

Study on Efficiency of Multi-nutrient Sprays versus Zinc Sprays on Correction of Zinc Deficiency in Semi-arid Banana Cultivation in India

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INTRODUCTION

The natural habitat of bananas is the humid tropics, but bananas are cultivated as irrigated crops in an area of 0.6mha in semi-arid regions of India. Due to a high soil pH (7.5 to 8.2) caused by free CaCO₃, Zn deficiency is very common, and 60-75% of Indian soils are Zn-deficient (Anonymous 1992).

Yield responses to foliar sprays of 0.3% ZnSO₄ were limited. The soil application of ZnSO₄, (25 g/plant) is recommended, but the efficiency is low due to soil fixation and poor translocation from roots. Low organic matter contents, management problems, and poor root health cause other macro and micronutrient deficiencies that are also frequently limiting factors resulting in low productivity and poor quality.

Hence, this study was undertaken to identify important nutrient problems besides Zn deficiency. The results will be used to examine if responses to the correction of Zn deficiency can be enhanced by a multi-nutrient-spray treatment rather than applying Zn alone following the law of maximum and synergistic interaction (Wallace 1992).

METHODS

A survey was undertaken in the banana plantation with CV Robusta (20 number) of Southern Karnataka in 2000-2001. Soil samples were collected from the 0-15 cm layer and in 30 cm lateral distance from banana plants. Leaf laminae were sampled from the 3rd leaf from the top. Soil samples were analyzed for pH, organic matter content, available B, Cu, K, N, P and Zn. Soil and leaf samples were analyzed for Cu, Fe, K, N, Mg, Mn, P, S and Zn using standard procedures.

After identifying important nutrient disorders by soil and leaf analysis, farm trials were conducted to compare applications with Zn sprays to multi-nutrient spray treatments (Zn plus deficient nutrients B, K, and N) at monthly intervals after the 4th month of planting. Banana growth and bunch yield were recorded, and the data was statistically examined.

RESULTS AND DISCUSSION

The nutrient survey indicated that N, K and B deficiencies were found besides Zn deficiency. The results are presented in Table 1.

Table 1. Effects of applying Zn alone versus multi-nutrient spray applications in banana CV. Robusta.

Treatments	No. of Plants at 2m*2m spacing	Mean bunch wt (kg)	Total yield (kg)
1) 0.3% ZnSO ₄	200	28.2	5638
2) 0.3% ZnSO ₄ + 0.1% H ₃ BO ₃	200	34.70	6940
3) 0.3% ZnSO ₄ + 0.1% H ₃ BO ₃ + 1% Urea	200	36.40	7280
4) 0.3% ZnSO ₄ + 0.1% H ₃ BO ₃ + 1% Urea + 0.5% Sulphate of potash	200	40.60	8120
5) No spray, No Zinc control	200	25.2	5020
CD 5%		4.5	625

CONCLUSIONS

This study indicated that responses to nutrient applications are significantly higher if Zn is applied with other deficient nutrients than when Zn is applied alone. According to the law of maximum, the largest net response to a given input is achieved when there are no other limiting factors (Wallace 1993), and the magnitude of the response will increase as more and more limiting factors are corrected. A corollary to the law is that the attained yield is greater than the sum of the individual parts because various parts interact to multiply the values of the others. In a developing country, such as India, technical support systems that could provide leaf and soil-analysis advisory are inadequate. Thus, it is better to add a minimum quantity of possibly deficient nutrients with Zn treatments to obtain economically sustainable yields. That is particularly important for small and marginal farms with less than 2 ha land who are the majority in the farming community. Based on this principle, a multi-nutrient foliar formulation was prepared with Zn and supplied to farmers as “BANANA SPECIAL” from ATIC of IIHR Bangalore. The product is very popular with farmers, and has significantly enhanced responses to Zn applications.

REFERENCES

- Anonymous, All India coordinated- Research project on micronutrient, Annual report 1991-1992, ICAR, New Delhi.
- Wallace, A. (1993) Limiting factors, High yields and the law of maximum Hort. Rew. 15: 409-448.