Elemental composition, molar ratios and pedogenesis of soils in Tekkali mandal of Srikakulam district, Andhra Pradesh

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ABSTRACT

A study on elemental composition and pedogenesis of soils of Tekkali mandal of Srikakulam district was carried out during 2022. The soils of study area were developed from granite-gneiss to calcareous- murrum mixed granite-gneiss parent material. Total silica (SiO_2) of soils ranged from 49.1 to 70.8 percent. Silica content in general decreased with soil depth, while sesquioxides (R_2O_3), alumina (Al_2O_3), iron oxide (Fe_2O_3), CaO, K_2O, Na_2O and MnO were found increasing with depth. The highest value of silica/sesquioxide ratio indicate siliceous nature of soils. The aluminum oxide content of the profiles varied from 15.50 to 22.20 per cent. The highest value was reported in *Thirlangi* profile, whereas the lowest value was recorded in *Naupada* profile. Iron oxide content varied from 3.03 to 8.9 per cent. Iron oxide content showed slight variation within a profiles and greater variation among profiles. The other oxides were in the order of CaO > MgO > K_2O > Na_2O. The molar concentration of silica (SiO_2) ranged from 0.817 to 1.178 moles, and molar concentration of sesquioxide ranged from 0.178 to 0.266 moles. The molar ratio of SiO_2 / R_2O_3 varied from 3.89 to 6.59 in different soil profiles. The SiO_2 / Al_2O_3 ratio varied from 4.71 to 7.26. These wider molar ratios indicate siliceous nature of parent material and dominance of silica among chemical fraction. The profiles examined in the current study showed the chemical index of alteration (CIA) values of the profiles examined varied from 52 to 88. The CIA values decreased with depth in all profiles. The surface horizons P2 and P5 profiles, were classified as very highly weathered. On the other hand, all subsurface horizons of these two profiles were slightly weathered. However, in profiles 1, 3, 4, 6, and 7 the CIA values were between 80 and 90 indicating highly weathered condition of soils. The chemical index of weathering (CIW) values closely followed the trend of CIA values. The bases/R_2O_3 values of all profiles ranged from 0.168 to 1.122 and found increased with soil depth in all the profiles. Relatively higher values of bases/R_2O_3 were found in P2 and P5 indicating base rich character. The weathering index of Parker (WIP) values of the soils formed on calcareous parent material (P_2 and P_5) were between 8.7 and 30.9. The lowest WIP values (6.4 to 11.3) were associated with profiles developed from granite gneiss parent material in uplands (P_1, P_3, P_4, P_6 and P_7). The PIA values ranged from 52 to 88 decreased with the depth in all profiles.

Keywords*: *Elemental composition, Molar ratios, Pedogenesis, Tekkali mandal