

Microbes protect crops from microbes

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Credit: Leiden University

Farmers do not love them all. Microbes can cause tragic consequences for crops. Even the presence of just one pathogenic fungus or bacterium can drastically reduce yields. Still, there are exceptions. In that case, a pathogenic microbe is present in the soil, but does not cause any harm. Adam Ossowicki graduated 1 June after a voyage of discovery to unravel the principles of this mystery.

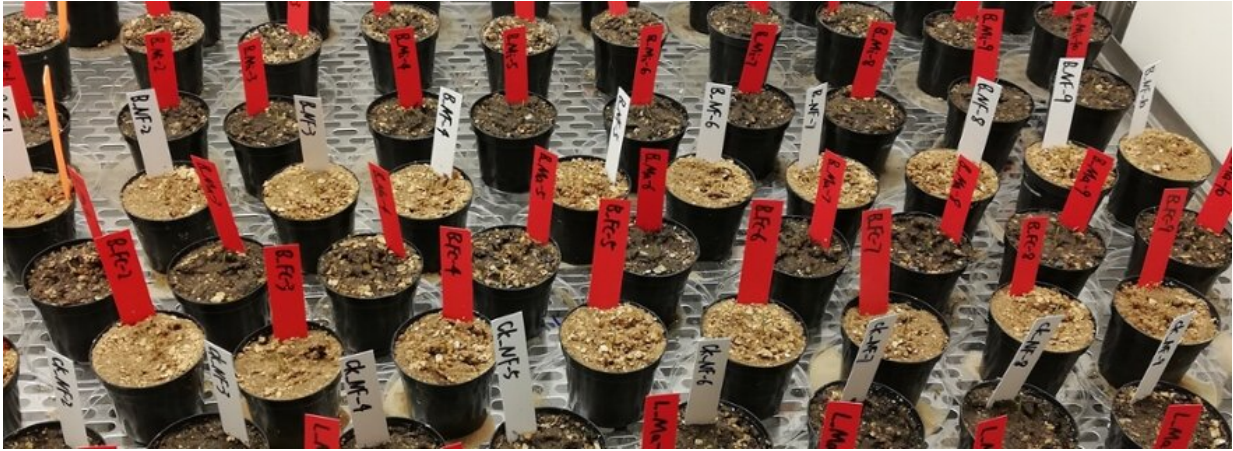
"One of the most devastating [fungal pathogens](#) is *Fusarium culmorum*, and when it strikes it reduces yields and contaminates the harvest with toxins making it unfit for consumption," Ossowicki explains. "The interesting part is that some soils possess an exceptional variety of microorganisms that protect crops from such pathogens. Those are called disease suppressive soils. I wanted to know more about them."

To achieve this, Ossowicki lured biology students and bioinformatics away from their laptops to gather soil from 28 different farms. "That was a good time for me, as Dutch farmers are nice people," says Ossowicki. "But the real work started when we came back to the laboratory."

Pathogen suppressive microbes

With the gathered [soil samples](#) the researcher performed several experiments, under supervision of Paolina Garbeva (NIOO-KNAW) and Jos Raaijmakers (NIOO-KNAW and IBL Leiden University). Ossowicki grew wheat plants in the collected soil and analyzed the effect of the pathogen. With the help of DNA sequencing technologies, the researcher could identify bacteria and fungi that can take part in the protection of the plant against the pathogenic fungus.

"It was difficult as the microbial world of soil is very complex," the researcher says. "After a series of experiments we found that four of our soil samples proved to be disease suppressive. With Vittorio Tracanna (Wageningen UR) I pointed out which exact microbes are likely to protect the plant. However, there is still a world to discover, as each of the soils seems to have a slightly different way to cope with the pathogen."



Credit: Leiden University

The smell of the forest after rain

Additionally, Ossowicki looked at substances produced by and spread through the air: volatiles. "An example of such a compound is geosmin, that causes the typical smell in the forest after it has rained," explains Ossowicki. "I showed that there are very clear protective effects of volatiles on the plants." However, there is still a long way to go before it can be proven with certainty which volatiles protect crops and how they do that. "Unfortunately, that is the nature of research as a Ph.D. student. Even four years of research is not enough to explain complex mysteries of nature."

Microbes as sustainable crop protection

In this way Ossowicki Adam hopes that his research could make a global difference in the future. "My research is a start, it is the fundamental part that filled our knowledge about microorganisms with new insights. I hope that in the future crops can be protected by managing [soil](#)

microbiomes without using harmful chemicals. Nowadays, one of the greatest challenges is not only to feed the [world population](#) but also to do it in a sustainable way."

Provided by Leiden University

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