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CHEMICAL PROPERTIES AND NUTRIENT STATUS OF TERRACE SOIL IN THE MADHUPUR TRACT OF BANGLADESH

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Abstract: Terrace soil samples collected from Tangail District, Bangladesh, were analyzed to ascertain chemical properties and nutrient status. The study was conducted in the Tejgaon soil series, which is one of the dominant soil series of terrace soil. The soil is acidic and non saline. Fertility status of the topsoil is moderate but sub soil is low in fertility. The soil contains optimum amount of K, Fe, Cu and Mn but the amount of Ca, Mg, N, S, and B are not in optimum level. The fertility status of the soil is gradually decreasing. Phosphorous deficiency of soil is very much below critical level.

Key words: Terrace soil; Madhupur clay; Tejgaon soil series

Introduction

Generally terrace means a relatively level upland, strictly a remnant alluvial formation which has been left above flood plain level. The terrace areas of Bangladesh are actually blocks of tertiary or pleistocene sediments, which have raised by earth movement. In Bangladesh the terrace soils are of various types such as shallow red brown terrace soil, deep red brown terrace soil, brown mottled terrace soil and shallow grey terrace soil. This study focuses the soils of Madhupur tract, which contains the deep red brown terrace soil. The deep red brown soils are the most extensive soils occupying less than half of the Madhupur and Akhaura tract. The Madhupur tract is a region of complex relief and soil patterns. Overall the red brown soils occupy 35% on level uplands. The upland soils on the Madhupur tract mainly have loamy top soils (Brammer, 1996).

The study was conducted in Jorka of Ghatail thana under Tangail district, Bangladesh, which represents the red lateritic soil of Madhupur *Sal* forest area, a high land tract 3-5 m above the flood level intersected by numerous big and small depressions (locally called "*Bydes*") and high dry land (locally called "*Chala*") (Haque, 1967). A wide variety of soils exist in the study area. Soil on deeply weathered Madhupur clay ranges from brown or reddish deep, friable loam or clay loam and the soil of shallowly weathered clay are brown, firm, relatively dense, shallow or very shallow (Haque, 1967). *Sal* occupy about 10% of the study area.

Terrace soils formed from Madhupur clay is quite homogenous both laterally and vertically. Surface is almost horizontal but has been broken into a number of fault blocks. In many places extensive areas of terrace like topography have been heavily dissected. Unaltered Madhupur clay is

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grey heavy clay (Morgan and McIntire, 1959). This soil supports *Sal* (*Shorea robusta*) forest, which produce valuable timber particularly for construction purposes and railway sleepers. But due to various reasons actual tree cover of the *Sal* forest is gradually depleting. So, it is an urgent need to study the chemical properties of terrace soil. This study was intended to find out the present status of chemical properties and nutrient status of terrace soils.

Materials and Methods

Top soil (0-7cm) from 10 places were collected, mixed thoroughly to make a composite sample and 1 kg dry soil was taken from that mixture in a polybag. Pits of standard size (1m X 1m X 1m) were dug at 10 places with the help of spade for collecting horizonwise samples. Soil samples were collected from various horizons and kept in polybags separately. Thoroughly mixed the soils of same horizons. These samples were taken to laboratory, air dried in room temperature, grounded, passed through a 2 mm sieve and stored for analysis. Chemical properties of the soil samples were analyzed in the laboratory.

Results and Discussion

The analytical results of soil samples have been presented in Table-1. The samples were found to be acidic and non-saline and all the layers showed more or less similar p^H values. Ca in the top soil and at the depth of 70-100 cm layer is satisfactory but deficiency in other layers. It has positive and significant correlation ($r = 0.96$ at $p = 0.05$) with K (Fig. 1).

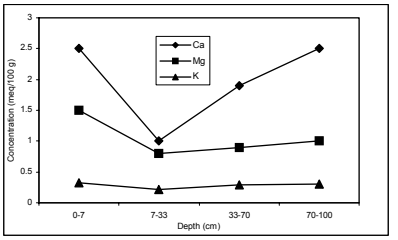

Fig. 1. Content of Ca, Mg and K at different depths of soil.

