

Effect of Wetting and Drying Cycles on Estimation of Stress at Compaction Threshold of Fine-Textured Soil

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Abstract

Flood irrigation after planting induces wetting and drying cycles in arable soils. For this reason, the effect of this process on load-bearing capacity (pre-compaction stress; σ_{pc}) of a fine textured soil (silty clay) was studied. In this research, large air-dry disturbed soil specimens were prepared and some of them were exposed to five wetting and drying cycles. Next, the large soil specimens with/without wetting and drying cycles were compressed under three preloads (0, 100 or 200 kPa) and then the centre section of the preloaded soil specimen was firstly submitted to a plate sinkage test (PST). Then immediately one cylindrical sample was cored for confined compression test (CCT). The results showed that for reconstructed soil samples without wetting-drying cycles, the predicted σ_{pc} using PST didn't significantly differ from the applied preload. Therefore, the PST can be used to determine the load-support capacity of the tilled soils. In PST, with an increase in soil water content from 0.9PL to 1.1PL, the amount of over-prediction in σ_{pc} decreased. However, wetting-drying process significantly increased over-prediction in σ_{pc} at the same water content. Hence, soil compressibility does not simply depend on the actual soil water content but also on the previous history of water content changes (i.e., wetting-drying cycles).

Keywords: Flood irrigation, Wetting and drying cycles, Pre-compaction stress.

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