



THE EFFECTS OF COVER CROPPING SYSTEMS ON VINE PHYSIOLOGY, BERRY AND WINE QUALITY IN A CLIMATE CHANGE SCENARIO IN SWITZERLAND

Authors: Markus RIENTH^{1*}, Serena FANTASIA¹, Matteo MOTA¹, Frédéric LAMY¹, David MARCHAND², Robin SONNARD², Vivian ZUFFEREY³, Nicolas DELABAYS⁴, Thierry HEGER¹,

¹Changins, HES-SO University of Applied Sciences and Arts Western Switzerland - Nyon, Switzerland

²FIBL, Research Institute of Organic Agriculture - Lausanne, Switzerland

³Agroscope, Swiss Agricultural Research Institute - Nyon, Switzerland

⁴hepia, Earth-Nature-Environment Institute - Jussy, Switzerland

*Corresponding author: markus.rienth@changins.ch

Abstract:

Context and purpose of the study – Sustainable weed control with little detrimental effects on vine physiology, yield, berry quality, soil structure, health and biodiversity is a key factor in vineyard management. Few options are available to avoid herbicide utilization and minimize negative effects of frequent tillage on soil quality. The present project aims to investigate and develop different cover management strategies in a cool climate viticultural region in Switzerland. The impact of different treatments on vine, must and wine has been studied in an experimental vineyard in Changins, Switzerland for one year and will be continued over the next three years.

Material and methods – The experiment was set up in August and sown in September 2021 and consists of 4 treatments: A) control: *spontaneous grass cover* on both inter-rows and *tillage* on the under-row; B) treatment 1: *spontaneous grass cover* on one inter-row, *high-biomass winter cover crop* (VITIFIT) on the other inter-row and *tillage* on the under-row; C) treatment 2: *permanent high biodiversity cover crop* (MCS 9) on one inter-row, *high-biomass winter cover crop* (VITIFIT) on the other inter-row and *permanent low-competitive cover crop* (NoGlyphos) on the under-row. D) treatment 3: *permanent high biodiversity cover crop* (MCS 9) on both inter-rows and *permanent low-competitive cover crop* (NoGlyphos) on the under-row. Watermark tensiometer probes for soil temperature and water potential measurements are installed for each treatment, at 30 and 80 cm depth. Temperature and humidity are estimated by tinytag probes. Vine physiology (photosynthesis, water deficit, vigour), berry quality (organic acids, sugar and nitrogen), wine quality as well as soil structure and vegetation cover are assessed throughout 3 years.

Results – Preliminary results of the first season show that the under-row tillage reduced water and nitrogen stress experienced by the vines during the very dry 2022 vintage. The sown under-rows (C and D) being the most stressed treatments characterized by the lowest steam water potential and leaf nitrogen. Berry weight, yield and assimilable nitrogen were highest in A and B. Malic acid concentration in berries was highest in the A treatment, where no sowing had been done.

The continuity of the study will help to confirm obtained results in climatically distinct years. It will assess potential carry over effect of treatments on vine physiology and perennity and help to better characterize the impact of different cover crop choices and management strategies on yield, quality and vineyard ecosystem. The study will provide growers tools to optimize the choice and management of their cover cropping systems.

Keywords: Cover crops, Vine physiology, Weed management, Biodiversity, Sustainable viticulture.