PRACTICE ABSTRACT NO.02

Forage legume species as cover crops in olive orchards

Problem

Economic sustainability of some agricultural practices with increasing costs of energy and of external inputs for managing the olive orchard.
Long-term environmental impact of some agricultural practices, and their incompatibility with organic olive growing.
Increasingly severe climatic events that threaten the resilience of the olive grove.

Solution

Introduce legumes as cover crops in olive orchard systems to reduce the use of external inputs, improve long-term sustainability and increase crop diversity to stabilize or enhance crop yields under climate change.

Figure 1: Flowering white clover (*Trifolium repens*, left) and sainfoin (*Onobrychis viciifolia*, right), as cover crops in the olive orchard.

Applicability box

Geographical coverage

Olive growing areas

Application period

All seasons

Required time

- Autumn or spring (sowing)
- From spring to autumn (periodic mowing)

Period of impact

All seasons

Equipment

Regular farmer equipment or sod seeder.

Outcome

Intercropping legume cover crops in olive orchards increases the amount of nitrogen in the soil as well as in the olive leaves, without depleting the soil water content compared to both spontaneous covers and tilled soil. In addition, it increases agroecosystems biodiversity and produces forage under the trees.

Practical recommendations

- Test soil and amend P and K levels if necessary.
- Of the species tested, the ones with the highest annual biomass production and the longest permanence in the field were sainfoin and bird's-foot trefoil. However, the choice should be based on the local climate and soil and orchard characteristics, local seed costs and availability in the market.
- In the absence of a sod seeding machine, scatter seeding can be used with subsequent covering by raking with available machinery.
- The performance of the cover crops, both in terms of biomass produced and duration over time, will be limited in high-density olive groves with limited light under the canopies. In olive orchards with dense canopies, avoid sowing close to the tree row, where there will be insufficient light.
- The first mowing should be done when 50% of the plants have flowered. Normally a second mowing is carried out, but the timing will depend on seasonal trends.
- The success of the intercropping is affected by different factors such as soil and climate conditions, choice of species and cultivars, trees density, organic vs conventional management system, weeds/pests/diseases control, technical equipment and type of intercropping.

Practical testing/ Farmers' experiences

- We recommend testing this technique under local conditions in a small area and cultivate the rest of the field as usual in order to compare the results and decide if it is convenient.

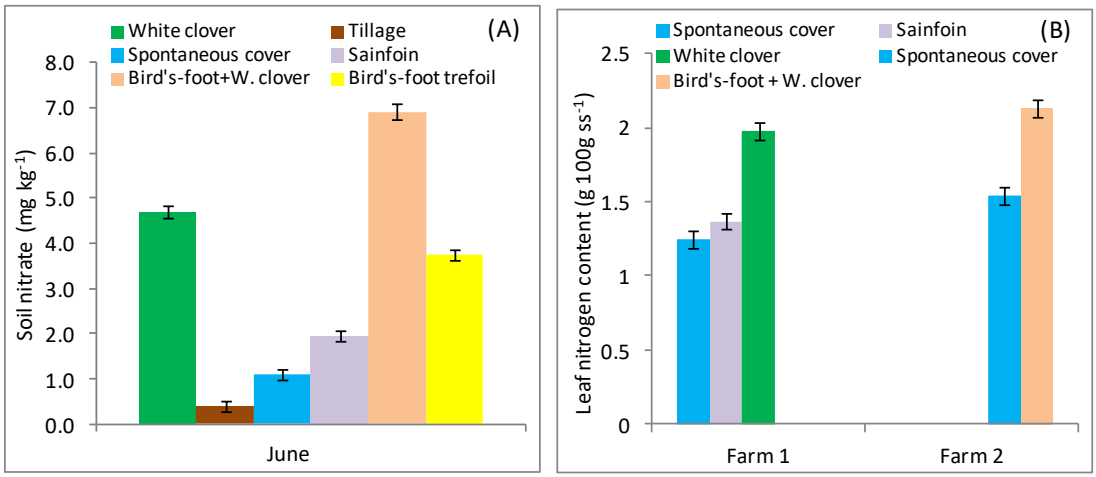

Figure 2: Top layer concentration of soil nitrate under different soil management detected at the time of the first mowing (A) and bioaccumulation of nitrogen content in olive leaves in two different farms, in September of the same year (B).

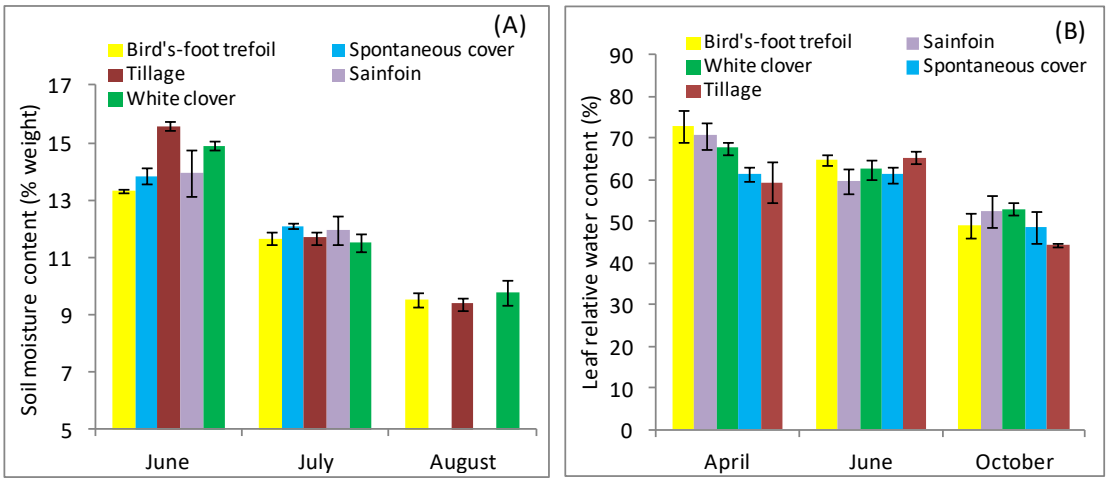

Figure 3: Soil moisture content measured on topsoil (from 5-30 cm depth) (A) and leaf relative water content of olive trees measured in the same year (B). Both parameters decrease during the season but with no differences between cover crops vs. spontaneous covers and tillage.

Further Information

- Ordóñez-Fernández R., de Torres M.A.R.-R., Márquez-García J., Moreno-García M., Carbonell-Bojollo R., 2018. Legumes used as cover crops to reduce fertilisation problems improving soil nitrate in an organic orchard. European Journal of Agronomy, Volume 95, , Pages 1-13, ISSN 1161-0301, https://doi.org/10.1016/j.eja.2018.02.001
- Kocira A. Staniak M., Tomaszewska M., Kornas R., Cymerman J., Panasiewicz K., Lipińska H., 2020. Legume cover crops as one of the elements of strategic weed management and soil quality improvement. A review. Agriculture 10: 394, https://doi.org/10.3390/agriculture10090394

About this practice abstract and Biodiversify

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Biodiversify is a PRIMA 2019 project (https://www1.montpellier.inra.fr/wp-inra/biodiversify/) investigating how agricultural biodiversification (i.e. mixed cropping, cover cropping and agroforestry) can increase ecosystem services, sustainability and resilience of Mediterranean agriculture.

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