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Enhancement of biological control properties naturally present in soil

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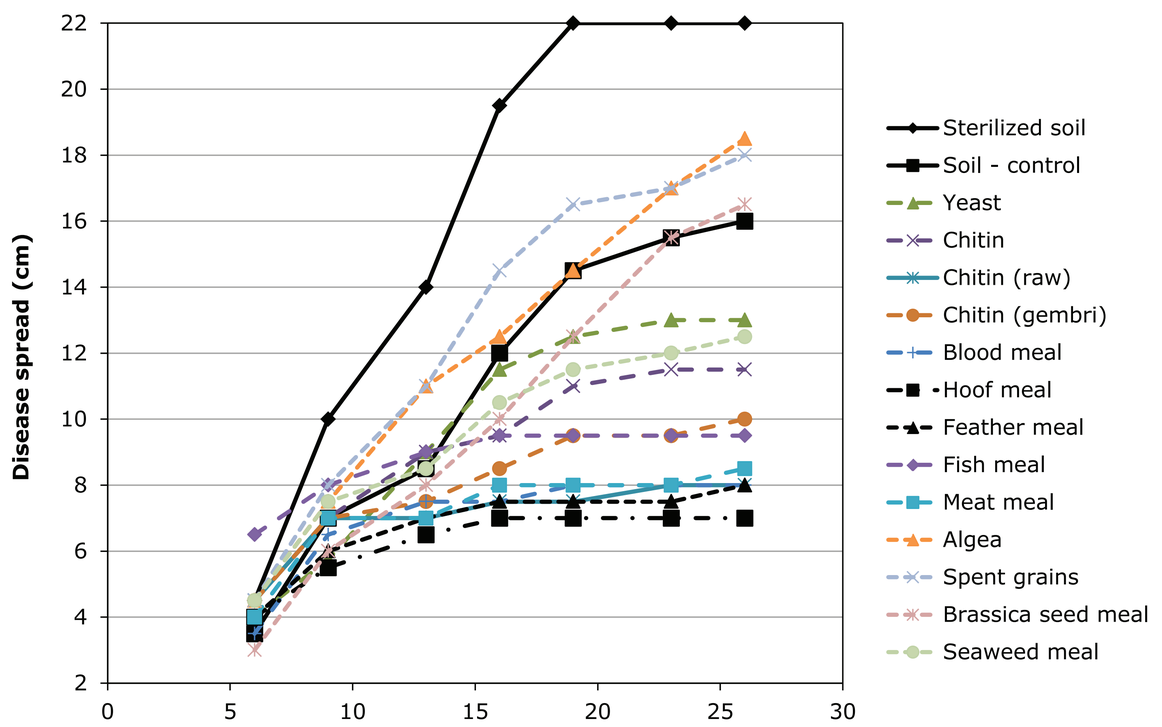
Introduction

Rhizoctonia solani is a soil-borne fungal pathogen which causes serious losses in many different agricultural crops. Enhancement of soil suppressiveness against this pathogen would be a profitable strategy for farmers. Previous research had shown that three closely related *Lysobacter* spp. were present in Rhizoctonia suppressive soils. Therefore, compounds which are expected to stimulate these bacteria were tested for their efficacy to enhance disease suppression.

Experimental set up

Different organic compounds (0.3 % g dry weight/g soil) were added to a marine clay soil, which was known to contain antagonistic *Lysobacter* spp. The soil was mixed and incubated for 1 week at room temperature. Thereafter, soil suppressiveness was tested in a bioassay with sugar beet seedlings and *R. solani* AG2.2IIIB under controlled climate and soil moisture condition. *Lysobacter* spp. were quantified with TaqMan®, a real-time PCR procedure. Effective organic compounds were also assessed in several other soils.



Effect of different organic compounds on disease development of *Rhizoctonia solani* AG2.2IIIB in sugar beet (LSD = 5.1 at day 26)

Rhizoctonia symptoms (upper left) and healthy plants with a similar dosage of Rhizoctonia inoculum in a suppressive soil (upper right). Bioassay to assess disease suppression under controlled climate and soil moisture condition (bottom).

Results

Enhanced disease suppression of *R. solani* AG2.2IIIB in sugar beet occurred after the amendment of soil with chitin and several protein-rich animal waste products, such as feather, hoof, blood, meat and fish meal. Plant derived waste materials were not effective. Disease suppression could be stimulated in different soil types. In general, *Lysobacter* populations were significantly enhanced in the suppressive treatments.

Practical application

The price of feather and hoof meal allow application in arable crops. Both are applied as fertilizer in organic agriculture. The efficacy of these compounds to enhance disease suppression will be further studied in the field under practical conditions. The organic waste compounds can be applied (1) as fertilizer with Rhizoctonia suppression as positive by-effect, or (2) in an optimized procedure to control Rhizoctonia.

The suggested application of animal by-products will enhance sustainable soil management by employing the naturally present beneficial microbial populations, meanwhile contributing to recycling of waste streams.

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