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Effect of micronutrients on growth and quality of banana (*Musa spp.*) cv. Karpooravalli (ABB)

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ABSTRACT

The present investigation was conducted to study the effect of micronutrients on growth, yield and quality of banana (*Musa spp.*) cv. Karpooravalli (ABB). The study was conducted by foliar application of micronutrients viz., Zinc sulphate, Borax and Ferrous sulphate at different concentrations along with recommended dose of fertilizer (110:35:330 NPK g plant⁻¹) and farmyard manure (25 t ha⁻¹) in Randomized Block Design (RBD) with three replications comprising thirteen treatments. From the experiment, it was concluded that among the application of different micronutrients, the treatment combination of 25 t ha⁻¹ FYM + RDF (110:35:330 g NPK plant⁻¹) + ZnSO₄ @ 0.75 % + Borax @ 0.75 % + FeSO₄ @ 0.75 % on 60, 90 and 120 DAP has enhanced the growth and quality characters of banana cv. Karpooravalli (ABB).

Keywords: Banana, Growth, Quality, Foliar application, Zinc sulphate, Borax and Ferrous sulphate

Introduction

Banana (*Musa spp.*) belongs to the family Musaceae, which is one of the most important tropical and sub-tropical fruit crop grown in India. The edible banana is originated in hot tropical regions of South-East Asia. It is also called as 'Kalpataru', Apple of paradise, Plant of virtue, Adam's fig and Tree of wisdom.

India contributes 26.45 percent of total world production and area of 9.65 lakh hectares among the total area under fruit crops in India with a production of 349.08 lakh tonnes during 2022-2023 (Ministry of Agriculture and Farmer Welfare). The area under banana cultivation in Tamil Nadu is 1.02 lakh hectares with a production of 42.37 lakh tonnes during 2022-2023.

Karpooravalli, meaning 'scented flower', is a popular variety of banana largely grown in South India. These have unique ash-coated golden yellow skin, delicious taste and pleasant aroma. The high fiber content in bananas helps regulate blood sugar levels, making it a good option for those with diabetes.

Balanced nutrition is very important for proper growth, high yield and quality. Banana is a high nutrient requiring crop. Micronutrients exist in very small amounts in both soil and plants, but their role is essential for the crop growth and equally important as primary and secondary nutrients. The role of micronutrients for production of quality traits have been already reported by several scientists. Zinc aids in regulating plant growth hormone and enzyme system, necessary for carbohydrate and starch formation, iron (Fe) promotes formation of chlorophyll pigment, which acts as an oxygen carrier involving cell division and growth and Boron (B) is necessary for translocation of sugars and promotes fruit maturity (Premalatha *et al.*, 2019) [1]. Micronutrient deficiencies in soil and crops have become prevalent in recent years due to several factors like intensive cropping, loss of top soil, soil erosion and leaching (Singh *et al.*, 2007) [2]. To meet the required micronutrients demand, foliar application of micronutrient is necessary to get more yield. Keeping this in view, the present investigation was carried out to study the effect of micronutrients on growth, yield and quality of banana (*Musa spp.*) cv. Karpooravalli (ABB).

Results and discussion

Growth characters

The results of the experiment are presented in Table 1 and Table 2. The result revealed that the combined foliar application of ZnSO₄ @ 0.75 % + Borax @ 0.75 % + FeSO₄ @ 0.75% on 60, 90 and 120 DAP along with 25 t ha⁻¹ FYM and RDF (110:35:330 NPK g plant⁻¹) (T₁₃) recorded the highest pseudostem height (327.19 cm), pseudostem girth (72.49 cm), total number of leaves plant⁻¹ (33.60), leaf area (14.11 m²) and shorter crop duration (376.10 days). While the least value for pseudostem height (254.36 cm), pseudostem girth (58.96 cm), total number of leaves plant⁻¹ (21.54), leaf area (10.28 m²) and longer crop duration (431.27 days) were recorded in control (T₁).

It may be due to increased photosynthetic rate and carbohydrate accumulation as a result of sufficient level of micronutrients in the plant system which helped for better plant growth (Ronbinson and Nel, 1988) [3].

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Shorter crop duration may be attributed to the faster increase in production of leaves which might have helped to synthesize more photo-

synthates, which in turn influenced earlier flowering stimulus as suggested by Murray (1960) [4].

Table 1. Effect of micronutrients on growth characters at harvest stage in Banana (*Musa spp.*) cv. Karpooravalli (ABB)

Treatments	Pseudostem height (cm)	Pseudostem girth (cm)	Total number of leaves plant ⁻¹	Leaf area (m ²)	Total Crop duration (Days)
T ₁	254.36	58.96	21.54	10.28	431.27
T ₂	289.82	67.02	29.15	12.60	395.44
T ₃	285.30	65.62	28.29	12.31	399.32
T ₄	306.73	63.35	31.00	13.25	387.75
T ₅	280.62	65.41	28.02	12.24	400.83
T ₆	291.54	67.11	29.20	12.63	395.48
T ₇	300.31	68.30	30.12	12.96	391.63
T ₈	271.83	61.40	25.87	11.94	405.12
T ₉	283.34	65.49	28.18	12.28	401.03
T ₁₀	293.18	67.20	29.25	12.67	395.51
T ₁₁	315.04	70.39	31.86	13.54	383.86
T ₁₂	322.46	71.43	32.72	13.83	379.97
T ₁₃	327.19	72.49	33.60	14.11	376.10
S.Ed	2.16	0.59	0.42	0.12	1.95
CD ($p = 0.05\%$)	4.31	1.01	0.83	0.26	3.92

