



Determining The Stability of a Soil

To determine the aggregate stability of a soil, which is the resistance of soil structure against mechanical or physicochemical destructive forces Van Walt recommends using Wet Sieving Apparatus.

Soil structure is one of the main factors controlling plant growth by its influence on root penetration, soil temperature and gas diffusion, water transport and seedling emergence and therefore it is an important soil characteristic for farmers, horticulturists, land conservation teams and surveyors.

Soil structure is defined by the combination or arrangement of primary soil particles into compound elements, which are separated from adjoining structural elements by surfaces of weakness. Soil texture, soil structure, and the type of clay mineral, organic matter content and type, cementing agents and cropping history will influence the aggregate stability.

Among the mechanical destructive forces effecting soil structure are soil tillage, impact of heavy machinery, treading by animals and raindrop splash. Physicochemical forces which can influence structure are slaking, swelling and shrinkage, dispersion and flocculation. Slaking is the process of structural breakdown under the influence of wetting of soil aggregates, due to swelling of clay minerals, dissolving of cementing agents, air explosion or reduction in pore water suction. Slaking may result in the formation of a superficial crust, reducing water infiltration and enhancing sediment loss by the downward movement of surface run-off water.

Van Walt's Wet Sieving Set

Our standard set includes a shaking machine for the wet sieving method of determining the resistance of soil structure. It has 8 sieves, aluminium cans with a diameter of 62.5 x 44 mm, sieve cans diameter 39 x 39 mm, with sieve opening of 0.250 mm and sieve surface of 10.2 cm².

Operating principles

The wet aggregate stability is determined on the principle that unstable aggregates will break down more easily than stable aggregates when immersed into water. To determine the stability, 8 sieves (with 60 Mesh screen) are filled with a certain amount of soil aggregates. These sieves are placed in a can filled with water, which will move up and downward for a fixed time. Unstable aggregates will fall apart and pass through the sieve and are collected in the waterfilled can underneath the sieve.



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After this fixed time, the cans are removed and replaced by new water filled cans. Now, all aggregates are destroyed. Sand grains and plant roots will remain on the sieve and only aggregates are considered. After drying the cans with the aggregates, the weight of both stable and unstable aggregates can be determined.

Dividing the weight of stable aggregates over total aggregate weight gives an index for the aggregate stability. To prevent slaking of the the filled sieves into the water filled cans, the aggregates are premoistened with water vapour, using a humidifier or a very fine plant sprayer.

Applications

Due to the impact of aggregate stability on plant growth and soil loss, applications of the wet sieving apparatus are usually in the fields of agriculture, land conservation and construction. It is also especially useful for researchers and scientists on soil erosion, land degradation and conservation, agriculture and sustainable agriculture.

Scientists on salinisation projects will benefit from the ability of determining wet aggregate stability using wet sieving to control the deterioration of soil structure or to determine possible impacts of amelioration practices on aggregate stability. Determining aggregate stability will give information on the sensitivity of soils to water and wind erosion, which might be prevented by mulching the soil surface. Information on soil aggregate stability will improve tillage programmes, adapted to the specific soil type and crop demands.

Advantages

- ease of operation
- no spoil of samples and results
- mechanical and electronic components are built-in for safety
- the electric motor is a 12/24 Volt DC motor with external adapter, so is very safe in wet conditions
- worldwide universal adapter complete with interchangeable mains plugs for use in UK, Europe, USA, Japan and Australia.