

## NEWSLETTER

N° 4 June 2020

### *Release*

Dear Readers,

Unexpectedly, as for other colleagues, projects, and any activity in the world, we have been hit by the Covid19 pandemic and the lockdown it has brought to all the countries involved in DOMINO. It has disrupted the plan of activities, particularly those requiring laboratory work. However, since the season has arrived and plants in the field have continued to grow, uptake nutrients, developed leaves, flowers and fruits, as under normal times, we also had to continue our field works. Somehow, these field activities have helped each of us keeping the contact with a “normal” reality.

The current issue of the newsletter is thus presenting some results about the possibility of controlling weeds developing on the row of the apple orchard by exploiting living mulches that could have different functions.

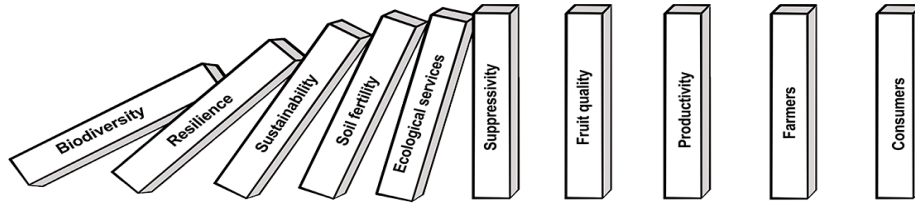
Thank you for following our website and wishing you a safe return to the living routines.

*Eligio Malusá and Davide Neri*

### *Can the use of living mulches reduce weeds infestation in organic orchards?*

Joanna Kwiatkowska, Joanna Golian

Weeds are an essential element of biodiversity, a component of the landscape and an important link in the animal food chain. However, in agricultural and horticultural crops they are undesirable plants that must be controlled. In orchards, the effect of excessive weeds infestation is a competition with trees for water and nutrients, as well as attractiveness for pollinating insects and the risk of inducing an excessive development of pests and fungal diseases. Moreover, soil overgrown with weeds absorbs less solar energy, which increases the risk of frost. The critical period during which fruit trees are particularly exposed to competition from weeds is from April to August. In organic orchards, where the use of herbicides is not allowed, there is an increasing interest about how to regulate weeds infestation, i.e. keeping them at a relatively low level, tolerated by trees. Therefore, research is constantly being carried out to develop new solutions to reduce weed infestation in orchards where fruits free from residues of plant



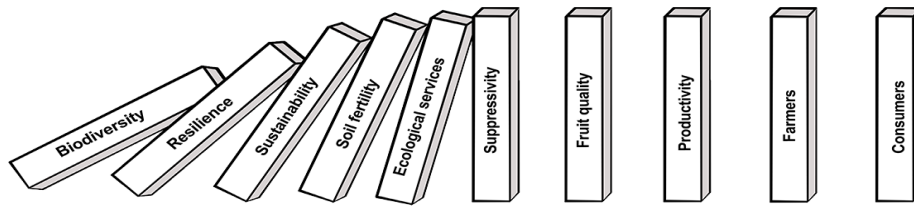
protection products are produced, maintaining at the same time the profitability for the fruit grower.

In the years 2019-2020, at the Weed Science Laboratory of The National Institute of Horticulture Research in Skierniewice, a research was carried out assessing the effect of several living mulches on weed infestation in tree rows of an organic apple orchard. The goal of growing living mulches on the tree row included the possibility to have a secondary source of income for the farmer, e.g. growing medicinal plants, or increasing ecological services (e.g. additional feed for pollinators, soil bioremediation from persistent organic pollutants – POPs, increase the control of soil-borne or air-borne pests and pathogens of the apple crop). Determining the suitability of the various species of living mulches planted in the tree row in covering the soil and reduce weed infestation was also an aspect interesting to evaluate. The study included 11 living mulch species, such as: lady's mantle (*Alchemilla vulgaris*), violet (*Viola odorata*), sweet woodruff (*Galium odoratum*) in association with common hedgenettle (*Stachys officinalis*), lungwort (*Pulmonaria officinalis*) in association with marigold (*Tagetes patula*), common gypsyweed (*Veronica officinalis*), wild strawberry (*Fragaria vesca*), mint (*Mentha x piperita*), nasturtium (*Tropaeolum* sp.) and the winter squash (*Cucurbita maxima*).

