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Influence of Micro Nutrients on Fruit quality of Ber

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ABSTRACT

An experiment was carried out to study the effect of certain micronutrients on fruit quality of Ber cv. Umran at village Manda Bhinda near Jaipur district (Rajasthan) during the year 2005-06. The experiment was laid out in a randomized block design with ten treatment combinations involving three levels of $FeSO_4$, Fe-EDTA and borax ($FeSO_4$ and FeEDTA 20, 30 and 40g plant^{-1}, respectively and borax 10, 20 and 30 g plant^{-1}) except control. The higher level of FeEDTA (40 g plant^{-1}) increased the fruit parameters i.e. length of fruit (4.88 cm), width of fruit (3.98 cm), fruit weight (32.74 g), pulp weight (30.77 g), stone weight (1.97 g) and pulp to stone ratio (15.61). It also produced favourable effect on fruit quality in terms of TSS (18.20%), ascorbic acid (102.08 mg 100g^{-1}) and non-reducing sugars (3.84%), whereas in terms of reducing sugars (7.02) the higher level of borax (30 g plant^{-1}) and in acidity (0.220%) FeEDTA 30 g plant^{-1} gave significantly better results compared to rest of the treatments.

Key words : Ber, Borax, FeEDTA, $FeSO_4$, Micronutrients

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Ber is a rich source of ascorbic acid, vitamins, TSS, carbohydrate, protein and acidity. It's fruit is eaten fresh as well as dried and processed into delicious candy. India, is one of the horticulturally rich country of the world, produces large varieties of fruits, and ber is one of these. Since last 50 years considerable research work had been carried out in the country on various aspects such as varieties, irrigation, weed management, spacing, post harvest etc. for increase in yield and quality of ber. It would therefore be worth while to improve the quality of ber with basal feeding on nutrients. Moreover, elements like nitrogen, phosphorus and potash play a vital role in promoting the plant vigour and production. The micronutrients like Fe, Zn, Mn, Cu and B not only essential but are equally important like other macro nutrients, except their requirement in micro maximising. Without minimizing the importance of macronutrients in maximising the fruit production in the country during the last 50 years, it can be stated that micronutrients are going to play a major productive and qualitative role in bringing stability and sustainability in the production system during the next few decades, particularly in ber.

In view of the above fact, it became quite clear that the investigation in ber is very important to improve the quality of fruits through micronutrients and hence the present study carried out.

MATERIAL AND METHODS

The experiment was conducted in a randomized block design with three replications and ten treatments at village Manda Bhinda near Jaipur district of Rajasthan state during the year 2005-06. The soil of experimental orchard was clayey with pH 7.8 and EC (dS m^{-1}) 0.96. Available N P K by colourimetric method are 340, 37 and 242 kg ha^{-1}, respectively, and organic carbon was 0.65 per cent. The bearing trees of ber cv. Umran of five year old were chosen. Each selected tree represented for one treatment in each replication. The recommended dose of fertilizer (RDF) was applied at the rate of 400 g nitrogen, 320 g phosphorus and 350 g potassium per plant. The 1/3 nitrogen and potassium and whole amount of phosphorus applied just after pruning. Remaining nitrogen and potassium applied in two splits in August and October months.

The various treatments are $FeSO_4$ 20 g- T_1, $FeSO_4$ 30 g- T_2, $FeSO_4$ 40 g- T_3, FeEDTA 20 g- T_4, FeEDTA 30 g- T_5, FeEDTA 40 g- T_6, Borax 10 g- T_7, Borax 20 g- T_8, Borax 30 g- T_9 and control (RDF)- T_{10}. The micronutrients were applied in two splits in May and August months. All plant protection and intercultural operations was undertaken whenever necessary. Fruit weight, fruit diameter, pulp weight, stone weight and pulp to stone ratio for physical characters of fruit and TSS, sugars, acidity and

Table 1. Effect of micronutrients on physical characters of ber fruit cv. Umran

Treatments	Weight of Fruit (g)	Length of Fruit (cm)	Width of Fruit (cm)	Pulb weight (g)	Stone weight (g)	Pulp: stone ratio
T_1 = $FeSO_4$ 20g	28.02	4.50	3.51	26.10	1.92	13.59
T_2 = $FeSO_4$ 30g	30.74	4.74	3.76	28.79	1.95	14.76
T_3 = $FeSO_4$ 40g	31.74	4.75	3.79	29.78	1.96	15.19
T_4 = FeEDTA 20g	29.50	4.60	3.64	27.57	1.93	14.28
T_5 = FeEDTA 30g	31.89	4.84	3.85	29.93	1.96	15.27
T_6 = FeEDTA 40g	32.74	4.88	3.98	30.77	1.97	15.61
T_7 = Borax 10g	27.12	4.40	3.44	25.25	1.87	13.50
T_8 = Borax 20g	27.85	4.45	3.46	25.95	1.90	13.65
T_9= Borax 30g	30.16	4.65	3.69	28.21	1.95	14.46
T_{10}= Control (RDF)	26.35	3.70	2.96	24.48	1.87	13.09
C.D.at 5%	3.54	1.08	0.98	1.95	NS	1.82
S. Em ±	0.951	0.093	0.062	0.872	0.005	0.056

