Ecology of
Soil Microorganisms
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Abstract Book

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Microbes as Important Drivers of Soil Processes

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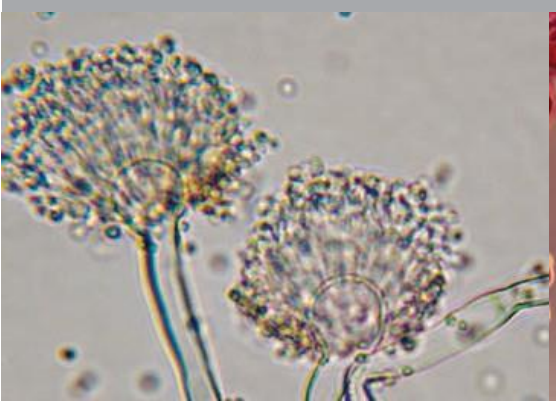
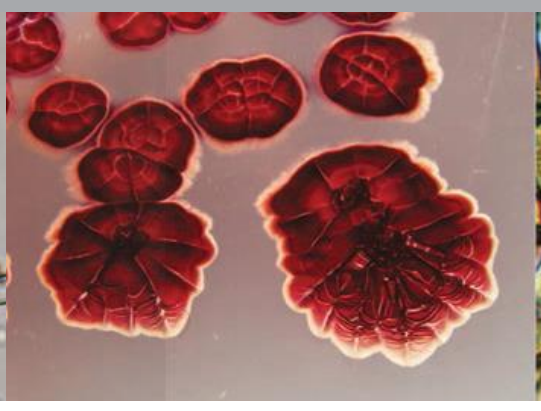


Lecture: Biodiversity and Functioning of Agricultural Soils

An indicator for disease suppression: linking soil chemistry to microbiology using dissolved organic carbon fractionation

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Soil organic matter (SOM) is a major component of soil quality, contributing to physical, chemical and biological properties of the soil. Incorporation of organic matter may stimulate the soil microflora, increase microbial activity and biodiversity and thus enhance suppression of soil borne pathogens by competition, predation and/or specific antagonism.
In a field experiment, a mixture of peat (95%) and manure (5%) was incorporated, creating three levels of SOM: 10, 20 and 30 g kg-1. Soil samples were analysed for a range of physical, chemical and biological soil parameters. Samples were also tested in bioassays for disease suppression against *Pythium intermedium*, *Rhizoctonia solani* and *Melodogyne* hapla using Hyacinth, Tulip and Lettuce respectively as test crops. SOM levels had no effect on sprout infection by *Rhizoctonia*. For both *Pythium* and *Melodogyna*, less disease symptoms were observed at higher SOM contents. It was concluded that higher SOM induced disease suppression against these two pathogens and that this suppression was mainly due to biological activity since in sterilized soil little or no suppression occurred. Multivariate analyses and multiple regressions obtained with model selection, showed positive correlation between disease suppression, SOM and hot water extractable carbon (HWC). Based on these results, SOM and soluble organic carbon have been proposed as indicators for disease suppression. Fractionation of soil dissolved organic carbon (DOC) may even give more detailed information on SOM quality as a substrate for the soil microflora and subsequent antagonistic activities. In another field trial, four different types of organic inputs were incorporated in the soil: compost, coconut fibre, cacao shells and biochar. The raw materials differed significantly in DOC concentrations, ranging from 4 mg kg^{-1} to more than 9000 mg kg^{-1}. DOC was further qualified by fractionation into pools of humic acids, fulvic acids, hydrophobic neutrals, and hydrophilic compounds. After amendment, soil physical, chemical and biological parameters were measured, including total DOC, DOC fractions and disease suppression. Statistical analyses showed that variation in disease suppression was best explained with models including total DOC, humic acids and fulvic acids, rather than SOM or HWC. Based on these results, qualification of DOC pools through fractionation may be an informative tool in predicting soil functional processes such as disease suppression.