT

A field experiment was conducted to determine the effect of foliar and soil application of iron, zinc and boron on yield and quality of fig (*Ficus carica* L.) cv. Deanna. The experiment was laid out in randomized block design with three replications. Results were found to be significant in most of yield and quality contributing parameters of fig. The number of fruits per tree (247), fruit length (7.03 cm), fruit diameter (5.30 cm), average fruit weight (56.1 g), fruit yield per tree (13.8 kg), yield (55.5 tha^{-1}), TSS (22.28%) and reducing sugar (16.41%) were increased significantly due to application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1} at pruning along with recommended dose of fertilizer (50 kg FYM + 900:225:300 of N:P_2O_5:K_2O per tree). On the contrary, the minimum acidity (0.15%) was recorded in the same treatment. The application of micronutrients either through soil or foliar application did not influenced the non reducing sugar content of fig fruit.

Key words: Fig, quality, micronutrient, yield.

The fig (*Ficus carica* L.) is a small or moderate sized deciduous tree, belonging to the family Moraceae. In India, its commercial production is mostly confined to western parts of Maharashtra, Karnataka and Andhra Pradesh. The total area and fruit production under fig cultivation in the country is 2,899 ha with production of 13,930 MT (av. productivity 4.8 t ha^{-1}). Out of which 2,242 ha area (77.34%) in Maharashtra with production of 7,894 MT (av. productivity 3.52 t ha^{-1}), 641 ha area (22.11%) in Karnataka with production of 6,021 MT (av. productivity 9.39 tha^{-1}) and 16 ha area (0.55%) in Andhra Pradesh with production 15 MT (av. productivity 0.93 tha^{-1}), respectively (Anon, 1). The fig is generally cultivated in shallow soil. These soils are deficient in micronutrients. Often the fertilizer application remains restricted to major nutrients only. The micronutrients are gradually depleted in soil due to non application or non-availability of organic manure to fig. Among all the nutrients, the fig suffers from Fe, Zn and B deficiencies. In view of this fact, it becomes quite clear that the application of micronutrient particularly Fe, Zn and B are very much important for increasing fig production and play as pivotal role in metabolism of growth, reproduction and chemical composition and thereby quality of fruits (Sharma, 13). Since, very little or no research work has been done in this regard, the present investigation was undertaken to study the effect of micronutrients on yield and quality of fig.

The investigation was undertaken on four years old fig orchards of cv. Deanna planted at 5 m × 5 m distance at National Agricultural Research Project, Ganeshkhind, Pune during the year 2007-08. The experiment was laid out in randomized block design with three replication consisted of ten treatments, *viz.*, water spray (control), foliar sprays of $FeSO_4$ (0.5%), $ZnSO_4$ (0.5%), borax (0.2%), $FeSO_4$ (0.5%) + $ZnSO_4$ (0.5%), $FeSO_4$ (0.5%) + $ZnSO_4$ (0.5%) + borax (0.2%), soil application of $FeSO_4$ @ 20 kg ha^{-1} $ZnSO_4$ @ 20 kg ha^{-1}, $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} and $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1}.The soil belongs to Inceptisol, clay loam in texture, pH 7.7, EC. 0.23 dSm^{-1}, organic carbon 5.4 g kg^{-1}, available N 162 kg ha^{-1}, available P_2O_5 30.16 kg ha^{-1}, available K_2O 413.0 kg ha^{-1}, DTPA extractable Fe 3.0 mg kg^{-1}, Zn 0.40 mg kg^{-1}, and hot water soluble B 0.42 mg kg^{-1}. The fig tree was supplied with basal recommended dose of 50 kg FYM + 900 : 225 : 300 g N:P_2O_5 : K_2O per tree, full dose of FYM, P_2O_5, K_2O and 600 g N were given at pruning and remaining 300 g N was applied one month after pruning per tree to all treatments. The soil application of micronutrients were applied alongwith recommended dose of fertilizers at pruning as per the respective treatments. The foliar application of micronutrients was applied one month after sprouting as per treatments and pH of solution 6.5 was adjusted with lime. The observation on growth, yield contributing characters and yield were recorded at harvest. The soil samples were analyzed for pH, EC, organic carbon, free $CaCO_3$, Av. N, P_2O_5, K_2O, DTPA extractable micronutrients and hot water soluble B by adopting standard analytical methods by Jackson (4) and Lindsay and Norvell (6).The fresh fruit was used for estimation of total soluble solids (TSS) by hand refractrometer, whereas, the reducing and non-

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reducing sugar and titratable acidity were estimated by adopting standard methods (Ranganna, 8).