Quality characters

The results of the experiment are presented in Table 2. The quality parameters like finger length (14.08 cm), finger girth (10.22 cm), finger volume (130.28 cm³), finger weight (113.12 g), pulp weight (89.20 g), peel weight (24.48 g), pulp:peel ratio (3.64), TSS (23.58°Brix), total sugar content (23.67 per cent), reducing sugar content (19.21 per cent), non-reducing sugar content (4.46 per cent), ascorbic acid content (10.13 mg 100 g⁻¹) were maximum, minimum acidity content (0.22 per cent) and moisture content (68.32 per cent) were recorded in combined foliar application of ZnSO₄ @ 0.75 % + Borax @ 0.75 % + FeSO₄ @ 0.75 % on 60, 90 and 120 DAP along with 25 t ha⁻¹ FYM and RDF (110:35:330 NPK g plant⁻¹) (T₁₃). While the least value for finger length (8.31 cm), finger girth (7.08 cm), finger volume (91.67 cm³), finger weight (70.42 g), pulp weight (51.25 g), peel

weight (19.35 g), pulp:peel ratio (2.64), TSS (18.35°Brix), reducing sugar content (17.88 per cent), non-reducing sugar content (3.12 per cent), total sugar content (21.02 per cent), ascorbic acid (5.27 mg 100 g⁻¹), highest acidity content (0.42 per cent) and moisture content (75.21 per cent) were recorded in T₁ (Control).

Jagadeeswari *et al.* (2018) [5] reported that foliar application of banana special micronutrient mixture during fruit development stage resulted in increased banana productivity. The multi-micronutrient mixture comprised of Zn and B and other micronutrients have an important role in sugar metabolism. This is due to its action on converting complex substances into simple ones, which enhances the metabolic activity in fruits and it results in increased total sugar of fruit. Similar findings were reported by Paul *et al.* (2015) [6] in banana cv. Nendran banana, Yadlod *et al.* (2008) [7] in banana cv. Shrimanti.

Table 2. Effect of micronutrients on quality characters in Banana (*Musa spp.*) cv. Karpooravalli (ABB)

Treatments	Finger length (cm)	Finger girth (cm)	Finger weight (g)	Finger volume (cm ³)	Pulp weight (g)	Peel weight (g)	Pulp : Peel ratio	TSS (°Brix)	Total sugar content (%)	Reducing sugar (%)	Non-reducing sugar (%)	Ascorbic acid (mg 100 g ⁻¹)	Titrate acidity (%)	Moisture Content (%)
T ₁	8.31	7.08	70.42	91.67	51.25	19.35	2.64	18.35	21.02	17.88	3.12	5.27	0.42	75.21
T ₂	12.45	9.02	95.84	116.91	74.86	22.76	3.28	21.42	22.53	18.59	3.95	8.38	0.34	70.58
T ₃	12.07	8.78	92.46	114.35	72.04	22.43	3.21	21.03	22.34	18.48	3.86	8.04	0.36	71.04
T ₄	13.28	9.57	103.31	122.51	80.87	23.49	3.44	22.32	23.06	18.87	4.19	9.16	0.29	69.71
T ₅	11.97	8.69	91.87	113.94	71.54	22.34	3.19	20.89	22.23	18.40	3.83	7.92	0.38	70.96
T ₆	12.49	9.08	96.12	117.06	75.08	22.81	3.29	21.47	22.55	18.57	3.98	8.45	0.33	70.63
T ₇	12.91	9.35	100.04	119.96	78.05	23.18	3.36	21.93	22.86	18.76	4.10	8.83	0.30	70.18
T ₈	11.56	8.56	88.53	111.32	68.76	22.02	3.12	20.49	22.01	18.29	3.72	7.61	0.40	71.43
T ₉	12.02	8.73	92.11	114.12	71.72	22.39	3.20	20.95	22.23	18.42	3.81	7.97	0.37	71.01
T ₁₀	12.53	9.12	96.72	117.38	75.26	22.86	3.30	21.51	22.65	18.64	4.01	8.49	0.32	70.65
T ₁₁	13.34	9.79	106.67	125.09	83.65	23.83	3.51	22.74	23.27	18.99	4.28	9.48	0.27	69.25
T ₁₂	13.71	10.01	109.89	127.66	86.42	24.16	3.57	23.19	23.46	19.10	4.37	9.81	0.24	68.79
T ₁₃	14.08	10.22	113.12	130.28	89.20	24.48	3.64	23.58	23.67	19.21	4.46	10.13	0.22	68.32
S.Ed	0.17	0.09	1.58	1.24	1.35	0.13	0.03	0.17	0.09	0.04	0.03	0.14	0.005	0.24
CD (<i>p</i> = 0.05%)	0.34	0.19	3.18	2.51	2.73	0.27	0.07	0.35	0.18	0.09	0.07	0.29	0.01	0.49

Conclusion

Based on the present investigation it could be concluded that combined foliar application of ZnSO₄ @ 0.75 % + Borax @ 0.75 % + FeSO₄ @ 0.75 % on 60, 90 and 120 DAP along with 25 t ha⁻¹ FYM and RDF (110:35:330 NPK g plant⁻¹) significantly enhancing the growth and quality of banana cv. Karpooravalli (ABB).

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