

Methods for head blight recognition: chlorophyll fluorescence and hyperspectral image analysis

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Fusarium infections on ears of cereal can cause yield losses. Mycotoxin contaminated products made from cereal grain can cause serious health problems in human and animal.

At present, the mycotoxin content of the grain are determined by time consuming and expensive laboratory methods like Fast-DON-ELISA-tests and HPLC at the harvest time.

The early recognition of head blight infected ears together with GPS could be helpful for a selective separated harvest of mycotoxin loaded crops.

The detection of diseased wheat ears caused by the pathogen *Fusarium culmorum* were tested by means of the two image analysis methods under laboratory conditions.

The chlorophyll fluorescence image analysis describes with the quotient of variable to maximal fluorescence the photosynthesis activity of plants. With cumulative Fv/Fm-value at 0.3 could distinguish the degrees of disease. The disease could already verify up to the 6th day after inoculation at plants with 5% symptoms.

As second method we used a hyperspectral scanner with the wavelength range of 400 nm to 1000 nm. Time series of images of healthy and artificially *Fusarium*-infected ears were recorded. The image analysis software ENVI was applied to define disease specific spectral signatures. Specific object classes were built as basis for classification of diseased and healthy ears. With 'Spectral Angle Mapper' as an appropriate method for classification healthy and diseased ear tissue could be clearly distinguished.

At time series analysis could not differ between diseased and healthy ears in the growth stage BBCH 65 (end of blooming) and during the ripeness (BBCH 85). Nevertheless a time frame of about ten days is open for a very good detection with both two methods.