

## **The importance of moisture in soil and its impact on the emission of BVOCs**

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This study aims to investigate the relationship between soil water-holding capacity (SWHC), biogenic volatile organic compounds (BVOCs), and the physicochemical properties of soil in a Cypriot vineyard. The study is important for sustainable vineyard management and environmental preservation. BVOCs are significant in soil health, influencing nutrient cycling, plant-microbe interactions, and atmospheric chemistry. Soil water also plays a crucial role in soil BVOC emissions. Changes in SWHC affect BVOC production and release and thus ecosystem functioning. For the soil BVOCs monitoring, the study developed a green sample preparation technique, headspace solid-phase microextraction (HS-SPME), coupled with gas chromatography-mass spectrometry (GC-MS). This method allows for accurate and environmentally friendly analysis of BVOCs, providing insights into how changes in WHC affect soil BVOC dynamics. The study evaluates the relationships between WHC, soil physicochemical properties, and BVOC emissions through comprehensive analysis. More specifically, WHC % from 10 to 70% were studied to simulate drought and rain/irrigation conditions. The results showed that increasing WHC caused increased emissions of most VOCs (hydrocarbons, aldehydes, ketones, alcohols, and aldehydes), but terpene emissions correlated with drought (10-30 WHC %). Overall, the relationship between soil BVOCs and SWHC is complex and may depend on microbial community composition, soil properties, and environmental conditions. Therefore, the findings underscore the importance of sustainable water management practices for mitigating BVOC emissions and promoting environmental sustainability in vineyard landscapes.

**Keywords:** HS-SPME-GC-MS, soil volatile organic compounds, water holding capacity