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Mycotoxin prediction with hyperspectral imaging

Cheng Liu, Gerrit Polder, Marlous Focker, Julia van Oord, Peter van der Zee, Margriet Dilling, Wouter Otter, Ine van der Fels-Klerx

Background

Mycotoxin contamination in small grain cereals can lead to safety issues, animal and human health problems and/or economic losses. Mycotoxin production is largely influenced by weather conditions during critical crop growing stages (i.e. flowering and harvesting) and agricultural management practices (i.e. soil tillage, cultivar, previous crop, fungicide application, etc). Due to the temperature increase and changing precipitation pattern changes caused by climate change, mycotoxin contamination in food and feed crops has become one of the top threats worldwide for human and animal health. A reliable precise mycotoxin early warning system is therefore needed to ensure food and feed safety without polluting the environment and to achieve a sustainable agriculture.

Objective

The project ToxinImage **aims to** predict on-site mycotoxin contamination in cereal grains in the Netherlands at early crop growing stage using new technologies like hyperspectral imaging (HSI) and machine learning. Such a site-specific crop management system will help farmers to do the right thing in the right place, in the right way, at the right time. This multi-disciplinary project integrates a variety of data, farm expert knowledge, technologies and algorithms with a dynamic consortium of farmers, farm cooperation, collectors, software developers, and researchers on phenotyping, precision farming and food safety. **Ultimately**, the proposed work will further improve and validate the existing mycotoxin prediction model developed by Wageningen Food Safety Research with more detailed field monitoring data, optimize the application of hyper/multi-spectral imaging technique in the field condition, and explore the possibility of *Fusarium* spp. early detection.

Field experiments at SPNA

Figure 1. TraitSeeker from the Netherlands Plant Eco-phenotyping Centre (NPEC) is taking hyperspectral images of the experimental fields at SPNA on 31st May 2021. TraitSeeker carries two hyperspectral cameras, one RGB camera and one laser sensor. It is operated by Unifarm from Wageningen University & Research.

Figure 2. Some of the project members from Wageningen Research and Unifarm participated the first field measurement day at SPNA

Project partners

- Stichting Proefboerderijen Noordelijke Akkerbouw (SPNA)
- De Priorij Advies
- CZAV
- Biomin
- Agrifirm
- Farmers' group
- Wageningen Food Safety Research and Wageningen Plant Research

Expected results

This project will deliver for the first time an early warning system for mycotoxin prediction using innovative Fusarium detection techniques, in particular HSI, as inputs, and making use of machine learning in system development. Such a decision support system will identify high-risk areas with fungal infection in the field (hot spots) and provide information to farmers on when and where to spray fungicides to limit the contamination. Alternatively, wheat plots with predicted high DON contamination class may be tested analytically or kept separately.

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