



Distribution of available micronutrient status in banana growing tracts of Thoothukudi District of Tamilnadu

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ABSTRACT

A study was conducted to access the micronutrient status of Zn, Cu, and Mn in banana growing tracts of Thoothukudi district of Tamilnadu. A total of 238 surface soil samples were collected from farmer's field and analyzed for DTPA-extractable micronutrient status and soil properties. Content of micronutrient was in order of Fe > Mn > Cu > Zn. The DTPA- Zn, Cu, Fe and Mn in soils varied from 0.22 to 2.89, 0.32 to 5.73, 3.00 to 71.18 and 2.87 to 33.56 mg kg⁻¹.

Keywords: DTPA-extractable micronutrients, banana growing soils, Thoothukudi district, Tamilnadu.

INTRODUCTION

The Word Micronutrient represents some essential nutrients that are required in very small quantities for growth of plants and microorganisms. These nutrients are metallic chemical elements viz., Zinc (Zn), Copper (Cu), Iron (Fe), and Manganese (Mn). The nutrient demand of banana is more, as it removes huge quantity of nutrients from soil for its growth and development. The availability of micronutrients for plants is controlled by their total amount present in the soil in which they occurs the emerging micronutrient deficiency of banana, affect its productivity. Thoothukudi is one of the major banana producing districts of Tamilnadu. The information available on the micronutrient status of banana growing tracts of Thoothukudi district is very meager. Inventory of available micronutrient status of the soil helps in demarcating areas, where application of particular micronutrients is needed for profitable banana production.

STUDY AREA

Thoothukudi is a coastal district bordering Virudhunagar and Ramanathapuram districts on the north, Tirunelveli district on the west and south and Gulf of Mannar on the east and south. The Thoothukudi district lies between 8^o19' to 9^o20' north latitude and 77^o 40' to 78^o10' east longitude. The total geographical area of the district is 4597.32 Sq.km which accounts for 3.5 per cent of the state (Fig.1). Among the 12 blocks of Thoothukudi district, 5 blocks Karungulam, Alwartirunagari, Thoothukudi, Tiruchendur and Srivaikuntam have been identified as banana growing tracts.

EXPERIMENTAL SECTION

Totally 238 surface soil samples (0-15 cm depth) covering entire five blocks of banana growing tracts of Thoothukudi district were collected by adopting the standard procedures of soil sample collection. The collected soil samples were air dried sieved (2 mm sieve) and analyzed for various soil properties by adopting standard procedures as follows. The pH and Electrical conductivity (EC) of the soil was estimated by employing potentiometry and conductometry method in soil water suspension of 1:2.5 ratios [1]. Organic carbon content of soil was estimated by chromic acid wet digestion method [2]. The soil was extracted with 0.005 M DTPA for available micronutrients and the micronutrient (Fe, Cu, Zn and Mn) in the extract was determined by atomic absorption spectrometer [3]. The analytical results of each soil sample were categorized in to low, medium and high based on the critical limit fixed for the Tamilnadu soils [4]. Critical limit for available Zn, Cu, Fe and Mn were 1.2, 1.2, 3.7 and 2.0 mg kg⁻¹.

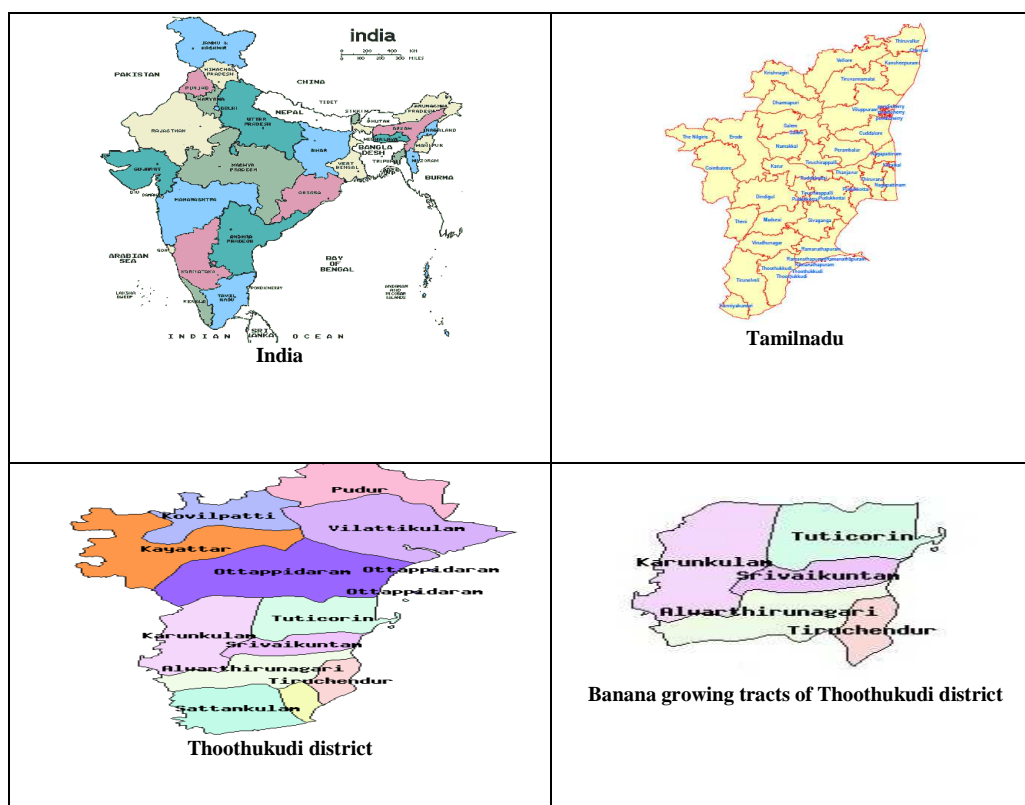


Fig. 1. Location map of Banana growing tracts of Thoothukudi District

RESULTS AND DISCUSSION

The soils of the banana growing tracts of Thoothukudi district were neutral to slightly alkaline (7.08-8.49) with a mean value of 7.77 (Table 1). Increase in pH might be due to the calcareous nature of the black soil and accumulation of bases as they were poorly drained [5].