The overall Ca content was not satisfactory due to leaching, low level of p^H and weathering process. Mg content showed an increasing trend with the increase of depth. In all layers Mg was found above critical level but overall status was not satisfactory, probably due to weathering and leaching. K content was higher in the top soil but lowest in the 7-33 cm layer and it showed increasing trend with the increase of depth. K has significant correlation with Mg.

Table 1. Analytical results of Tejgaon soil series.

Depth (cm)	p^H	Ca	Mg	K	P	S	B	Cu	Fe	Mn	Zn
	(Meq/100 gm)					(μgm/gm)					
0-7	5.5	2.5	1.5	0.32	1	15	0.48	1.06	26.3	17.1	0.64
7-33	5.2	1.0	0.8	0.22	1	7	0.39	0.23	7.6	3.4	0.22
33-70	5.2	1.9	0.9	0.29	Trace	6	0.17	0.32	8.7	4.4	0.28
70-100	5.2	2.5	1.0	0.30	Trace	7	0.17	0.40	10.8	6.4	0.37
0-7*	5.1	3.1	1.5	0.40	1	10	0.30	1.39	50.1	32.4	0.86

*composite soil.

The overall status of K content was satisfactory. In all layers there was tremendous deficiency of P, probably due to low level of p^H and inadequate decomposition of litter in the forest floor. High S content was found in the top soil. Both Fe and Mn were higher in the top soil (Table 1 and Fig. 2).

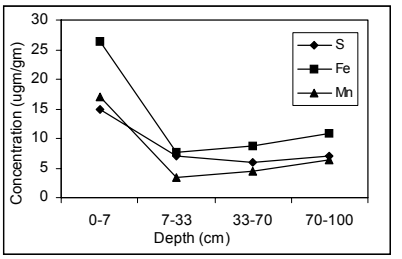

Fig. 2. Content of S, Fe and Mn at different depths of soil.

Correlation between them was positive and significant (r = 0.998 at p = 0.05). The overall contents of Fe and Mn were satisfactory probably due to acidity of soil. Cu content was higher in the top soil. (Table-1 and Fig. 3). It is positively correlated with Fe and Zn (r = 0.998 and 0.996 respectively at p = 0.05). B content was found higher in the top soil but it showed a decreasing trend with the increase of depth (Table 1 and Fig. 3).

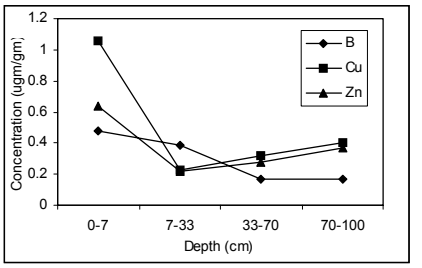

Fig. 3. Content of B, Cu and Zn at different depths of soil.

From the above results it is clear that the nutrient status of the soil is low. The probable causes are: exposure of forest floor due to destruction of vegetation through encroachment and illicit felling.

Increase of surface temperature resulting increased oxidation which ultimately raise soil acidity and disintegration of soil nutrient elements. Top soil organic matter and nutrient elements are washed away by wind and water erosion. Litters are not allowed to decompose in the forest floor as they are collected by the local poor people for their fuel energy requirement and ultimately decrease the level of nutrients. Due to low soil pH, huge amount of nutrients are lost through leaching. Soils of the study area have low moisture holding capacity that provides unsuitable environment for micro flora and fauna. Some nutrients (N, S, P) decreased due to gaseous losses (denitrification, desulfonation and volatilization).

Conclusion

Terrace soil occupies about 8% area of the country and it has a great potential for supporting vegetation specially *Shorea robusta*. But it is degrading with the passage of time and becoming less

suitable for growth and development of vegetation. The fertility status of the soil particularly the top layer has already been aggravated and it will reach to a critical level very soon. The following steps can be taken for upliftment of the fertility status of soils of the study area: projects for afforesting the terraces should be undertaken to improve the vegetation cover, tree containing large amount of leaves should be planted and all litters and twigs should be allowed to decompose in the forest for improving the fertility status of the soil. Moisture holding capacity of the soil need to be improved by providing vegetation cover and mulching. Different types of soil conservation practices can be adopted on the basis of physico-chemical properties of soil.

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