



## **Effects of seasonal olive mill wastewater applications on hydrological and biological soil properties in an olive orchard in Israel**

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During olive oil production in Mediterranean countries, large amounts of olive mill wastewater (OMW) are generated within a short period of time. OMW has a high nutrient content and could serve as fertilizer when applied on land. However, its fatty and phenolic constituents have adverse effects on hydrological and biological soil properties. It is still unknown how seasonal fluctuations in temperature and precipitation influence the fate and effect of OMW components on soil in a long-term perspective. An appropriate application season could mitigate negative consequences of OMW while preserving its beneficial effects. In order to investigate this, 14 L OMW m<sup>-2</sup> were applied to different plots of an olive orchard in Gilat, Israel, in winter, spring, and summer, respectively. Hydrological soil properties (water drop penetration time, hydraulic conductivity, dynamic contact angle), physicochemical parameters (pH, EC, soluble ions, phenolic compounds, organic matter), and biological degradation (bait-lamina test) were measured to assess the soil state after OMW application. After one rainy season following OMW application, the soil quality of summer treatments significantly decreased compared to the control. This was particularly apparent in a ten-fold higher soil water repellency, a three-times lower biodegradation performance, and a four-fold higher content of phenolic compounds. 1.5 years after the last OMW application, the soil properties of winter treatments were comparable to the control, which suggests a certain recovery potential of the soil. Spring treatments resulted in an intermediate response compared to summer and winter treatments, but without any precipitation following OMW application. Strongest OMW effects were found in the top soil layers. Further research is needed to quantify the effect of spring treatments as well as to gain further insight into leaching effects, the composition of organic OMW constituents, and the kinetics of their degradation in relation to climatic conditions.