



## **Influence of fungicides on wheat physiology measured by different sensors and imaging techniques**

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Use of fungicides is one of the most widespread methods to control fungal diseases in intensive wheat production. Several reports have been published on the effects of some fungicidal chemical groups on the physiology of wheat. The most reported effect is the delay of leaf senescence caused by strobilurins. The use of sensors and imaging techniques is an excellent alternative to destructive methods to measure side effects of fungicides on wheat physiology. In this study the effects of the three fungicidal compounds bixafen, fluoxastrobin and prothioconazole on wheat physiology were assessed and compared by the use of different non-invasive sensors under disease-free conditions in the greenhouse. The analysis of plant surface temperature was suitable to detect effects of fungicides on plant senescence. Chlorophyll fluorescence was useful to establish differentiation the effective quantum yield of Photosystem II. Reflectance measurements of wheat leaves were highly sensitive to changes in plant vitality. Vegetation indices have shown an important potential as a non-destructive measure of fungicidal side effects. It was possible to assess changes of plant senescence due to fungicide application in terms of chlorophyll content, transpiration rate, photosynthetic rate and leaf spectral reflectance of wheat plants by using non-destructive sensors. Furthermore, it was elucidated that sensors and imaging methods are useful tools to estimate the effects of fungicides on wheat physiology. The application of these sensors and imaging techniques as decision-support tools in innovative plant protection systems will be presented and discussed.

**Keywords:** Chlorophyll fluorescence, disease-free environment, leaf reflectance, vegetation indices, transpiration, decision-support-systems in plant protection