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MINERALOGICAL CHARACTERIZATION AND DEGREE OF WEATHERING OF SOME BENCH MARK SOILS FROM RICE GROWING AREAS OF PUNJAB.

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ABSTRACT

Origin of clay minerals, their subsequent transformations in soils, and type of original parent material, can be investigated by soil mineralogy using X-Ray Diffraction Analysis (XRDA). Mineral composition of six rice soils (Miranpur, Pacca, Pindorian, Gujiana, Miani, and Bhalwal soil series) were investigated by XRDA. These soils are the major soil series occurring in recent and sub-recent river flood plains. Miranpur, Pindorian, and Miani soil series were developed from alluvium under sub-humid and semi-arid climate. The Pacca soil series is developed in shallow broad basin infills in sub-recent flood plains under semi-arid climate and Bhalwal soil series is developed in alluvium derived from the Himalayas and has an admixture of water transported loess. The dominant clay minerals in the studied soils were mica, smectite and kaolinite. Vermiculite and chlorite were less abundant. X-ray diffraction analysis showed a transformation of mica into smectite and vermiculite. In Pacca soil smectite was the only weathering product of mica. In Bhalwal soil series, mica was not weathered into any secondary mineral.

INTRODUCTION

Rice is an important food and cash crop in Pakistan. It is mainly grown on alluvial plains of Punjab and Sindh Provinces. About 60% of the rice area falls in Punjab. Fine basmati rice (*Oryza indica*) is mostly grown in Punjab which have low yield potential (1.7 t/ha). Rice crop productivity is controlled by the nature of soils and their physical, chemical and mineralogical properties. Texture, mineralogy, and organic matter content determine ambient soil environments (Bajwa, 1981). The soils having dominance of smectite clays can shrink and expand with basal spacing of 1 to 4nm and can adsorb water and cations (Mengel and Kirkby, 1987). Such soils are quite productive. Since soils with dominance of smectite, on weathering, swells and clog the soil pores, therefore water percolation and infiltration in such soils is reduced. These soils have greater water retention capacity (Sanchez, 1973) and are ideally suited for rice which requires continuous flooding of the fields. For growing rice, generally puddling is done, which destroys pores structure, decreases large pores and increases small pores in surface layer (Ghildyal, 1978) and thus reduces downward movement of water. But soils containing swelling type of clay minerals may require less puddling or not at all. This paper reports the mineralogical characterization and minerals composition of six different soils in Pakistan used mainly for rice cultivation.

MATERIALS AND METHODS

Soil samples (0-15cm) from six soil series namely Miranpur, Pacca, Pindorian, Gujiana, Miani, and Bhalwal, were taken from Gujranwala and Sheikhupura- mostly rice growing Districts of the Punjab. These soils are the major soil series occurring in recent and subrecent river flood plains. Miranpur, Pindorian, and Miani soil series, referred to Pedon 1, 3, 5 in the succeeding discussion, were developed from alluvium under sub-humid and semi-arid climate. The Pacca soil series (pedons no. 2) is developed in shallow broad