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Vertical distribution of available macro and micronutrients cation in red soils of Tamil Nadu

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ABSTRACT

Vertical distributions of available macro and micro nutrients cations in soil pedons (Sivagangai, Melapoongudi, Tamarakki and Keelapoongudi series) from red soil region (Kutturavupatti village, Sivagangai district, Tamilnadu) were studied. The soil texture varied from loamy sand to clay and bulk density ranged from 1.11 to 1.33 Mgm^{-3}. Organic carbon was more in surface than subsurface and pH of soil ranged from 5.5 to 8.3. The available nitrogen in soil was low (<280 kg) in all the pedons which ranged from 28 to 117 kg ha^{-1} and its distribution was found decreasing with increasing depth. The available phosphorus (P) and potassium (K) content in soil was low to high (P 5.3 to 25.2 kg ha^{-1} and K 87 to 574 kg ha^{-1}) in all the pedons. The available Fe, Mn, Zn and Cu contents in soil ranged from 6.2 to 71.8, 2.6 to 15.4, 0.8 to 11.5 and 1.6 to 29.2 ppm, respectively. The available micronutrients content of these soils were in the order of Fe> Mn> Zn >Cu.

Key words : Available macronutrients, DTPA extractable micronutrients, Soil fertility

Crop production primarily depends on the soil fertility characters of the soils where it is raised. Crops do not only take nutrients from surface layer but also draw a part of their nutrient requirement from subsurface layer of the soil. Therefore, the knowledge of vertical distribution of available macro and micronutrients captions is very important in recommending soil fertility management practices. Keeping this in view, the present study was carried out at village level for soil fertility management for realizing higher production.

MATERIALS AND METHODS

Present investigation was carried out in the year 2005-06. The area under study runs approximately form$78^0$25' and $78^0$30' E longitude and $9^0$55' and 10^0 00' N latitude in Kutturavupatti village of Sivagangai district, Tamil Nadu.. The climate of the area is semiarid with mean annual rainfall of 1012 mm and mean air temperature ranges from 20 to 38^0 C. Soils of the area qualifies for 'ustic' soil moisture regime and 'isohyperthermic' soil temperature regimes. The geology of the area comprises mainly gneiss in uplands, calcic gneiss and kankar nodules in the lowlands. Sampling sites were selected considering contrasting difference in texture, topography, drainage, calcareousness and type of vegetation. Soil samples were collected from each pedons horizon wise, air-dried, ground in wooden plank and roller, passed through a 2 mm stainless steel sieve and analyzed for various parameters. Soil pH was measured in 1:2 soil water suspension using class electrode pH meter. Electrical conductivity was measured in 1:2 soil water supernatant solutions with the help of Conductivity Bridge. The organic carbon was determined by rapid titration method (Walkely and Black, 1934). The available fractions of Fe, Mn, Zn and Cu were extracted with DTPA-TEA buffer (0.005M DTPA + 0.01M $CaCl_2$ + 0.1 M TEA, pH 7.3) as per the method of Lindsay and Norvell (1978) and the concentration of Fe, Mn, Zn and Cu in the DTPA- extracts was determined using atomic absorption spectrophotometer (AAS). Available nitrogen and potassium were estimated by alkaline permanganate and neutral normal ammonium acetate method, respectively. Available phosphorus was estimated by using 0.5M $NaHCO_3$ extractant for alkaline condition (Olsen *et al.*, 1954) whereas under acid condition Bray (0.03 N NH_4F+0.025 N HCL) extractant was used (Bray and Kurtz, 1945).

RESULTS AND DISCUSSION

Physico - chemical characteristics:

Four typical pedons were studied and named as Sivagangai (P_1), Melapoongudi (P_2), Tamarakki (P_3) and Keelapoongudi (P_4) series. In these pedon 1 and 4 were in upland and pedon 2 and 3 were in lowland. The clay, silt and sand contents in soils varied from 6.5 to 46.1, 3.5 to 18.11 and 37.8 to 83.0 per cent, respectively. Clay content increased with increasing depth in pedon 1 and 3 whereas silt and sand distribution pattern observed was irregular. The bulk density of soils varied from 1.11 to 1.33 Mgm^{-3}. The progressive increase of bulk density with depth was observed in pedon 2 only. It might be due to