Quantitative Analysis of Soil Organic Carbon in the Arid Mangroves of Qurm Nature Reserve, Oman

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Mangroves are highly effective carbon sinks, particularly for sequestering soil organic carbon (SOC) and regulating atmospheric CO_2 levels, thereby playing a vital role in mitigating climate change. However, the carbon sequestration potential of mangroves in arid regions remains poorly understood. This study examines SOC stocks and soil physicochemical properties in *Avicennia marina* stands within the Ramsar site, the Qurm Nature Reserve (QNR), in Muscat, Oman. Soil samples were collected from three zones: seaward (S1), midstream (S2), and landward (S3), at three depth intervals (0–20, 20–40, and 40–60 cm). The analysis showed significant differences in pH, Calcium Carbonate ($CaCO_3$), and bulk density across the sampling sites ($p < 0.05$), whereas electrical conductivity (EC) and SOC remained stable and showed no significant differences. Soil physicochemical parameters were consistent across depths. The results indicate a high potential for carbon storage in the QNR mangroves; the estimated SOC was 136.25±18.51 Mg C ha^{-1} in QNR, with the highest value recorded at S3 at a depth of 40-60cm (487.50±31.20 Mg C ha^{-1}). These results underscore QNR's potential as a carbon sink and provide baseline data for conservation and climate mitigation efforts in arid coastal ecosystems.

Keywords: *Mangrove, Soil organic carbon, Dry bulk density, Arid zones, Qurm Nature Reserve*