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Role of 'Bio' in Weathering, Nutrient Release and Mobilization of Al and Fe in the Cauvery Floodplain Sediments, Southern India

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In the sediments of the Cauvery river basin (lying in the rain shadow region of the Western Ghats in the terrain dominated by middle to late Archaean gneissic rocks, Archaean supracrustal rocks, Proterozoic granitoids and isolated hills of charnockites standing out), most of the nutrients are still trapped in the rock forming minerals (perhaps because of their recent origin) and are not bio-available. Grain size and texture analyses show uniformity throughout the course of the river (Sand~40-70%; Silt~15-40%; Clay~20%), the grains falling in the sandy-clay-loam category. A uniform geochemistry is noted for all the samples along the river course. Organic carbon, nitrogen and extractable phosphorus contents of the sediments are very low (~1%, 0.1% and ~150 ppm respectively). Low organic acid (C1-C6) concentrations (~350 ppm) do not seem to have greatly influenced the pH and bio-availability of elements in the soil. Low CIA values (58-65) indicate that the sediments have undergone very little chemical weathering. *Aspergillus sp.*, *Byssochlamys sp.* and *Penicillium sp.* (all known bare rock invaders and prolific producers of various organic acids) were the dominant fungi isolated from the sediments. This supports our view that the sediments are indeed incipiently weathered. The order of leaching of elements in the organic acid fraction followed the pattern Al>Ca=Na>Fe>Mg>K>P>Ti. Thus, the floodplain sediments are chemically and biologically immature and derived from sources subjected to physical weathering and erosion. Analysis of extracted humic and fulvic acids (HA and FA) indicates that, possibly the humus is fresh and not very complex in nature. XRD patterns of HA and FA show a crystalline structure (generally reported to be amorphous; Tan, 1977), again, perhaps indicating immaturity. Unlike clay, where the degree of crystallinity increases with maturity, it is possible that the crystallinity of HA and FA is lost during maturation. The presence of apatite associated with HA and FA, is also inferred. Bulk major and trace element analysis of HA and FA shows a high concentration of Al (~4.2%) and Fe (~1%). Equiline plots of both major and trace elements (HA vs. FA) show a distinctive bias towards HA. The mobilization of Fe and Al (traditionally, so called immobile elements) by HA, FA and organic acids seems to emphasize the dominance and importance of bio-weathering in this semi-arid sub-humid tropical system.

Tan KH, *Soil Science*, **123(4)**, 235-240, (1977).