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Effect of foliar spray of micronutrient on plant growth character and yield of banana

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ABSTRACT : The experiment was conducted by Agricultural Research Station, Tamil Nadu Agricultural University, Vellore district of Tamil Nadu during 2014-15 to study the effect of foliar spray of micronutrients on growth and yield parameter of banana. The investigation was carried out in simple Randomized Block Design with three replications and 12 treatments in the experimental field at Kavasampattu village, Vellore district. The uniform healthy 2 months old sword suckers of cv. POOVAN were planted in pit at a spacing of 2m x 2m after treating the Carbendazim. The nitrogen and potash were applied in 3 splits *i.e.* at 3, 5 and 7th months after planting. The phosphorus was applied by basal. The micro-nutrients *viz.*, Zn (0.5%), borax (0.1%), Fe (0.2%) and Cu (0.2%) were applied singly or in combination as foliar spray at 3, 5 and 7th month after planting of suckers. Control plants were sprayed with water only. Recommended plant protection measures and cultural operations were made throughout the period of study. Observation on plant height, leaf number and flowering percentage were recorded at shooting. From the findings of the present investigation, the yield per hectare was significantly higher in high density population of plant height, number of leaves and flowering percentage with application of foliar spray of zinc (0.5 %) and boron (0.1%) followed by boron (0.1 %) and iron (0.2 %). It can be adopted for higher yield of banana.

KEY WORDS : Foliar nutrition, Micronutrients, Banana

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Micronutrients are required by plants in minute quantities, although these are very effective in regulating plant growth as they form a part of the enzyme system and thus, regulating plant growth as they form a part of the enzyme system and thus, regulate plant life. Micronutrients like Cu, Zn, Mo, B and Mn are necessary for healthy growth of banana (Srivastava, 1964). Deficiencies of Zn, Cu, Fe and Mo affected the growth and production in banana (Charpentier and Martin, 1965). However, no such research results are available for the new North East zone of Tamil Nadu. Therefore, the present experiment was carried out to study the response of Zn, B, Fe and Cu singly or in combination on

growth, yield and quality of banana.

RESEARCH PROCEDURE

The experiment was conducted in simple Randomized Block Design with three replications and 12 treatments in the experimental field at Kavasampattu village, Vellore district during 2014-15. The uniform healthy 2 months old sword suckers of cv. POOVAN were planted in pit at a spacing of 2m x 2m after treating the Carbendazim. Five kg farm yard manure +110g N, 50g P₂O₅ and 330g K₂O plant⁻¹ were applied. Full dosed of FYM and phosphate was applied before planting of sucker in the pits. The

nitrogen and potash were applied in 3 splits *i.e.* at 3, 5 and 7th months after planting. The micronutrients *viz.*, Zn (0.5%), borax (0.1%), Fe (0.2%) and Cu (0.2%) were applied singly or in combination as foliar spray at 3, 5 and 7th month after planting of suckers. Control plants were sprayed with water only. Recommended plant protection measures and cultural operations were made throughout the period of study. Observation on plant height, leaf number and flowering percentage were recorded at shooting. Fully developed leaf laminae and soil samples from each plant under different parameters were collected for estimation of Zn, B, Fe and Cu contents at different stages of shooting. The initial soil parameter pH 7.29 and EC 0.11 dSm⁻¹ were recorded in soil sample. The soil samples were collected and analysed for the available nutrient content. It contains 241, 24, 243 kg/ha of nitrogen, phosphorus and potassium, respectively. The available micronutrient content was 1.37 ppm manganese, 1.51 ppm iron, 1.67 ppm zinc, 1.1 ppm boron and 0.61 ppm copper in the initial soil sample. The data obtained was statistically analysed for analysis of variance (Cochran and Cox, 1992).

RESEARCH ANALYSIS AND REASONING

In banana crop, there was linear increase in plant height in all the treatments with the advancement of age from 3rd to 7th month. Significant differences among the treatments were observed from 3rd month to 7th month.

During the all the stages of banana, maximum plant height was noticed in the 159.5 cm in the treatment of foliar application of zinc and boron in the 7th month of banana crop (T₅) followed by 157.7cm in the treatment of foliar application of boron and iron (T₈) while it was minimum plant height was noticed in the treatment of control (T₁₂) (Table 1).

It has been well documented that the plant height increases with an increase in plant density as reported by Chattopadhyay *et al.* (1985) in giant governor banana. The results of present investigation are in conformity with the above findings. 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.

Significant differences were noticed among the treatments with respect to number of leaves from 3rd to 7th month. The number of functional leaves per plant in all the treatments increased linearly with the advancement of age from 3rd month to 7th month (Table 2). The maximum number of leaves (18.6) were found in the treatment of foliar application of zinc and boron in the 7th month of banana crop (T₅) followed by (17.8) in the treatment of foliar application of boron and iron (T₈) while it was minimum plant height was noticed (13.9) in the treatment of control (T₁₂) (Table1).

