

Wet sieving apparatus to determine aggregate stability of soils



Introduction

The wet sieving apparatus is used to determine the aggregate stability of a soil, which is the resistance of soil structure against mechanical or physico-chemical destructive forces.

The standard set includes a shaking machine for wet sieving method, suitable for 8 sieves, stainless steel cans diameter 64 x 45 mm, sieve cans diameter 39 x 39 mm with a sieve opening 0.250 mm and a sieve surface of 10.2 cm².

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.

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 influence the aggregate stability.

Among the mechanical destructive forces are soil tillage, impact of heavy machinery, treading by animals and raindrop splash. Physico-chemical forces are e.g. slaking, swelling and shrinkage, dispersion and flocculation.

Slaking is the process of structure 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 downward transportation with surface runoff water.

Applications

Due to the impact of aggregate stability on plant growth and soil loss, applications of the wet sieving apparatus are the fields of agriculture and land conservation. This method to determine aggregate stability will be especially useful for researchers and scientists on soil erosion, land degradation and conservation, agriculture, sustainable agriculture.

Scientists on salinization problems may have advantage determining wet aggregate stability using wet sieving, to control 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 e.g. by mulching the soil surface. Information on soil aggregate stability will improve tillage programs, adapted to the specific soil type and crop demands.

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 water-filled can underneath the sieve. 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 aggregates when putting the filled sieves into the water filled cans, the aggregates are pre-moistened with water vapour, using a humidifier or a very fine plant sprayer.

Advantages

- Through the central knob easy operation of the sieve holder.
- The cans can be easily filled and filled-up with water through the special can-fill openings in the sieve-holder.
- The sieve-holder can be set and locked in the leak-out position while the sieves are still straight above the cans and so preventing the spoil of aggregates.
- The sieve-holder can be put in the bottom position, independently the position of oscillating mechanism, so it is easier to control the water level in the cans.
- The oscillating mechanism and the electric motor are build-in so that it is not possible to touch the oscillating mechanism and the electric motor
- The electric motor is a 12/24 Volt DC motor with external adapter, so very safe in wet conditions.
- World wide universal adapter (input 90 to 264 Vac) complete with interchangeable mains plugs for use in UK, Europe, USA, Japan and Australia.