Table 2. Effect of micronutrients on bio chemical characters of ber fruit cv. Umran

Treatments	TSS (%)	Total Sugars (%)	Reducing Sugars (%)	Non reducing sugars (%)	Acidity (%)	Ascorbic Acid Mg $100g^{-1}$
T_1 = $FeSO_4$ 20g	16.56	9.62	6.48	3.14	0.233	98.52
T_2 = $FeSO_4$ 30g	17.35	9.75	6.50	3.25	0.226	100.92
T_3 = $FeSO_4$ 40g	16.80	10.77	6.97	3.80	0.226	101.98
T_4 = FeEDTA 20g	16.94	10.59	6.65	3.94	0.226	99.02
T_5 = FeEDTA 30g	17.95	10.65	6.90	3.75	0.220	102.00
T_6 = FeEDTA 40g	18.20	10.82	6.98	3.84	0.223	102.08
T_7 = Borax 10g	15.85	9.65	6.60	3.05	0.236	95.00
T_8 = Borax 20g	16.04	10.44	6.74	3.70	0.233	97.75
T_9= Borax 30g	17.02	9.99	7.02	2.95	0.226	99.57
T_{10}= Control (RDF)	13.10	8.50	5.30	3.20	0.246	90.23
C.D.at 5%	1.235	1.080	1.120	NS	0.021	3.69
S. Em ±	0.579	0.544	0.549	0.398	0.005	1.033

ascorbic acid for chemical characters of fruits were recorded. TSS was recorded with the help of hand refractometer and chemical composition of fruits was determined by following the standard methods (Ranganna, 1977).

RESULTS AND DISCUSSION

Physical characters of fruit

Data revealed that the physical characters of fruit were significantly influenced by the various treatments of micronutrients (Table 1). The higher weight (32.74 g) of individual fruit, length (4.88 cm) of fruit, width of fruit (3.98 cm), pulp weight (30.77 g), stone weight (1.97 g) and pulp to stone ratio (15.61) were observed in plants treated with FeEDTA 40 g/plant. All other treatments also had beneficial results compared to control. The ferrous application has improved the chlorophyll content (Jacobson and Oertli,1957) of ber leaves that might have increased the photosynthetic efficiency of ber leaves and greater production of assimilates. The greater production of photosynthates and their translocation to economic sinks may be the reason of improved yield characters. The findings are in accordance with the results obtained by Rajput *et al.(1976)* in mango, Chauhan and Gupta (1985) in ber and Yadav *et al. (2006)* in banana. Increases in the pulp to stone ratio may be ascribed to the increased pulp weight

as compared to increase in the weight of stone (Table1). Generally, the increase in stone weight was less in comparison to fruit weights due to application of nutrients because stone weight is a genetic character of a variety. Similar results have been reported by Brahmachari and Kumar (1997) in litchi.

Chemical characters of fruits

The effect of different concentrations of micronutrients on Chemical characters are given in Table 2. The rate of increase in TSS per cent (18.20), Total sugars per cent (10.82), non-reducing sugars per cent (3.84) and ascorbic acid (102.08 mg 100 g^{-1}) was higher in T_6 (FeEDTA 40 g) compared to other treatments whereas control showed lowest TSS (13.10%), total sugars (8.50%), reducing sugars (5.30%) and ascorbic acid contents (90.23 mg 100 g^{-1}). The maximum reducing sugars (7.02%) werte noted in treatment T_9 (Borax 30 g $plant^{-1}$) whereas the minimum reducing sugar recorded in control (5.30%). The minimum acidity (0.220%) was recorded in treatment T_5 (FeEDTA 30 g $plant^{-1}$) and maximum in control (0.246%). The increases in TSS and ascorbic content in fruits treated with iron might be due to an increase phytosynthetic activity and more production of starch and consequent conversion to sugars (Dhillon and Bindra 1995). Intensive production of sugars in fruits might be the reason for increased sugars in fruits. Shing *et al.(1970)* in guava, Chitkara and Bhambola (1971) in sweet orange, Shrivastava (1971) in pineapple and Yadav *et al.* (2006) in banana, have reported increased sugar content in fruit due to micronutrients. The decrease in fruit acidity owing to the application of micronutrients might be because the acids have quickly got converted into sugars and its derivatives by the reaction of glycolytic pathway.

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