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USE OF ATTERBERG LIMITS FOR STRUCTURE AND TILLAGE MANAGEMENT OF FIVE GREAT SOIL GROUPS OF SRI LANKA

V.G.D. Nayanaka* and R.B. Mapa

Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka
**nayanakavgd@gmail.com*

Atterberg limits are important pre-requisites in determining optimum and range of workable water content for tillage operations to obtain a suitable aggregate size distribution with minimum power requirement. Therefore, the objective of this study was to determine the Atterberg consistency limits of five Sri Lankan soils and relate them to soil tillage and structure management.

Soils representing five great groups namely, Reddish Brown Earth *(Rhodustalfs)*, Reddish Brown Latasolic *(Tropudults)*, Grumasols *(Vertisols)*, Calcic Red Latasols *(Ustorthents)* and Calcic Yellow Latasols *(Xerorthents)* collected from surface layer (0-30 cm) were used in this study. Five replicates taken from a bulk sample representing each great soil group were used to determine plastic and liquid limits using the standard methods. The plasticity index was obtained as the difference between liquid limit and plastic limit. Soil texture was determined by the pipette method. Relationship between Atterberg consistency limits and clay content was determined by means of correlation coefficient.

Plastic limit (PL) of Grumasols was significantly ($P<0.05$) higher than the other four soils. Calcic Red Latasols and Reddish Brown Latasolic soils also showed significantly higher PL compared to Reddish Brown Earth soils and Calcic Yellow Latasols. Plasticity index (PI) of Grumasol was significantly ($P<0.05$) higher (33.49%) than other soils, which had low PI's with 1-2% differences among them. A, significant relationship between soil clay content and Atterberg limits indicated that the soil texture is a key property affecting the mechanical behavior of soil. Based on the results obtained, Grumasols could be classified as high plastic soils whereas other four as low plastic soils. According to the optimum water contents for tillage, calculated based on PL, Grumasols could be tilled at a high moisture content of 33% with minimum structural damage. However, high PI of Grumasols indicated that this soil is susceptible to compaction over a wide range of soil moisture content, hence it is necessary to avoid use of heavy machinery within this sensitive moisture range, i.e. between PL and liquid limit. Moreover, Calcic Yellow Latasols and Reddish Brown Earth soils are likely to show an optimum friability when tilled at 13% and 14% moisture respectively. In contrast to Grumasols, these soils cannot be tilled at high soil moisture contents as their optimum workable moisture ranges are low. Reddish Brown Latasolic soils and Calcic Red Latasols will be less compactable and easily tilled around 17% and 19% soil moisture respectively. However, it is important to note that when these soils are tilled at water contents beyond optimum, not only large clods can be produced but also structural damage may occur. Therefore, knowledge on Atterberg limits and optimum water content for tillage of the studied soils are beneficial to manage them with minimum structural damage and power requirement during tillage.