Surface reactivity of Andisols on volcanic ash along the Sunda arc crossing Java Island, Indonesia

Abstract

Six highland Andisols along an E-W sequence in Java Island, Indonesia were sampled with the objective to assess the influence of the change of parent ash materials on surface reactivity of Andisols, with emphasis on short-range order mineral constituents and active Al and Fe compounds on fluoride and phosphate sorption. Because of the variety in parent ash materials and under the typical environmental conditions prevailing in East, Central and West Java, respectively, the soil's mineralogical and chemical properties differ significantly. Allophane is formed abundantly with concomitant development of active Al and Fe. The allophane content is found to increase from East to West Java, presumably due in part to the change in parent ash materials. Consequently, active Al and Fe in the soils increase in that order, which in turn raise fluoride reactivity, P-sorption maximum and P-bonding energy, implying an increase in P-fixation and/or P-retention. Estimated soil P-sorption maxima differ significantly between the three regions. There is no difference in P-bonding energy between the soils of the East and Central Java, but the values for these two regions are lower than those of the West Java. It is concluded that in terms of P-fertilizer strategy, the soils of the three regions can be divided into three separate groups: the East, Central and West Java soils display different phosphorus requirements, being lower in the east as compared to the west of the island.

Keyword: Andisols; Fluoride reactivity; P-bonding energy; P-sorption; Surface reactivity