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# Effect of cover crops management in aggregate stability of a vineyard in Central Spain.

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Our research focuses in cover crop treatments used to avoid soil degradation in hillsides. The soil-plant interaction can influence the soil structure. In this study we pay special attention to the soil aggregates in a hillside vineyard (average slope of 14%), under Mediterranean semiarid climatic conditions (average annual temperature 14ºC, annual rainfall around 400 mm), in the South East of Madrid located at an altitude of 800 masl. The soil classification according to USDA (2006) is Calcic Haploxeralf. Its particle size yields 58% sand, 18% silt and 24% clay, so that according to USDA classification it is a sandy clay loam soil. The bulk density of the first 10 cm of topsoil is 1.2 g cm-3 and its real density is 2.4 g cm-3. It has low organic matter content: 1.3 $\pm$ 0.1% (Walkley and Black, 1934).

Three treatments were tested: i) traditional tillage ii) soil covered by Brachypodium distachyon allowing self-sowing, and iii) soil covered by Secale cereale, mown in early spring. In each treatment the aggregate stability was measured. These cover crops were established in a 2m wide strip at the center of the rows.

We have collected samples of soil for each treatment along 2 years and we analyzed the aggregates, trying to find changes in their stability.
Aggregates of 4 to 4.75 mm diameter were selected by dry sieving. The stability was measured with Drop-test: CND and TDI (Imeson and Vis, 1984). An improvement in the stability of aggregates was observed after two years of cover crop treatment. There are significant differences among the treatments analyzed with Kolmogorov-Smirnov test, being Brachypodium distachyon the treatment with more stable aggregates, it is necessary a mean higher than 8 drops to disintegrate every aggregate completely.

Organic carbon was also measured by Loss on Ignition method (Schulte and Hopkins, 1996). This method can lead to an overestimation of the organic matter in soil samples but is considered suitable for aggregates. Again, those aggregates from treatments with cover crops had more organic carbon than the aggregates from traditional tillage treatment (Brachypodium distachyon 26.35, Secale cereale 18.83 and traditional tillage 17.04 g Kg-1).
Lastly, the oxidable soil organic matter was also analyzed (Walkley-Black, 1934) and these results also indicated an increase in cover crop treatments, especially after the second year of treatment when the percentage of oxidable organic matter in the treatments with vegetable covers is approximately 1.5 times higher than this content in tillage treatment (1.015 %).

The results support the conclusion that treatments with cover crops increased or at least maintained the stability of aggregates which is linked to the organic matter in the aggregates, on the contrary, the traditional tillage treatment showed less stable aggregates along the time.

Keywords: aggregates stability, LOI, organic matter, vineyard, vegetable cover

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