Morphological, Chemical and Physical Properties of Two Pan Soils in the Lower Volta Basin of Ghana

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Abstract

The morphological, chemical and physical properties of two pan soils, namely Kpejeglo series and Agawtaw series were studied. Kpejeglo series and Agawtaw series together constitute the largest soil association in the lower Volta basin of the Accra Plains. They also occupy a very large portion of the Ho-Keta plains. Two pedons of each series were studied and the results showed that both soils were slightly acidic in the A horizons but alkaline in the B horizons. The electrical conductivity of the soils followed the trend of the pH, showing an increase from the top to the bottom of the pedons. Although the soils generally contained high amounts of extractable bases, and had high CEC, the amount of organic carbon in the four pedons was very low, < 1%. Percentage base saturation and exchangeable sodium percentage increased with depth in all the four pedons due to the presence of large amounts of calcium carbonate nodules and high levels of extractable sodium in the soils. There was an inverse relationship between the quantities of sand and clay in the two soils. While the quantity of clay in the A and B horizons of the soils increased with depth, the sand quantities decreased. The C horizons, however, showed higher percentage of sand relative to clay content. The bulk density of the hardpan horizons of Kpejeglo Pedon 2 (KP 2) was higher than that of the horizons above it but lower than that of the horizons below it. In the case of the hardpan horizon of Agawtaw Pedon 1 (AG1), it had a higher bulk density than the horizons above and below it. The bulk density values of the hardpan horizons of Kpejeglo Pedon 1 (KP 1) and Agawtaw Pedon 2 (AG 2) were not high and not very different from those of the other horizons. Soil strength measurements showed that the hardpan horizons had a significantly higher penetration resistance. The hardpan horizons of all the pedons of the two soils consistently recorded significantly higher penetration resistance than the surface horizons. From the results, soil strength appeared to be a better indicator of the presence of hard pan horizons than bulk density. The pans in both soils were provisionally classified as duripans (USDA Soil Taxonomy) or petroduric horizons (WRB of IUSS/ISRIC/FAO).