

How does vineyard management intensity affect inter-row plant diversity and associated root parameters

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Vineyard management has changed dramatically in the last 50 years. In many wine-growing regions, vineyard inter-rows are kept clean of vegetation by frequent tillage or use of herbicides to establish bare soil systems. In the last thirty years, policy-makers and several winegrowers have realized that temporary or permanent vegetation cover between the vine rows may increase ecosystem services like soil erosion mitigation, soil fertility and biodiversity conservation. The inter-row area of a vineyard can host a diverse flora providing habitat and food resources for pollinating insects and natural enemies of pests. The goal of this study was to analyze the influence of different soil management intensities on plant diversity and root parameters in the vineyard inter-rows.

We investigated 15 vineyards in Romania and 14 in Austria to study the effects of three different management intensities on plant diversity, above and below-ground plant biomass, total root length and surface area of roots. Management intensity ranged from bare soil inter-rows to alternative soil tillage every second year to permanent vegetation cover for more than five years. In each vineyard inter-row, six soil samples (7 cm diameter and 10 cm height) of the upper soil layer were extracted for root analyses. Root were separated from the soil, stained and finally scanned and analyzed with the WinRHIZO software. Finally, roots were dried at 70°C to obtain dry matter of the root samples. Vegetation cover and vascular plant diversity was recorded in four 1 m² plots within each vineyard inter-row two times a year.

The most intensive bare soil management regime in Romania significantly reduced root biomass, total root length and surface area in comparison to the alternative and permanent vegetation cover management. Plant biodiversity was also reduced by intensive management, but differences were not significant. While alternative tillage every second year showed the highest values of plant species diversity and functional richness, total root length, surface area and root biomass always showed the highest value in the vineyards with permanent vegetation cover.

In Austria, the difference between temporary and permanent vegetation cover was much less pronounced than in Romania. The overall synthesis of these results combined with additional biodiversity datasets and soil parameters gathered within the transdisciplinary BiodivERSA project VineDivers will be used to draft management and policy recommendations for various stakeholder groups engaged in viticulture.