Screening of endophytes from rice cultivars as biocontrol agents against *Fusarium fujikuroi*

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Rice is among the most important staple foods worldwide. Italy is the biggest rice producer in Europe. The main seedborne disease affecting this crop is bakanae disease, caused by *Fusarium fujikuroi*. Typical symptoms include seedling damping off and internode elongation. Bakanae disease has become a concern for seed companies and farmers as most conventional fungicides for seed dressing are gradually phasing out in the EU. The main disadvantage of biocontrol agents is their reduced efficacy in field conditions. Endophytes, on the other hand, show potential for plant application, as their close relationship with the host allows for higher protection against both plant diseases and abiotic stresses. The aim of the work was to isolate rice endophytes from Italian cultivars to select potential biocontrol agents for preventive seed dressing against *F. fujikuroi*. A total amount of 135 endophytes were isolated from rice seeds of 22 Italian rice cultivars, and from leaves and culms of 6 bakanae tolerant rice cultivars. Microbial count was performed for each plant tissue, showing an average concentration of $\log_{10}$ 7.23 cfu/g dry weight of rice seeds and $\log_{10}$ 5.36 cfu/g fresh weight of rice leaves and culms. *In planta* screenings were performed in order to select endophytes with biocontrol activity against *F. fujikuroi* and/or plant growth promotion of rice plants under controlled conditions. Preliminary results allowed to select 3 bacterial and 2 fungal isolates due to their ability to reduce bakanae disease severity up to 46.7%, and to enhance rice plants fresh weight up to 24.1%. The endophytic strains selected were molecularly identified and tested for abiotic stress tolerance *in vitro*. Further investigation on biocontrol mode of action and plant growth promotion features of the endophytic strains will also be performed to select candidates for field trials and to develop downstream stabilization and formulation.

Using functional data analysis to detect weather patterns associated with DON levels in oats

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Functional data analysis encompasses the methodology of time series data and was conducted to link weather-based time series of air temperature, precipitation, and relative humidity with the levels of the mycotoxin deoxynivalenol (DON) produced by *Fusarium* Head Blight (FHB) fungi in Norwegian spring oats. The association between specific weather conditions and DON contamination in harvested grain, has previously been shown to differ between phenological growth stages rather than number of days from sowing. We have developed a simple empiric model to predict phenological development of oat growth stages based on sowing date and air temperature. By using this model, the time series of the weather conditions could be linked to oat growth stages. Weather patterns associated with DON content in the harvested oat grain were observed mainly from about three weeks pre-flowering onwards. Oat fields with elevated DON levels generally had warmer weather around sowing, and lower temperatures and higher relative humidity or rain prior to flowering onwards, compared to fields with low DON levels. Our results are in line with results from similar studies presented for FHB epidemics in wheat. Functional data analysis was found to be a useful tool to reveal weather patterns of importance for DON development in oat grains and can thus be used as a first step in the development of a forecasting model to guide farmers' decisions on eventual fungicide treatments under current Norwegian growing conditions.