SULPHATE SORPTION–DESORPTION CHARACTERISTICS OF LATERITIC SOILS OF WEST BENGAL, INDIA

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ABSTRACT: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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INTRODUCTION

Sulphur deficiencies in India are widespread and scattered throughout 120 districts out of 400 districts [1]. Intensification of agriculture with high yielding crop varieties and multiple cropping, coupled with use of high analysis S -free fertilizers and restricted use of organic manures, has accelerated the depletion of soil reserves [2]. In India, red and lateritic soils cover an area of about 91 million hectares. These soils are derived from granite, gneiss, schist, and sand stone, shale parent rocks on gently to undulating geomorphic surfaces. Basically these soils are well drained and acidic with lower cation exchange capacity and organic matter content and have mixed or kaolinitic clay mineralogy enriched with sesquioxides [3].

Red and Lateritic soils occupy an area of about 28,000 sq km in West Bengal, which is about 28 per cent of the total geographical area of the state [4]. Of these, red soil occur in the districts of Birbhum, Bankura, Burdwan, Midnapore and some other parts of Malda and West Dinajpur and gravelly soils are found in the districts of Purulia, part of Midnapore, Bankura and Birbhum [5]. Some parts of Birbhum, Burdwan, Bankura, and Midnapore have also laterites and lateritic soils [6]. In fact, the red, laterite and associated soils of Eastern India are acidic in soil reaction, light textured, low in organic matter and P and are often deficient in S [2,6].

MATERIALS AND METHODS

In order to study the sorption-desorption characteristics in red and lateritic soils of Birbhum district of West Bengal, India four acidic soil samples (0-0.15m depth) in bulk quantities were collected from Sriniketan (Typic ochraqualf, $23^0 03^/$N and $87^0 04^/$ E), Suri (Typic Haplustalfs,

$23^0 55^/$ N and $87^0 32^/$E), Sainthia (Typic ochraqualfs, $23^0 95^/$N and $87^0.68^/$ E) and Illambazar (Vertic ochraqualfs, $23^o 53^/$N and 88^0 $05^/$ E) during July 2006. Air-dried soil samples after processing (<2mm) were analyzed for pH [20], organic carbon [21], CEC [20], Free Fe ad Al oxides in a-citrate-bicarbonate-dithionite extracts of soil [20], available S [22], total S [23] and mechanical analysis by Bouyocous hydrometer method [24].

RESULTS AND DISCUSSION

The sorption-desorption behaviour of four red and lateritic soil samples viz. Sriniketan (Typic ochraqualf), Suri (Typic Haplustalfs), Sainthia (Typic ochraqualfs) and Illambazar (Vertic ochraqualfs) have been presented through tables and figures. Some properties of these soils are presented in Table 1.

Table 1. xxxxxxxxxxxxxxxxxxxx

xxx	xxx	xxx	xx	xx	xx	xx
xxx						
xx						
xx						
xxx						

Sulphate Sorption Behaviour

The data related to the SO_4 sorption pattern of soils studied containing various amounts of SO_4 (75 to 600 mg S L^{-1}as K_2SO_4) for 24 hours is shown in Table 2. The sorption of SO_4 in soils increased with increasing levels of the added sulphur.

The mean sorbed SO_4 sulphur in soil was highest in Suri (84.7 %) followed by that in Sriniketan (83.5%), Illambazar (78.4%) and Sainthia (77.2%). The percentage of sorbed SO_4-S in soils varied between 71.4 and 94.8 per cent in Suri, 72.0 and 95.6 per cent in Sriniketan, 68.2 and 93.2 per cent in Illambazar and 66.9 and 89.5 per cent in Sainthia. It is interesting to note that the adsorption though gradually reduced but not in proportion following the trend of more adsorption with increase in SO_4 concentration of equilibrium solution. The hyper-bolic shapes of curve (Figure 3) indicate that adsorption tends to reach a maximum limit with increase in the ambient SO_4 concentration. Therefore, continuous application of S may lead to considerable build up of residual S whatever sulphate would have left following the fate of fixation or adsorption.

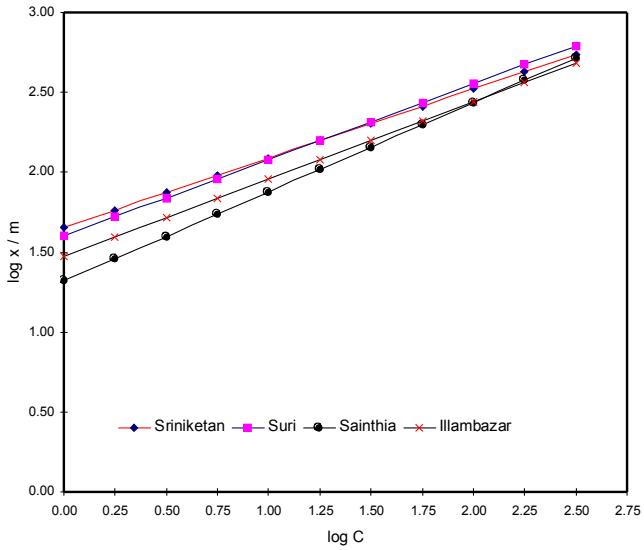

Fig. 1 Freundlich adsorption isotherms for soils

CONCLUSION AND RECOMMENDATION

The overall results of the present study indicate that the sulphate sorption capacity of the red and lateritic soils studied was at a higher degree of magnitude. During desorption, the amount of sulphate desorbed at a given equilibrium S concentration in solution was always lower than the amount of sulphate sorbed during sorption, however, the desorbed amounts increased in proportion to amounts of sulphate sorbed.

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