



Temporal and soil management effects on soil infiltration and water content in a hillslope vineyard

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The maintenance of bare soil in the vineyard's inter-rows with tillage, as well as other mechanized operations which increase the vehicle traffic, expose the soil to degradation, favoring overland flow and further threats as compaction, reduction of soil water holding capacity and water infiltration. Water infiltration is strongly controlled by field-saturated hydraulic conductivity, which depends primarily on soil texture and structure, and it is characterized by high spatial and temporal variability. Beyond the currently adopted soil management, some major causes in variability of infiltration rates are the history of cultivation and the structure of the first centimeters of the vineyard's soil.

A study was carried out in two experimental vineyard plots included in the "Tenuta Cannona Experimental Vine and Wine Centre of Regione Piemonte", located in NW Italy. The study was addressed to evaluate the temporal variations of the field-saturated hydraulic conductivity, in relation to the soil management adopted in the inter-rows of a hillslope vineyard. The investigation was carried out in a vineyard comparing the adoption of two different soil managements in the inter-rows: 1) conventional tillage and 2) controlled grass cover. Several series of double-ring of infiltration tests were carried out during a 2-years period of observation, using the simplified falling head technique (SFH). In order to take into account the effect of tractor traffic, the tests were done both inside the track, the portion of soil affected by the transit of tractor wheels or tracks, and outside the track. Before the execution of each test, bulk density and initial soil water content close to the investigated area were determined. Relations among infiltration behavior and these parameters were analyzed.

Field-saturated hydraulic conductivity (K_{fs}) at different sampling dates showed high variability, especially in the vineyard with cultivated soil. Indeed, highest infiltration rates were measured within a month after the tillage operations (951.0 mm h^{-1}). However, the positive effect of tillage was only temporary, since the lowest mean K_{fs} was obtained in the tilled plot, for the undisturbed soil conditions, namely when measurements were carried out long time after the execution of tillage operations (107.6 mm h^{-1}). Significant differences between the hydraulic conductivity measured inside the track and outside the track positions were found both in the grass covered and in the tilled vineyard's inter-rows. The results of the investigation show that, in the specific area of study, the maintenance of grass cover in the vineyard inter-rows gives higher water infiltration than tillage throughout the year.