

Testing soil for legume fatigue

Problem

Soil legume fatigue causes severe root diseases and even crop failure. Heavy conjoint infestation (e.g., *Didymella*, *Fusarium*, *Aphanomyces* and other root rot pathogens) may accumulate in the soil in crop rotations that include pea, faba bean, vetch, red clover or lucerne and lead to total loss of the legume.

Solution

With a simple legume fatigue test, soil can be examined for the fatigue syndrome prior to cultivation.

Outcome

The test reveals if the soil is contaminated with the pathogens mentioned above and can, thus, point to the need for a legume break.

Applicability box

Geographical coverage

Generally, and especially in clayey and shallow soils

Application period

3 months prior to cultivating the field with concerned legumes

Required time

About 4 hours (baking time not included)

Period of impact

Entire crop rotation

Equipment

Baking oven, aluminium trays, flowerpots, seed, scale

Practical recommendations



1. Extract 10 l soil from the field plot of interest and sieve down to 10 mm
2. Fill 4 aluminium trays with the soil
3. Cover the trays with tinfoil and place in baking oven for 12 h at 70-100°C
4. Let the soil cool down for 12 hours, then fill 4 pots with untreated soil (mark with "U") and 4 pots with heat-treated soil (mark with "H")
5. Place 5-10 legume seeds (depending on seed size) in each pot
6. Place the U and H pots randomly in a tray with some water and keep them in a sheltered place at >18°C and daylight
7. Keep the pots moist by pouring water into the trays (avoid overwatering).
8. After 6 weeks, cut all plant shoots at the stem right above the soil surface, and weigh the shoots of each pot separately
9. Divide the shoot weight of the "U" pots by the shoot weight of "H" pots, e.g., 200 g U plants / 180 g of H plants = a ratio of 0.9
10. This ratio gives you an indicator for legume fatigue (see below)

Practical testing/Farmers' experiences

A ratio below 0.8 indicates a risk of legume fatigue. The lower the ratio, the higher the risk. Decide cautiously whether to cultivate the tested legume. It is also recommended to test any other legume that is planned for the crop rotation of that field. In case of a ratio <0.2, we strongly advise against a cultivation of the tested legume (and possibly any other legume) for 7-8 years.





Further information

- Use the comment section on the [DiverIMPACTS discussion forum](#) to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the author of the practice abstract by e-mail.
- Wiki: http://vm193-134.its.uni-kassel.de/En.DiversiWiki/index.php/Mixture_practice_for_farmers_and_advisors
- Check the [Organic Farm Knowledge Platform](#) for more practical recommendations.

About this abstract

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This practice abstract was originally elaborated in the Organic Knowledge Network Arable project (OK-Net Arable) and was adapted for the DiverIMPACTS, ReMIX and LIVESEED projects, based on the EIP AGRI practice abstract format.

ReMIX is a H2020 multi-actor project that will allow designing cropping systems based on agro-ecology for the benefit of farmers and the whole EU agricultural community. ReMIX will exploit the benefits of species mixtures to design more diversified and resilient agro-ecological arable cropping systems. Based on a multi-actor approach, ReMIX will produce new knowledge that is both scientifically credible and socially valuable in conventional and organic agriculture. The project will tackle practical questions and co-design ready-to-use practical solutions. The project will span from the specification of end-user needs and the co-design of in-field and on-farm experiments to demonstrations with evaluation of new varieties and practices. ReMIX will contribute to the adoption of productive and resilient agricultural systems. The project is running from May 2017 to April 2021

DiverIMPACTS: The project is running from June 2017 to May 2022. The overall goal of DiverIMPACTS - Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability - is to achieve the full potential of diversification of cropping systems for improved productivity, delivery of ecosystem services and resource-efficient and sustainable value chains.

LIVESEED: The project is running from June 2017 to May 2021. The overall goal of LIVESEED is to improve performance of the organic sector by boosting organic seed and plant breeding across Europe. LIVESEED is based on the concept that healthy seed and large portfolio of species and cultivars adapted to organic systems are key for realising the full potential of organic agriculture and climate change adaptation.

Website: www.remix-intercrops.eu, www.diverimpacts.net, www.liveseed.eu © 2020

