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FORMS OF IRON AND THEIR DISTRIBUTION IN SOME SOIL PROFILES OF TAMIL NADU

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ABSTRACT

The distribution pattern of total and available iron and their relationship with different soil properties were studied in twenty three soil profiles representing seven major soil series covering four major soil types of Namakkal Taluk in Tamil Nadu. Total iron content varied from 2.90 to 13.60 per cent and the content increased with depth in all the soils.

The available iron content varied from 2.01 to 12.66 ppm and the content decreased with depth in laterite and alluvial soils while irregular pattern was observed in black and red soils. Total available iron had a positive association with organic matter and clay content.

Key words: Iron, distribution, Tamil Nadu soil profiles.

It has become essential to demarcate areas which are deficient or likely to be deficient in micronutrients and suggest ways and means of avoiding such deficiencies. Hence, in the present study, an attempt was made to assess the depth-wise distribution of total and available iron in some soil profiles and to delineate the soils that are deficient in available iron.

MATERIALS AND METHOD

Soil samples collected from twenty three profiles representing seven major series namely, Peelamedu, Upparapatti, Thiruchengodu, Thullukkanur, Thondipatti, Vellalur and Kolli Hills series covering four major soil types were analysed for their mechanical composition, pH, organic carbon and calcium carbonate content (Jackson, 1962). Total iron was estimated in sodium carbonate fusion extract of the soil using spectrophotometer. Available iron was estimated by Olsen and Carlson (1950) method using normal ammonium acetate of pH 4.8 as extractant.

RESULTS AND DISCUSSION

The total iron content varied from 2.90 to 13.60 per cent. The content increased with depth in all the soils examined. The clay content was also found to increase with depth. Similar to that reported by Abdul Ghani (1964) in Egyptian soils, the iron that is bound in the clay complex against leaching might have partly contributed to the increase in iron content with depth. The total iron content was found to be maximum in laterite soils followed by black, red and alluvial soils. Arunachalam and Dhanapalan Mosi (1973) have also reported similar trend. A positive association of total iron content with clay ($r = 0.441^{**}$) and also with organic matter ($r = 0.219^{*}$) were observed (Tables 1 and 2). Similar results were reported by Arunachalam and Dhanapalan Mosi (1973) for Tamil Nadu soils.

Table 1. Simple correlation coefficients between forms of iron and soil properties

Sl. No.	Soil properties	Total iron	Available iron
1.	pH	-0.668**	-0.108 N.S
2.	Clay	0.441**	0.250**
3.	Silt	0.303**	0.185N.S
4.	Fine sand	-0.422**	-0.153 N.S
5.	Coarse sand	-0.210*	-0.223*
6.	Organic matter	0.219*	0.564**
7.	Calcium carbonate	-0.204*	0.037 N.S
8.	Total iron	-	0.030 N.S

* Significant at 5 per cent level
** Significant at 1 per cent level
NS Not-Significant

* Formed part of the M.Sc (Ag.) Thesis submitted by the first author to Tamilnadu Agricultural University, Coimbatore.

Tabel 2. Results of Multiple correlation analysis

S.No.	Variables	Partial regression coefficient(bi)	SE_{bi}	t and significance
	A.Total Iron			
1.	pH	-1.073	0.202	-5.318**
2.	Clay	0.016	0.052	0.308
3.	Silt	0.042	0.058	0.725
4.	Fine sand	-0.027	0.054	-0.500
5.	Coarse sand	-0.012	0.050	-0.246
6.	Organic matter	-0.478	0.405	-1.181
7.	Calcium carbonate	-0.038	0.063	-0.593
8.	Available iron	-0.070	0.107	-0.652
	a: 14.97			
	B.Available iron			
1.	pH	0.161	0.212	0.760
2.	Clay	0.022	0.048	0.451
3.	Silt	0.052	0.054	0.972
4.	Fine sand	0.024	0.051	0.483
5.	Coarse sand	9.448	0.047	0.201
6.	Organic matter	2.030	0.320	6.339**
7.	Calcium carbonate	7.165	0.059	1.213
8.	Total iron	-0.061	0.093	-0.653
	a: -0.398			

The available iron content varied from 2.01 to 12.66 ppm and the content decreased with depth in alluvial and laterite soils as reported by Follet and Lindsay (1971) while no regular pattern of distribution was noticed in other soils as reported by Velayutham (1974). The available iron content was found to be more in laterite soils than alluvial, black and red soils. Fateh Lal and Biswas (1973) reported that red foot hill soils of Rajasthan contained greater amounts of available iron than black, alluvial and red soils. Lower pH, high organic matter and low calcium carbonate status in laterites and prevalence of reduced conditions in alluvial soils might account for higher amounts of available iron in laterite soils.

Significant positive correlations were obtained between available iron and organic matter ($r = 0.564^{**}$) as well as clay content ($r = 0.250^{**}$). Lodha and Baser (1971) and Arunachalam and Dhanapalan Mosi (1973) have also reported similar trends. The positive association might be due to increase in clay content with depth and also due to more of ferrous iron. Multiple correlation studies indicated that the organic matter is mainly responsible for the availability of iron when compared to other seven factors studied.

For demarcating deficiency areas, Aiyer (1946) and Rajagopal *et al.* (1975) have indicated that 2 ppm of available iron to be the critical limit below which deficiency could occur. As per the limit proposed by them, the soils under study are moderately sufficient in available iron and may not show deficiency symptoms in the crops.

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