A total of 51 weed species were present in the apple orchard. Regardless of the living mulch plant used, the soil surface was mostly covered by two perennial weed species, horsetail (*Equisetum arvense*) and dandelion (*Taraxacum officinale*), and several annual species, particularly purple deadnettle (*Lamium purpureum*), chickweed (*Stellaria media*), quick weed (*Galinsoga parviflora*), shepherd's purse (*Capsella bursa-pastoris*) and annual meadow grass (*Poa annua*).

*E. arvense* is considered one of the particularly persistent and difficult to control weed species that appear in orchards. Both mechanical and manual attempts to eradicate this species usually do not bring results, because fragmentation of runners stimulates vegetative reproduction. Horsetail plants can outgrow ground cover plants and also break through organic mulch. However, some of the living mulches species were able to contain its development.

The lowest weed infestation was found with mint, Alchemilla, nasturtium and pumpkin, (approx. 20% for all species). On the other hand, *Pulmonaria* and *Veronica* allowed the weeds to cover more than 50% of the soil. The production of mint and Alchemilla biomass was also remarkable, being these plants assessed as potential secondary cash crops, amounting to approximately 500 g/m<sup>2</sup> and 386 g/m<sup>2</sup>, respectively, for the Alchemilla and mint.



Nevertheless, among the studied living mulches species, the best effect was produced by mint. Indeed, since already in the second year after planting it limited weed infestation by 60-70 %, compared to the natural cover. Annual living mulches such as pumpkin and nasturtium also showed strong growth and good soil cover, competing well against weeds. The effects on reducing weed infestation by these species were, however, slightly smaller than that of mint, because of their annual growth behaviour, and by the time these plants grew properly some of the weeds had already germinated. The remaining species of cover plants showed a weaker effect on the reduction of weed infestation, and the weakest effect was observed in the rows of trees in which the cover plants were lungwort and forest speedwell.

All the collected data show that not all studied species are similarly useful in soil management of tree rows. While none of them adversely affected the nutritional status of the trees, some of them are of more interest in weed control and others, such as wild strawberries, require more attention in the first year after planting to allow them to develop and cover the soil. An effect that has not been assessed but is expected to be interesting for the overall management of the orchard has been observed for some species. For example, a long flowering period (e.g. for nasturtium) resulted in a greater attraction of pollinating and possibly other beneficial insects, which could also have an impact on the health of the tree. The fertilization needs and the water management of the orchard using this new row management method will be further assessed. Indeed, in the long run, their growth and biomass production may need to be maintained through proper fertilization and irrigation to avoid possible competition with tree species. The good biomass production of some live mulches also points to their use as an additional source of income, as their leaves and flowers are used commercially to make valuable medicinal products as well as for aesthetic purposes.

We thus believe that the answer to our initial question can be positive, but a careful consideration of the orchard conditions and soil fertility must be done when selecting the potential living mulch species. The different options and ecological services that the different species can provide are also opening new opportunities to exploit them for different purposes, including the improvement of the orchard biodiversity.

