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Soil microbial communities in agroecosystems and natural habitats contributing to resistance and resilience of the soil environment.

Summary

The control of common scab of potatoes (CS) includes resistant varieties (cultivars), precise fertilization, increase of soil moisture, and chemical treatments. Yet, these management practices do not have common or reproducible results at differing sites. A monitoring study was done in 32 sites to evaluate the relation between CS and biological/chemical soil parameters. Correlations were observed between scab severity and content of nutrients such as Fe, N, and Ca in soil and periderm, and between disease severity and abundance of actinobacteria and total bacteria, together with the pathogenicity determinant, *txtB* gene (biosynthetic gene of thaxtomin) in both soil and periderm of potatoes. The findings led to novel conclusions, which can help to understand relationships applicable in scab control.

Peat and DTPA chelated iron were supplemented to pots filled with soil conducive for CS in order to determine the effects of soil organic matter, iron and pH on CS development. The results were compared with data obtained for a suppressive soil from a nearby field with naturally low CS severity. Both peat and iron supplements decreased CS and the combination of the two supplements reduced CS the most effectively. Moreover, the bacterial community changed towards its composition in the suppressive soil after the combined peat and iron treatment.

To assess cultivar resistance × soil suppressiveness interactions, one resistant and one susceptible cultivar were grown in conducive and suppressive fields. The results showed that communities of bacteria, archaea and micro-eukaryotes differed between resistant and susceptible cultivar and between suppressive and conducive soil. In bacteria, cultivar effects were the most important and highest diversity was found in tuberosphere of the resistant cultivar. In archaea and micro-eukaryotes, differences were between suppressive and conducive soils.

Interactions between 21 actinobacterial strains isolated from potato rhizosphere and the pathogen (*Streptomyces scabiei*) were studied *in vitro.* The results showed that several strains could suppress *S. scabiei* in vermiculite media and may be further tested as soil inoculants for biological suppression in fields.

In conclusion, the studies demonstrated how potato plants and soil microbial communities interact in CS control and it was showed that the plant – soil interfaces

(tuberosphere, rhizosphere) are the most important compartments for further CS studies. The plant-microbe interaction is influenced by the properties of both soil and cultivar. Therefore, nutrient supplementation, and choice of resistant cultivar or suppressive soil can be used as an accessible way to suppress the CS.

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Půdní mikrobiální společenstva přispívající k rezistenci a resilienci půdního prostředí v agroekosystémech a na přírodních stanovištích.

Souhrn