

Characteristics and Mineralogy of Some Clay Rich Soils of the Lower Indo-Gangetic Plains of Murshidabad District, West Bengal

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Abstract: Typical four clay rich pedons developed from alluvium in Murshidabad district, West Bengal under lower Indo-Gangetic plain characterized by high clay content were studied for their morphological, physical and chemical characteristics including mineralogy to study the origin, formation and distribution of clay minerals in soil. Soils are very deep, dark brown to grey in color; very fine in control section with redoximorphic features i.e., mottles and gley. Soils are acidic to neutral in reaction, high in organic carbon, medium to high in cation exchange capacity (CEC) and high in base status. Siltation, drainage congestion, flooding are the major problems in this area for agricultural development. Mineralogically, these soils are dominant in Kaolin and mica with some interstratifications of smectite-hydroxy-interlayered vermiculite. However, high clay CEC value of these soils indicate the presence of smectite. The shrink-swell behavior of these micaceous soils with higher exchangeable Ca^{2+} and Mg^{2+} is mainly due to the presence of smectite. Smectite-rich alluvium has been carried to the site from the Rajmahal Traps of Jharkhand state by the perennial rivers once flowed towards the east. Thus, the smectite clay minerals supplies the exchangeable bases especially Ca^{2+} through weathering and hence raises the pH near neutral making the availability of most of the nutrients enhancing the fertility status of the soils of the lower IGP. This information will be helpful in advocating proper management practices for crops to attain higher productivity.

Keywords: Gleying; hydromorphic features in soils; mica – kaoline – smectite cooccurrence; wetland soils.

Clay minerals constitute an important component of the soil system and knowledge of their role in sustainable soil management, soil fertility and productivity is imperative (Kome *et al.*, 2019). It helps not only to increase the availability of soil moisture but also help to increase the availability of essential nutrients to the plants and therefore information on mineralogical characteristics of the soil is utmost important towards the management of natural resources. The types of clay minerals in soil and their distribution not only help to understand the soil development processes, but also provide

useful information for sustainable land management (Wilson 1999). Clay mineral analysis has therefore have been widely used to characterize soil parent material and to relate it to the bedrock (Bronger *et al.*, 1994), as well as to associate mineralogical transformations with changes in climate and weathering intensity (Bini and Mondini, 1992). The knowledge provided by the clay mineral composition of soils coupled with other studies, such as geological, geomorphological and soil surveys can provide the best information on pedogenesis of soil. The lower Indo-Gangetic Plains (IGP) of Murshidabad

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