A Mower with Chains for Under-row Weed Control in the Vineyard

Lorenzo Gagliardi\*, Marco Fontanelli, Mino Sportelli, Christian Frasconi, Michel Pirchio, Andrea Peruzzi, and Michele Raffaelli

Dipartimento di Scienze agrarie, Alimentari e Agro-ambientali, Università di Pisa, Via del Borghetto 80,56124 Pisa, Italia; marco.fontanelli@unipi.it; mino.sportelli@phd.unipi.it; christian.frasconi@unipi.it; michel.pirchio@for.unipi.it; andrea.peruzzi@unipi.it; michele.raffaelli@unipi.it; \*Correspondence: lorenzo.gagliardi@phd.unipi.it

**Keywords.** Non-chemical weed control; organic farming, soil conservation; mowing; tillage

**Abstract.** Among the different agricultural practices required in the vineyard, weed management is crucial to achieve adequate yields. Non-chemical under-row weed control is commonly performed through soil tillage. However, considering the high rate of soil degradation of European vineyards, concerns about the potential negative effects related to tillage are increasing. To date, attention is focusing on strategies which promote organic farming practices and soil conservation, such as the maintenance of a permanent sod under the row with mowing. Most of the mowers cut weeds by means of blades. However, in the Mediterranean Europe vineyards have been planted on soils often characterized by high stoniness, where blades are poorly effective and get frequently damaged. A commercial under-vine mower was modified by replacing blades with chains to achieve more resistance in case of impact with stones. In February 2021 a preliminary cutting test aimed to identify the appropriate setting of the mower with chains was carried out on an open field. The modified machine and the commercial version were compared considering two forward speeds (1.5 and 2.4 km·h-1), and two rotation speeds of the cutting tool (1830 and 2500 rpm). Weed cover percentage, height, and above-ground biomass were evaluated. The setting with lower forward speed and higher rotation speed of the cutting tool obtained the best results in terms of weed control. In April 2021 a three-year comparative test started in the vineyard. The trial is aimed to compare the mower with chains with machines that perform under-row weed control through soil tillage, such as motorized discs, weeder blade cultivator, and rollhacke. Weed cover percentage, height, and above-ground biomass were assessed. At the first weed control intervention the mower achieved a weeds height around vine trunks similar to the motorized discs, but higher compared to the other machines. The mower achieved a lower weed biomass compared to rollhacke, and similar compared to the other machines. Motorized discs obtained best results in terms of weed cover. At the second intervention weeds height in mowed plots was lower compared to rollhacke, while weed biomass was lower compared to rollhacke and motorized discs. Moreover, the mower achieved the lowest weed cover. Overall, at the first year of the test the mower obtained promising results but further years of evaluation are needed to draw conclusions on the comparison.