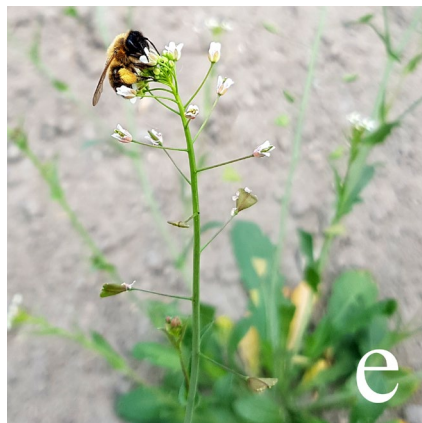
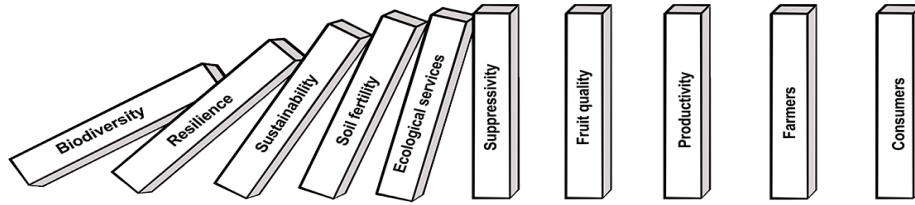


Fig. 1: Weed species common in apple orchards: a) purple deadnettle (*Lamium purpureum*); b) annual meadow grass (*Poa annua*); c) chickweed (*Stellaria media*); d) dandelion (*Taraxacum officinale*); e) shepherd's purse (*Capsella bursa-pastoris*); f) horsetail (*Equisetum arvense*).

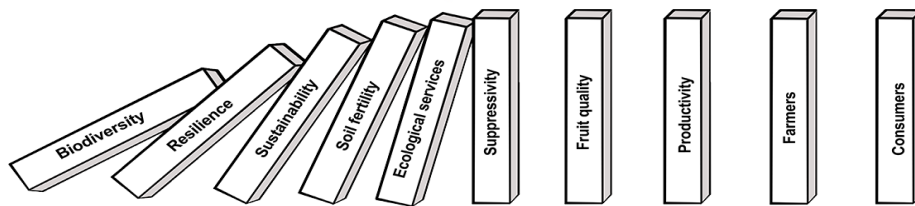
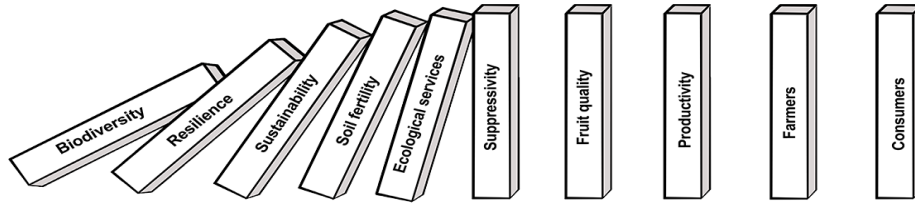


Fig. 2: The effect of the use of row living mulches on the orchard' weeds at the end of the growing season: a) lady's mantle (*Alchemilla vulgaris*); b) nasturtium; c) pumpkin; d) mint.

Read more at the CORE Organic website: <http://www.coreorganic.org/>  
 find publications from the project at: <http://www.domino-coreorganic.eu/>



## The DOMINO consortium

### Coordinator:

Davide Neri

Department of Agricultural, Food and Environmental Sciences

Università Politecnica delle Marche

Italy

e-mail: [d.neri@univpm.it](mailto:d.neri@univpm.it)

### Partners:

Hristina Kutinkova, Fruit Growing Institute, Bulgaria

Markus Kelderer, Laimburg Research Centre, Italy

Eligio Malusa, Research Institute of Horticulture, Poland

Maria-Martha Fernandez, Centre Technique Interprofessionnel Fruits Légumes, France

Michael Friedli, Research Institute of Organic Agriculture – FiBL, Switzerland

Sabine Zikeli, Hohenheim University, Germany

### Stakeholders involved:

Werner Castiglione – BioSudtirool, Italy

Christian Gamper - Vi.P Bio Vinschgau, Italy

Reinhard Verdorfer - Bioland Südtirol, Italy

Ulrich Kiem SBR organic, Italy

Vincenzo Vizioli – AIAB Associazione Italiana Agricoltura Biologica. Italy

Christoph Höfflin - Fördergemeinschaft Ökologischer Obstbau e.V., Germany

Stowarzyszenie Polski EkoOwoc - Poland