

HUNGARIAN UNIVERSITY OF AGRICULTURE AND LIFE SCIENCES
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BUDAPEST

Evaluation of soil microbiology and soil life in different viticulture cultivation techniques

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Viticulture specialization

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SUMMMARY

In vineyards in Hungary, the exclusive use of mineral fertilizers, along with soil tillage, usually leads to a loss of soil organic matter (SOM) and reduction of soil water holding capacity and soil structural stability, resulting in a decline of soil quality and environmental degradation. Cover crops and organic fertilization are a conservation management practice that can provoke changes in soil quality which requires evaluation. In this context, the objective of our work was to evaluate the effect of different soil managements on various soil parameters. We evaluated four different soil managements in Etyek-Buda wine region: OT: old vineyards + conventional tillage, OC: old vineyards + cover crop between the rows, FT: fresh plantation (2 years) + conventional tillage, FM: fresh plantation (1year) + conventional tillage +organic manure. Soil physical and chemical parameters (soil humidity, humus, labile C fractions, pH, CE) and biological parameters (DHA activity, glomalin) were measured at the level of the three soil depths (0-20cm), (20-40cm) and (40-60cm).

The trend of soil chemical and microbiological properties was jointly influenced by the soil management system. From a soil-management perspective, the results showed positive implications and repercussions on all the studied soil parameters, as a result of the practice of cover cropping, no tillage and organic manure. In summary, we found that:

- First, long-term tillage practices affect soil characteristics like water content, aggregation, organic matter content, and enzymatic activity which, in turn, impact microbial diversity. Thus, it has become a well-known principle of conservation tillage that soil organic matter increases in the surface few centimeters of soil as tillage is decreased. This is especially true for no tilled soils, because plant residues accumulate at the surface and are not mechanically mixed into the plow layer.
- Second, cover crops are a relatively inexpensive method of augmenting carbon into the soil, resulting in benefits both to the soil and to the environment. High levels of soil biological activity are frequently listed as an indicator of soil vitality. In this study we found that planting cover crops stimulates biological activity in the soil, serving as an energy source for the ecological community in the root zone, known as the rhizosphere. Soil with vegetation supports higher microbial populations than tilled soil. Our results showed also that vegetation cover increased soil carbon in both stable and labile fractions.
- Third, organic manure had significantly increased the activity of biological activity, as compared to unamended soil. The results showed that the organic fertilizer caused a more pronounced increase in the majority of soil life indicators such as humus content, humus stability, dehydrogenase activity and glomalin concentration, which in turn, lead to greater impact on microbial community.

In conclusion, we can say that soil management in viticulture and sustainable strategies assume greater significance to improve the quality of modern viticulture. In this review we aimed to highlight new agronomic techniques capable of enhancing the resilience of the system and contributing to conservation and ecosystem services provision, and we found that agro technical practices required in integrated and organic farming, namely soil management with covering crop is an eco-friendly system which can maintain the soil health in terms of soil biological fertility and productivity.