

How organic mulches affect spontaneous weed vegetation and soil properties

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Abstract

Spontaneous weeds are one of the main problems for farmers in semi-arid wine regions due to the excessive competition they pose to the crop and the complicated management that this entails. Traditionally, herbicide application and tillage management have been commonly used for weed suppression despite their negative environmental impacts. Currently, there is a need for environmentally sustainable viticulture practices. This three-year study describes the effects of different soil management practices in the vine row on spontaneous weed abundance and species community, as well as the impact on physical and chemical soil properties and water retention capacity. Specifically, three soil managements with organic mulches (grape pruning debris (GPD), straw (SM), and spent mushroom compost (SMC)) and two conventional methods (under-row tillage (TILL) and herbicide (HERB)) were analysed. SM and GPD mulches delimited weed growth under 30% of weed soil coverage. In addition, they reduced the proportion of harmful weed species, increased plant diversity and ecological richness, reduced crop competence and decreased the inputs of herbicide or tillage maintenance and, consequently, improved soil quality and integrity. Among conventional practices, TILL treatment was highly sensitive to the timing of agricultural work and environmental conditions, exhibiting significant year-to-year variability. Organic mulch, particularly SMC, increased the soil's water retention capacity and the content of essential elements and organic matter. Furthermore, SMC mulch presents a weak physical barrier than SM and GPD, allowing bigger spontaneous germination in the former resulting in weeds soil coverage of more than 85%. In conclusion, organic mulches improved soil physicochemical properties and water retention capacity. Besides, SM and GPD mulches controlled the excessive growth of spontaneous weeds.

Key words: grapevine, plant suppression, circular economy, viticulture, ecosystem services.