Zoosymposia 22: 059–059 (2022)
https://www.mapress.com/j/zs

Abstract

ISSN 1178-9905 (print edition)
ZOOSYMPOSIA
ISSN 1178-9913 (online edition)

https://doi.org/10.11646/zoosymposia.22.1.28

Restoring management practices in Tuscan organic vineyards and impact on soil mesostigmatid mites*

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**In*: Zhang, Z.-Q., Fan, Q.-H., Heath, A.C.G. & Minor, M.A. (Eds) (2022) *Acarological Frontiers: Proceedings of the XVI International Congress of Acarology (1–5 Dec. 2022, Auckland, New Zealand)*. Magnolia Press, Auckland, 328 pp.

Soil fauna actively contributes to drive crucial processes of energy and nutrient cycling in agricultural systems, to influence the quality of crops and pest incidence. Soil tillage can be absolutely considered as one of the most influential agricultural manipulations of soil structure and has a profound influence on soil biology and its provision of ecosystem services. Understanding the effects of different tillage intensities is of interest not only to the scientific community but also to farmers, practitioners, policymakers, and agricultural consultants. As the long-term evidence in degraded vineyard soils, EU and FAO highly recommend inter-row practices basing on sustainable managements and good agronomic practices (GAPs) to re-install soil functionality. In this study, we aimed at evaluating effects of different GAP practices that can improve soil recovering on some soil quality indicators, with emphasis to edaphic mesostigmatid mites.

The Italian experimental vineyards (age 10 to 20 years) were in two organic farms in Tuscany (Central Italy): i) Fontodi (Panzano in Chianti, Firenze) and ii) San Disdagio (Roccastrada, Grosseto).The vine grape cultivar was Sangiovese. In each plot, four treatments were selected: a) compost produced on farm by manure, pruning residue, grass (COMP); b) faba bean, barley green manure (GM); c) sowing, dry mulching with *Trifolium squarrosum* (DM) d) control (CTRL) where usual management of the whole vineyard was adopted. Cover crops were seeded in fall and mown in late spring, leaved in the ground for mulching in DM or incorporated into the uppermost soil layers in GM. The referring soil functionality level was considered by an external control treatment for each plot in non-degraded vineyards (ND). The soil samplings were in April 2015 (T0, pre-treatment) and, after yearly GAP application, in May 2018 (T3, post-treatment). For each treatment, physical, chemical, and biological properties were assessed with focus on microarthropod component for the biological ones. Soil microarthropods were extracted by Berlese-Tullgren selectors for 6 days.

The mite community represented 70% of edaphic microarthropods (92,702 specimens collected). The applied GAPs played a role in contrasting the soil degradation process, especially in San Disdagio previously characterized by low soil functionality. The distribution patterns of microarthropods were homogeneous within the experimental plots. The COMP increased organic matter favouring mites' populations, mainly oribatids, and predator nematodes. Following DM, the most dangerous nematode of grapevines, the virus-vector *Xiphinema index* (Longidoridae) decreased. Mesostigmatids increased with their prey, independent of soil chemical-physical parameters (Pearson index). In both sites, the three GAPs did not induce significant effect in mesostigmatid community (p>0.05). As mesostigmatids are secondary consumers with high dispersion ability, bio-indication based on their recording seems affected more by vineyard management and complexity of the landscape than soil microhabitat. Considering the role of soil inhabiting organisms and their relationships, the GAPs' effectiveness can be assessed and gain more efficiency in promoting measures to recover ecosystem services.

Keywords: organic viticulture, soil mesofauna, Good Agronomic Practices, biodiversity

Submitted: 31 Aug. 2022; Accepted by Zhi-Qiang Zhang: 28 Sept. 2022; published: 30 Nov. 2022