The total soluble salts expressed as electrical conductivity (EC) ranged from 0.08 to 0.45 dS m⁻¹ with an average value of 0.20 dS m⁻¹ and the values (Table 1) indicated that salinity is not a problem in these soils.

The soils are low to high in organic carbon content vary from 0.26 – 0.87 % with an average value of 0.58 % (Table 1). This result suggested that plant residues decomposed in surface soil would have contributed for the organic carbon status of the soil [6].

The available Zn content of the soils under studied area varied from 0.22 to 2.89 mg kg⁻¹ with a mean value of 1.34 mg kg⁻¹ (Table 1). Considering 1.2 mg kg DTPA-extractable Zn as the critical limit 38.7 % samples were found to be Zn deficient (Table 2). The alkaline soil reaction and free CaCO₃ content of the soils may be the contributing factors for low Zn availability [7].

The amount of available Cu varied from 0.32 to 5.73 mg kg⁻¹(Table 1). The mean value of Cu (2.02 mg kg⁻¹) was much higher than the critical limit of 1.2 mg kg⁻¹. On the whole 3.2 % of the samples were deficient in available Cu (Table 2). Higher availability of Cu in these regions may be ascribed to higher organic matter content in the surface horizons [8].

The available Fe content in the soil varied from 3.00 to 71.18 mg kg⁻¹ with a mean value of 26.57 mg kg⁻¹ (Table 1). Considering 3.7 mg kg⁻¹ as critical limit for Fe deficiency 1.6% of the sample were deficient in available Fe (Table 2). The content of the DTPA available Mn in the studied soil varies from 2.87 to 33.56 mg kg⁻¹ with a mean value of 11.21 mg kg⁻¹ (Table 1). Based on the critical limit 2.0 mg kg⁻¹ of DTPA-Mn none of the sample was deficient in DTPA-Mn (Table 2). The overall scenario of DTPA-Fe and Mn contents in the soils of banana growing tracts of Thoothukudi revealed a very high status of both these elements. Sufficiency in these regions may be attributed to high organic content [9].

Table 1: Range and mean values of soil properties and available micronutrient status in banana growing tracts of Thoothukudi district

| Soil properties | Lowest | Highest | Mean | SD | Mode |
|--------------------------------|--------|---------|-------|-------|-------|
| pH | 7.08 | 8.49 | 7.77 | 0.27 | 7.82 |
| EC(dS m ⁻¹) | 0.08 | 0.45 | 0.20 | 0.07 | 0.15 |
| OC (%) | 0.26 | 0.87 | 0.58 | 0.13 | 0.49 |
| DTPA-Zn (mg kg ⁻¹) | 0.22 | 2.89 | 1.34 | 0.56 | 1.24 |
| DTPA-Cu (mg kg ⁻¹) | 0.32 | 5.73 | 2.02 | 1.15 | 1.08 |
| DTPA-Fe (mg kg ⁻¹) | 3.00 | 71.18 | 26.57 | 15.91 | 31.47 |
| DTPA-Mn (mg kg ⁻¹) | 2.87 | 33.56 | 11.21 | 5.76 | 13.78 |

Table 2. Per cent sample category of available micronutrients in banana growing tracts of Thoothukudi district

| S.No. | Blocks | DTPA-Zn | | | DTPA-Cu | | | DTPA-Fe | | | DTPA-Mn | | |
|-------|------------------|---------|--------|------|---------|--------|------|---------|--------|------|---------|--------|------|
| | | Low | Medium | High | Low | Medium | High | Low | Medium | High | Low | Medium | High |
| 1 | Alwarthirunagari | 18.4 | 55.1 | 26.5 | 2.0 | 8.2 | 89.8 | 0 | 2.0 | 98 | | 0 | 100 |
| 2 | Karungulam | 18.4 | 59.2 | 22.4 | 4.1 | 10.2 | 85.7 | 2.0 | 4.1 | 93.9 | | 0 | 100 |
| 3 | Srivaikundam | 22.4 | 38.8 | 38.8 | 6.1 | 26.5 | 67.4 | 0 | 0 | 100 | | 2.0 | 98 |
| 4 | Thiruchendur | 63.3 | 28.6 | 8.1 | 4.1 | 61.2 | 34.7 | 4.1 | 14.3 | 81.6 | | 22.4 | 77.6 |
| 5 | Thoothukudi | 71.4 | 28.6 | 0.0 | 0.0 | 42.9 | 57.1 | 2.0 | 14.3 | 80.9 | | 0 | 100 |
| Mean | | 38.7 | 42.0 | 19.1 | 3.2 | 29.8 | 66.9 | 1.6 | 6.9 | 90.8 | | 4.8 | 95.1 |

CONCLUSION

The above investigation clearly indicated that the soils of banana growing tracts of Thoothukudi district are deficient in available Zn. Therefore to overcome the deficiency of DTPA-Zn in banana growing tracts of Thoothukudi district foliar spray of 0.5% ZnSO₄, 2 to 3 times at 10-15 days interval can be effective in correcting Zn deficiency. The deficiency of micronutrients is tending towards increasing order, therefore need for sustained application of organic manures or through supplementation with inorganic fertilizers is essential. Hence it is essential to adopt an integrated way of adding organic amendments with micronutrients, which will sustain the soil fertility and banana productivity.

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