The data presented in Table 1 showed that there was significant effect of micronutrient either soil or foliar application on yield contributing characteristics and yield of fig over control. The highest number of fruits per tree (250) was recorded under soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} and it was on par with the other treatments except foliar spray of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$. The increase in number of fruits per tree due to combined application of micronutrients either through foliar or soil application might be due to production of auxins which were probably helpful for retention of fruits by reducing flower drops thereby increasing number of fruits (Dhinesh *et al.*, 2).The fruit length ranged between 5.50 and 7.10 cm. The foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% borax resulted in significant higher fruit length (7.10 cm) and it was closely followed by soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg + borax @ 5 kg ha^{-1} (7.03 cm) and soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} treatments and on par with each other. The increase in fruit length was possibly due to accumulation of more food material in the tree that lead to efficient utilization for fruits development (Ram and Bose, 8). There was significant increase in fruit diameter and it was ranged between 3.83 to 5.30 cm. The soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1} recorded higher fruit diameter (5.30 cm). However, it was at par with application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} treatment (5.20 cm). The increase in fruit diameter might be due to accumulation of more food material in the tree and lead to efficient utilization for development of fruits.

The soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1} recorded the maximum average fruit weight (56.1 g), fruit yield per tree (13.8 kg) and yield (55.5 q ha^{-1}), which were at par with the soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} treatment. This effect might be due to fact that micronutrients played a pivotal role in vegetative growth, flowering, development of plants and are also directly involved in the process of photosynthesis, this means that a possibility of increasing dry matter percentage as well as yield. The beneficial effects of micronutrients on growth and nutrition were also observed by earlier workers in sapota (Saraswathy *et al.*, 12), in Kinnow mandrian (Dinesh *et al.*, 2), in mandarin orange (Saraswathi *et al.*, 11) and in guava (Rathore *et al.*, 10).

A perusal of data presented in Table 2 revealed that all treatments were found significantly superior to control. The maximum TSS (22.28%) was obtained due to soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1}, which was on par with foliar spray of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% borax (22.03). This might be due to application of micronutrients, which may be attributed to an increased photosynthetic activities and production of more sugars. These findings are in agreement with those of Rathore *et al.* (9) in guava. The minimum acidity (0.15%) was recorded significantly with soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} +

Table 1. Effect of micronutrients on yield parameters of fig.

Treatment	No. of fruits $tree^{-1}$	Fruit length (cm)	Fruit dia. (cm)	Av. wt. of fruit (g)	Yield kg $tree^{-1}$	Yield q ha^{-1}
Water spray (control)	199	5.50	3.83	49.6	9.8	39.5
Foliar spray $FeSO_4$ (0.5%)	230	5.63	4.13	50.9	11.7	46.8
Foliar spray $ZnSO_4$ (0.5%)	223	5.57	4.17	52.7	11.7	46.9
Borax spray (0.2%)	225	6.53	4.07	50.6	11.3	45.4
Foliar spray $FeSO_4$ (0.5%) + $ZnSO_4$ (0.5%)	243	6.20	4.50	50.4	12.2	48.8
Foliar spray $FeSO_4$ (0.5%) + $ZnSO_4$ (0.5%) + Borax (0.2%)	245	7.10	4.73	51.7	12.6	50.6
Soil application $FeSO_4$ @ 20 kg ha^{-1}	241	6.27	4.17	51.5	12.4	49.7
Soil application $ZnSO_4$ @ 20 kg ha^{-1}	240	6.60	4.27	52.5	12.6	50.3
Soil application $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1}	250	7.00	5.20	54.5	13.6	54.5
Soil application $FeSO_4$ + $ZnSO_4$ @ 20 kg ha^{-1} each + Borax @ 5 kg ha^{-1}	247	7.03	5.30	56.1	13.8	55.5
CD at 5%	16.9	0.69	0.40	3.51	0.82	3.27

Table 2. Effect of micronutrients on quality of fig.

Treatment	TSS (%)	Acidity (%)	RS (%)	NRS (%)
Water spray (control)	21.00	0.26	15.38	0.44
Foliar spray $FeSO_4$ (0.5%)	21.50	0.22	16.00	0.52
Foliar spray $ZnSO_4$ (0.5%)	21.61	0.24	16.12	0.62
Foliar spray Borax (0.2%)	21.90	0.16	16..34	0.50
Foliar spray $FeSO_4$ + $ZnSO_4$ (0.5%)	21.68	0.21	16.13	0.50
Foliar spray $FeSO_4$ + $ZnSO_4$ (0.5%) + borax (0.2%)	22.03	0.22	16.39	0.69
Soil application $FeSO_4$ @ 20 kg ha^{-1}	21.60	0.21	16.12	0.49
Soil application $ZnSO_4$ @ 20 kg ha^{-1}	21.68	0.21	16.15	0.67
Soil application $FeSO_4$ + $ZnSO_4$ @ 20 kg ha^{-1}	21.75	0.17	16.18	0.55
Soil application $FeSO_4$ + $ZnSO_4$ @ 20 kg ha^{-1} each + borax @ 5 kg ha^{-1}	22.28	0.15	16.41	0.65
CD at 5%	0.26	0.06	0.37	NS

