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Density-Moisture Relations of Two Trinidad Soils Obtained with a Soil Vibratory Compactor

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Abstract: *Density-moisture relations are required while constructing roads and other structures and during farming operations. The Proctor test is the standard method of determining this relationship but other methods exist including the vibratory hammer or table and the soil vibratory compactor. The design, construction and testing of a soil vibratory compaction machine, which could produce maximum densities that mimic the Proctor test has been described in a previous paper by Leonard et al. (2019). A mechanism was designed and developed that vibrated the soil at a given time, amplitude and frequency and resulted in compacting the soil. It was determined that 17 Hz frequency operating at an amplitude of 1.7 mm for 5 mins were the ideal parameters to operate the compactor. However, it is still unclear whether the soil vibratory compactor could be used to test soils with varying clay contents with different water and organic matter contents. This paper utilises a vibratory compactor working at the pre-determined parameters to test the density-moisture relations of two soils (sandy loam and clay) treated with peat at five different contents (0%, 4%, 8%, 12% and 16%) by mass and compacted at moisture contents which ranged from 5% to 55%. Similar tests were carried out using the standard Proctor test so as to compare the results. Results generally showed that although most bulk density values determined using the soil vibratory compactor were slightly lower (within a range of 0.02 to 0.06 t m^{-3}) than the values from the standard Proctor test, density values from the two methods were perfectly related ($r = 0.998$). The soil vibratory compactor could then be used to estimate the bulk density values that are obtainable using the Proctor test. The major advantage of the constructed soil vibratory compaction equipment is that it could reduce the tedium involved in the standard Proctor soil compaction test.*

Keywords: *Soil, compaction, vibration, Proctor, test*