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Organic Matter as an Indicator of Soil Degradation

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Numerous and expensive physical-chemical tests are often carried out to determine the level of soil degration. This study was to find one property, as Organic Matter, which is usually analyzed for determine the soil degradation status. To do this 19 areas in the south and southeast of the Iberian Peninsula (provinces of Málaga, Granada, Almería y Murcia) were selected and a wide sampling process was carried out. Sampling points were spread over a wide pluviometric gradient (from 1100 mm/yr to 232 mm/yr) covering the range from Mediterranean wet to dry. 554 soil surface samples were taken from soil (0-10 cm) and the following properties were analyzed: Texture, Organic Matter (OM), Electric Conductivity (EC), Aggregate Stability (AE) y Cation Exchange Capacity (CEC). These properties were intercorrelated and also with rainfall and the K factor of soil erosion, calculated for each sampling point.

Los results obtained by applying the Pearson correlation coefficient to the database shows how as rainfall increases so does OM content (0,97) and la CEC (0,89), but K factor (-0,80) reacts inversely.

The content of OM in the soil is related to its biological activity and this in turn is the result of available wáter within the system and, consequently, rainfall. This is specially important in fragile and complex ecogeomorphological systems as is the case of the Mediterranean, where greater or lesser rainfall is similarly reflected in the levels of increase or decrease of soil organic matter. This affirmation is reinforced by linking the organic matter of the soil with other indicative properties such as CEC and erosion, as has been shown by various authors (Imeson y Vis, 1984; De Ploey & Poesen, 1985; Le Bissonnais, 1996; Boix-Fayos et al., 2001; Cammeraat y Imeson, 1998; Cerdá, 1998).

As has been stated, there is a direct relationship between rainfall, organic matter content, cation exchange capacity, structural stability, and the resistence to soil erosion factor; making it obvious that greater aridity implies greater soil degradation, diminishing the properties which sustain a protective vegetal cover and leaving the soil even more vulnerable to erosion and desertification.

OM stands out as the most important edaphic parameter, which could be used as an edaphic indicator of degradation, because of the direct relationship it has been proved to have with the rest of the parameters studied.

OM being therefore the most representative indicator, we have tried to determine the degradation threshold within the pluviometric gradient considered. That is, given that OM is directly related to the soil degradation indicators, and it is also a property associated with biotic factors, reference thresholds have been established, widely accepted in scientific literature, between OM (4%) and erosion (0,25) with the aim of determining on which point of the pluviometric gradient could this degradation threshold be situated which would be determined by the point where both variables cross. So, we were able to establish a “Mediterranena pluviometric degradation threshold”, which is situated in 560 mm/yr. Below this threshold organic matter content diminishes significantly and soil erosion increases.