G56 How Cadaver Decomposition in Soil is Affected by Moisture: Part I: A Field Experiment to Investigate Seasonal Effects

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After attending this presentation, attendees will understand how the rate of cadaver decomposition in soils can differ according the soil texture and season of burial.

This presentation will impact the forensic community and/or humanity by demonstrating the influence of seasonal variation in moisture on decomposition processes associated with cadavers buried in soils of contrasting texture.

Soil moisture resulting from rainfall affects decomposition processes by directly influencing the activity of soil organisms and the leaching of soluble materials. The amount and distribution of moisture in association with an organic resource, such as a cadaver, is dependent upon precipitation, uptake by vegetation and losses via evapotranspiration and drainage. These factors are, in part, influenced by soil texture (which is defined by the soil particle size distribution). The predominance of large soil particles (sand) results in greater pore space (the area between soil particles) and increased rates of drainage and aeration. Thus, a soil that is dominated by small soil particles (clay) may be subject to waterlogging. The most accurate assessment of the availability and distribution of moisture is the measurement of matric potential (the pressure with which moisture is held between soil particles). This measure can be used to determine the ease with which soil microorganisms can take up moisture.

In order to investigate the effect of soil texture and seasonal moisture variation on cadaver decomposition, a field experiment was conducted at two disparate field sites. Site 1 comprised a sandy loam soil (84% sand, 11.1% silt, 4.9% clay) and was located in Yabulu, Queensland, Australia (19°12'S, 146°36'E). Site 1 receives an average rainfall of 995 mm during the wet season (November-April) and 140 mm during the dry season (March-October). The mean maximum/minimum temperature during the wet season is 30.5 °C/27°C. Dry season mean maximum/minimum temperature equals 22.9 C/16.7°C. Site 2 comprised a loamy sand soil (97.7% sand, 1.3% silt, 1% clay) and was located in Pallarenda, Queensland, Australia (19°11'S, 146°46'E). On average, Site 2 receives 1005.1 mm rainfall during the wet season and 120.3 mm rainfall during the dry season. The mean maximum/minimum temperature during the wet season is 30.7 °C/23.1°C. Dry season mean maximum/minimum temperature equals 26.9 °C/16.4°C. The resulting vegetation at the two sites was dominated by grasses with scattered trees. These characteristics are typical of a savannah ecosystem. Cadavers (*Rattus rattus*: ~18 g) were buried at a depth of 2.5 cm. Each cadaver was located in the centre of a 2 m^2 plot. Cadaver mass loss, soil microbial activity and nutrient concentration was measured over a period of 28 days in order to determine if an increase in soil moisture during the wet season would result in an increased rate of cadaver decomposition. This experiment was replicated six times and controls (soil without cadaver) were used.

The soil at Site 1 reached a matric potential of –0.03 megapascals (MPa) (equivalent to 15% moisture content v/v) during the wet season and was a constant -1.5 MPa (55% v/v) during the dry season. The soil at Site 2 reached a matric potential of –0.005 MPa (25% v/v) during the wet season and –1.5 MPa (3% v/v) during the dry season. All decomposition processes were greater during the wet season as demonstrated by the quantification of cadaver mass loss, microbial activity and nutrient concentration. This is most likely due to an increase in the activity of soil organisms and the leaching of soluble cadaveric materials as an effect of rainfall. Some differences were observed between soils within seasons.

Cadaver Decomposition, Soils, Seasonal Effects

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