Pakistan J. Sci. Ind. Res., Vol. 15, Nos. 1–2, February–April 1972

A STUDY ON THE MAGNESIUM SOLONETZ SOILS OF SITAKUNDA, CHITTAGONG, EAST PAKISTAN

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(Received June 30, 1970)

Abstract. The soils under study moved towards higher base saturation with depth showing the podsolic character of the surface horizons. The exchangeable calcium holds the relative dominance over all other ions in the surface horizons of the soils but it is exceeded by exchangeable magnesium in the subsurface horizons. The exchangeable potassium is higher in the A horizons than in the B horizons of the soils.

The exchangeable sodium has assumed a high percentage of the total metal ions showing the sticky consistency of the soils under moist condition, cemented and compacted structure of the A horizons and the solonetz structure of the B horizons of the soils.

The high percentages of exchangeable magnesium and sodium show that in these soils solonization has taken place because of the presence of magnesium and sodium in the salt water creek which flows through that area. Due to the dominance of magnesium in the exchange complex the soils have been termed as magnesium solonetz.

In Sitakunda, near Chittagong, East Pakistan, the Andharmanik and the Janmara valleys flanked by the adjoining high hills (belonging to the Chandranath hills of the Arakan Yoma range) represent an area close to the Bay of Bengal. A brackish water creek flowing through the area is the cause of the salinity of the soils. A pedogenic study was undertaken to see the effect of the brackish water on the distribution of exchangeable cations and pH of the soils on depth basis.

Materials and Methods

The study was undertaken on the soils occuring in the valleys of the Andharmanik and the Janmara which are flanked by the adjoining hills near Sitakunda, Chittagong. These valleys are situated at a distance of 24 miles, north-west of Chittagong. Flanked by the Chandranath hills the valleys extend towards north-east to reach the south Sitakunda reserve forest at a distance of 2 miles. The sea runs at a distance of 5 miles, south-west of the valleys.

As a result of the detailed survey done in the valleys the soil types found to be of dominant occurrence were named as:

1. Janmara fine sandy loam [1] } (located at the slope in the hill foot)
2. Janmara clay loam
3. Janmara silty clay loam (located at the valley centre)
4. Janmara fine sandy loam [2] (located at the slope hill foot)
5. Telbansal sandy clay loam } (located at the valley flat)
6. Gargaridala silty clay loam }

All the dominant six soil types were sampled for laboratory studies on horizon basis.

The exchangeable cations were determined on ammonium chloride extract of the soils as described by Piper.[1] Calcium was precipitated as oxalate, magnesium as 8-hydroxy-quinolate, sodium as complex urenyl magnesium acetate and potassium as cobaltinitrite. calcium and potassium determinations were done volumetrically by oxidising the oxalate and cobaltinitrite precipitates by potassium permanganate, magnesium and sodium were determined gravimetrically. Exchangeable hydrogen was estimated by Piper's metanitrophenol method. The pH measurements of the soils were made by Kuhn's colorimetric method as modified by Crowther.[2]

Results and Discussion

The pH, exchangeable hydrogen, per cent composition of the exchangeable cations, total cation exchange capacity and per cent base saturation of different soils are presented in Table 1.

The observations show that the cation exchange capacity of the soils ranges from 13–22 m.e.% and the soils under study do not fall under the group of laterites as laterites are generally low in cation exchange capacity. The cation exchange capacity shows a marked decrease in the A_2 horizon of Janmara clay loam and Janmara silty clay loam to be followed by a rise in the B horizon. This may be due to variation in the vertical distribution of the clay content in the soils.

In general, the per cent base saturation shows a rise with depth in the soils indicating that elevation from the A horizons and deposition in the B horizons has taken place with respect to the exchangeable metal ions indicating podsolized nature of the soils.[3]

The exchangeable hydrogen comprises only a minor portion of the exchange complex. The leaching condition of the area brought about a much more ingress of exchangeable hydrogen on the colloids being replaced by some metal ions in the soil solution.

Calcium is the dominant exchangeable cation in the surface horizons of the soils (Table 1) and it decreases with depth.

Exchangeable magnesium content increases with depth exceeding calcium in the B horizons (Janmara clay loam) of the soils.

Exchangeable potassium is the lowest of all the metal ions in the exchange complex of the soils (Table 1) and the amount in the A horizons assume a higher value than that in the B horizons of the soils.

Exchangeable sodium has assumed a significant portion of the total exchangeable metal ions, the percentage being 16–31 in the B horizons of the soils and around 1–29 in the A horizons. The amount of exchangeable sodium being 20% of the total exchangeable metal ions is enough to show up a solonizing activity in any soil.[4,5] The high exchangeable sodium content, no doubt, has largely contributed towards the cementation and compaction noticed in the A horizons of the soils (Table 1). The stickiness of the soils under moist condition may be due to relatively high amount of sodium in the exchange complex.

The high exchangeable magnesium content has contributed to the stickiness of the soils as exchangeable magnesium behaves alike exchangeable sodium in affecting physical properties of soils.[6]

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