borax @ 5 kg ha^{-1} as compare to maximum in control, *i.e.*, water spray (0.26%). However, it was on par with 0.2% borax foliar spray(0.16%) and soil application, of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} (0.17%). The reduction in acidity might be due to conversion of acids into sugar and their derivatives by reaction involving reversal of glyconic pathway (Rulsner *et al.*, 13). The similar results were also reported by Sharma (13) and Lal *et al.* (5) in guava. The maximum sugar content (16.41%) was recorded due to soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} closely followed by combined foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% borax treatment (16.39%). This might be due to increase in photosynthesis activities and chlorophyll content of leaves and activities of enzymes like catalyses, peroxidases and polyperoxidases, which ultimately leads to more accumulation of sugars in fruits. The similar results were also reported in by Rathore *et al.* (10) in guava, and Dutta *et al.* (3) in litchi.

From the above results it could be concluded that the soil application of $FeSO_4$ + $ZnSO_4$ each @ 20 kg ha^{-1} + borax @ 5 kg ha^{-1} to fig after pruning was effective in increasing yield and quality of fruits on Inceptisol.

REFERENCES

1. Anonymous. 2010, *Horticulture Development of Maharashtra*, Commissionerate of Agriculture, Government of Maharashtra, Pune, *Shodhganga* pp. 1-23.
2. Dhinesh, Babu K., Dubey, A.K. and Yadav, D.S. 2007. Effect micronutrients on enhancing the productivity and quality of Kinnow mandarin. *Indian J. Hort*. **64**: 353-56.
3. Dutta, P, Banik, A. and Dhua, R.S. 2000. Effect of boron on fruit set, fruit retention and fruit quality of litchi cv. Bombai. *Indian J. Hort.* **57**: 287-90.
4. Jackson, M.L. 1973. *Soil Chemical Analysis*, Prentice Hall, India Pvt. Ltd., New Delhi.
5. Lal, G., Sen, N.L. and Jat, R.G. 2000. Yield and leaf nutrient composition of guava as influenced by nutrients. *Indian J. Hort.* **57**: 130-32.
6. Lindsay, W.L. and Norvell, W.A. 1978. Development of DTPA soil test for zinc, iron, manganese and copper. *Soil Sci. Soc. American J.* **42**: 421-28.
7. Ranganna, S. 2004. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products* (2nd Edn.), Tata McGraw Hill Pub. Co. Ltd., New Delhi.
8. Ram, R.A. and Bose, T.K. 2000. Effect of foliar application of magnesium and micronutrients on growth, yield and fruit quality of mandarin orange (*Citrus reticulata* Blanco). *Indian J. Hort.* **57**: 215-20.
9. Rathore, N.S., Dashora, L.K. and Sarolia, D.K. 2008. Effect of zinc and boron on yield and quality of guava (*Psidium guajava* L.) cultivar 'Sardar' under Mewar region. Deptt. of Hort. Rajasthan College of Agri. M.P. Univ. of Agri. & Tech., Udaipur, pp. 33-35.
10. Rulsner, H.P., Hoblet, W. and Rast, D. 1975. Gluconcogenesis in the ripening berries of *Vitis vinifera*. *Vitis*, **13**: 314-28.

11. Saraswathi, T., Thangaraj, T., Azhaklamanavalan, R.S. and Balakrishnamurthy, G. 1998. Effect of micronutrients on yield and quality of mandarin orange (*Citrus reticulata* Blanco). *South Indian Hort*. **46**: 128-31.

12. Saraswathy, S., Balakrishnan, K., Anbu, S., Azhakia Manavalan, R.S. and Thangaraj, T. 2000. Effect of zinc and boron on growth, yield and quality of sapota (*Manilkara achras* Mill.) cv. PKM1. *South Indian. J. Hort.* **52**: 41-44.

13. Sharma, M.K.1998. Effect of zinc, copper and boron on growth, yield, quality and post harvest shelf life of guava (*Psidium guajava* L.) cv. L-49 during rainy season. Ph.D. thesis, Rajasthan Agriculture University, Bikaner.

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