Increase in number of functional leaves and leaf area in wider spacing may be due to less competition for moisture and sunlight (Berrill, 1963) and hence, leaf emergence reduced under very close planting owing to

Treatments	3 rd Month	5 th Month	7 th Month
T ₁ -Zn	82.8	132.3	153.0
T ₂ - B	84.9	135.3	155.7
T ₃ - Fe	83.8	132.3	151.0
T ₄ - Cu	82.1	132.4	152.1
T ₅ - Zn + B	85.5	138.6	159.5
T ₆ - Zn + Fe	81.9	133.6	152.8
T ₇ - Zn+Cu	82.5	132.4	150.8
T ₈ - B + Fe	84.5	137.4	157.7
T ₉ - B +Cu	82.1	131.8	151.3
T ₁₀ - Fe + Cu	85.03	131.9	150.4
T ₁₁ - Zn + B+ Fe+ Cu	82.27	134.8	154.4
T ₁₂ - Control	79.83	128.5	142.5
S.E.±	0.36	0.29	0.24
C.D.(P=0.05)	0.74	0.59	0.52

Table 2 : Effect of foliar spray application on number of leaves at different stages in banana

Treatments	3 rd Month	5 th Month	7 th Month
T ₁ -Zn	6.1	8.1	16.3
T ₂ - B	5.4	10.6	15.8
T ₃ - Fe	5.3	9.9	15.7
T ₄ - Cu	5.5	9.7	15.3
T ₅ - Zn + B	7.3	12.6	18.6
T ₆ - Zn + Fe	6.2	11.5	17.4
T ₇ - Zn+Cu	6.4	10.4	16.5
T ₈ - B + Fe	6.9	11.5	17.8
T ₉ - B +Cu	5.6	10.7	16.6
T ₁₀ - Fe + Cu	5.3	9.7	16.3
T ₁₁ - Zn + B+ Fe+ Cu	6.3	11.6	16.7
T ₁₂ - Control	5.1	9.5	13.9
S.E.±	0.13	1.44	0.13
C.D.(P=0.05)	0.28	2.98	0.29

lower temperature inside the canopy since temperature had significant influence of leaf emergence. This might have helped in production of higher leaf area by producing wider leaves (Robinson and Nel, 1988) in wider leaves. The highest number of leaves was attributed by nutrient supplementation through foliar application of micronutrients. Further the results of this investigation are in same line with the findings of Singh and Uma (1996).

During the all the ages of banana crop, significantly difference were observed among the treatments with

respect to flowering percentage at 7th month of banana crop (Table 3), the maximum flowering (68.2%) were found in the treatment of foliar application of boron and iron (T₈) followed by (62.3%) in the treatment of foliar application of zinc and boron (T₅) while it was minimum value of flowering (41.9%) was noticed (13.9) in the treatment of control (T₁₂).

The results of the present investigation also point out the there was a variation in the growth rate in terms of plant height with the age recording more growth rate

Table 3 : Effect of foliar spray application on flowering percentage on 7th month of banana

Treatments	Flowering percentage
T ₁ -Zn	52.6
T ₂ - B	57.9
T ₃ - Fe	51.5
T ₄ - Cu	53.4
T ₅ - Zn + B	62.3
T ₆ - Zn + Fe	52.3
T ₇ - Zn+Cu	50.5
T ₈ - B + Fe	68.2
T ₉ - B +Cu	53.5
T ₁₀ - Fe + Cu	53.1
T ₁₁ - Zn + B+ Fe+ Cu	54.3
T ₁₂ - Control	41.9
S.E.±	0.42
C.D.(P=0.05)	0.86

Table 4 : Effect of foliar spray application on yield of banana

Treatments	Bunch weight (kg)
T ₁ -Zn	8.57
T ₂ - B	13.70
T ₃ - Fe	12.30
T ₄ - Cu	13.23
T ₅ - Zn + B	14.27
T ₆ - Zn + Fe	11.63
T ₇ - Zn+Cu	11.23
T ₈ - B + Fe	14.67
T ₉ - B +Cu	12.60
T ₁₀ - Fe + Cu	12.30
T ₁₁ - Zn + B+ Fe+ Cu	13.27
T ₁₂ - Control	10.27
S.E.	0.14
C.D.(P=0.05)	0.28

during initial stages and less during later stages (Chacko and Reddy, 1981).

Plant girth increased at wider plant density indicating that plant girth and height of banana are inversely proportional to each other. Similar findings were also reported by Reddy and Singh (1993). Increase in plant girth and number of suckers per plant due to decrease in plant density may be due to the fact that, plant faced less competition for moisture and sunlight in wider spacing (Berrill, 1963), the results of the present study are in accordance with the findings of Robinson and Nel (1988) in banana.

The highest bunch weight (14.67 kg) was recorded in the treatment of foliar application of boron and iron (T_8) in banana crop followed by (14.27 kg) in the treatment of foliar application of zinc and boron (T_5) while it was minimum bunch weight was noticed (8.57 kg) in the treatment of zinc (T_1) (Table 4). The results of the present study are in accordance with the findings of Yadlod and Kadam (2010) in banana. Similarly, the distribution of micronutrients indicated that the boron and iron contents were significantly higher in the T_8 treatments with compared to control. The similar results were also found with the findings of Senthilkumar *et al.* (2014).

Conclusion :

From the findings of the present investigation, the yield per hectare was significantly higher with application of foliar spray of boron (0.1 %) and iron (0.2 %) followed by zinc (0.5 %) and boron (0.1%) and plant height, number of leaves were higher recorded with application of foliar spray of zinc (0.5 %) and boron (0.1%) compared to control. It can be adopted for higher yield of banana.

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