

## Healthy soils - healthy plants

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### Introduction

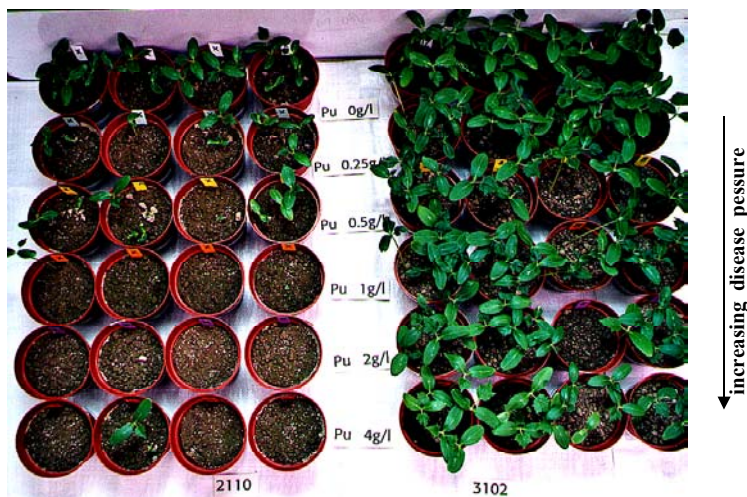
Healthy soils with a high capacity to deliver nutrients and to suppress plant diseases are key in organic farming, because synthetic fertilizers and pesticides are not used. Whether resistance against soil or air born plant diseases can be enhanced by cultural practices such as soil management, manure application or crop rotation is still under discussion.

### Materials and methods

To test this, 40 organic arable farms in the Swiss midlands were selected. Soil samples of potato fields were taken for chemical and microbiological analyses, as well as for biotests with the two pathogenic fungi *Pythium ultimum* and *Phytophthora infestans*. Leaf and tuber samples were taken for nutrient analyses. The biotest with *P. ultimum* was performed on 20 soils with potted cucumber. The number of emerged cucumber plants and their biomass were measured three weeks after inoculation. The biotest with *P. infestans* was performed on 12 soils with potted tomatoes. The diameter of lesions was measured one week after infection of the tomatoes with *P. infestans*.

### Results and Discussion

Soils of farms managed organically for more than 30 years contained significantly less P and K than soils of the farms managed organically for less than 5 years. However, potato yields were not different and ranged between 20 and 50 t/ha fresh matter, mean 30 t/ha. The yields were related to texture soil, fertilization and livestock units per hectare ( $R^2=0.55$ ). The resistance against *P. ultimum* correlated positively both with the amount of manure and with the ratio basal respiration to microbial biomass ( $R^2=0.61$ ). Resistance against *P. infestans* correlated with the proportion of cereals in the crop rotation and the C/N-ratio of the microbial biomass in the soil ( $R^2=0.74$ ).



Suppression of *Pythium ultimum* by two different, long-term organically cultivated soils.

### Conclusions

These data show that fertilization, crop rotation and community structure influence pathogen suppression.

### References

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