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Organic mulches improve vine vigour, yield and physiological response in a semi-arid region

Andreu Mairata[1*], David Labarga[1], Miguel Puelles[1], Luis Rivacoba[1], Javier Portu[1], Alicia Pou[1]

[1]*Instituto de Ciencias de la Vid y del Vino (CSIC, Gobierno de la Rioja, Universidad de La Rioja), Finca La Grajera, Ctra. Burgos Km. 6, 26007 Logroño, Spain*

e-mail: amairata@larioja.org

Abstract (250 words)

Recycled organic mulch within the row in vineyard floor management has become an interesting ecological strategy to adapt the crop to climate change consequences in semi-arid regions.

This study aimed to assess the impact of three recycled organic mulches [straw (STR), grape pruning debris (GPD), and spent mushroom compost (SMC)] and two conventional soil management practices [herbicide (HERB) and under-row tillage (TILL)] on vegetative vigour (NDVI), production (kg/plant), and physiological parameters (δ13C in grapes and leaf gas exchange during four grapevine phenology stages). Additionally, temperature and water soil parameters were collected at three soil depths. Data was collected during the 2021 and 2022 grapevine growing seasons in La Rioja, Spain.

The SMC treatment increased vegetative plant growth compared to HERB and GPD and higher production values than TILL and HERB. These differences were attributed to higher water content during flowering to veraison period. Physiologically, there were no δ13C grape differences among soil management treatments due to irrigation applications during veraison and maturation, blurring potential effects on δ13C. Regarding leaf gas exchange, SMC showed higher Water Use Efficiency (WUE_i: photosynthesis/stomatal conductance) at flowering and setting in both years. However, during veraison and maturation, stomatal conductances decreased due to elevated climatic stress. In 2021, STR and SMC exhibited higher stomatal conductances during veraison and maturation, resulting in a decline in WUE_i. In contrast, in 2022, characterized by warmer and drier conditions, low conductances were observed, masking differences between soil treatments. Organic mulch treatments, especially SMC, improved plant capacities in semi-arid regions.

Keywords: water use efficiency, soil management, carbon isotope discrimination, mulching, yield.