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The Incidence of Maize Root Rot in Oman and Exploring the Maize Rhizosphere Microbiome from Differentially Managed Fields

MAHMOOD ALANSARI¹, MARIA RENATE FINCKH¹, MIKE DEADMAN², ABDULLAH AL-SAAD²

¹University of Kassel, Ecological Plant Protection, Germany

²Sultan Qaboos University, Dept. of Crop Sciences, Oman

Abstract

Root rot diseases are considered as the most important factor limiting maize production in Oman. A survey was conducted in six maize growing governorates in Oman: AlBatinah South, AlBatinah North, Muscat, Dhofar, AlDahira and AlDaklyia. Fungi and oomycetes from plant samples were isolated using culture-dependent methods and identified using 16S rRNA sequencing. Additionally, the culture independent approach was used to investigate the rhizosphere microbiome in a field treated with compost and another sprayed with fungicides.

Maize root rot infection was present in all surveyed areas with disease incidence levels ranging from 0 to 35%. This was associated with nine fungal or oomycete species. *Pythium arrhenomanes* and *Fusarium fujikuroi* are new records in Oman. Pathogenicity tests on maize were conducted in the laboratory. *P. arrhenomanes* was the most pathogenic to maize compared to other pathogenic fungi. However, an additive effect of more than one of the other pathogens seems to enhance pathogenicity compared to individual pathogens resulting in effects similar to those of *P. arrhenomanes*.

Large differences were observed in maize disease incidence between two fields with similar environmental conditions but one managed organically with compost amendments and one conventionally without compost. Both farmers had used maize from the same seed source. The abundance of *Trichoderma* species in the maize rhizosphere microbiome in the field treated with compost was considerably higher than in the field sprayed with fungicides. The presence of *Trichoderma* was associated with lower disease incidence and direct antagonism could be observed in the laboratory.

Our findings indicate that more than one pathogen is associated with root rot disease in Oman. Also, results showed that the use of organic compost amendments enhance soil health that was clearly reflected in better plant protection, growth and production.

Keywords: *Fusarium fujikuroi*, maize root rot, *Pythium arrhenomanes*, rhizosphere microbiome