PHENET
PHENOTYPING & ENVIROTYPING SOLUTIONS FOR AGROECOLOGY

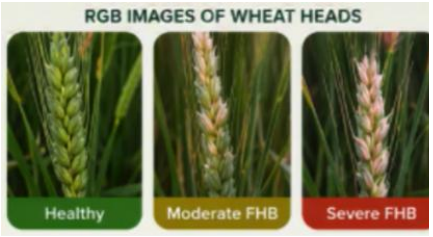
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Smartphone FusaSeyd App



CONTEXT & OBJECTIVE

Using **resistant varieties against fusarium head blight (FHB)** is the main strategy to prevent the risk of producing **mycotoxins**. Up to now, only an expert eye can assess the disease susceptibility of cereal varieties in field trials. The developed method aims to evaluate on the field the severity of FHB infection on winter wheat from RGB image using the smartphone **FusaSeyd App**.



FHB severity assessment on winter wheat



Bounding boxes of healthy (green) and fusarium-infected (red) ears (Left); FHB segmentation (red) (Right)

ADVANTAGES

- **Analysis in the field**
- Accounts for the **spatial distribution of the damages**
- Evaluates the **area affected** by the damage

PERFORMANCE

Two modelling approaches were tested. The first involves direct detection of FHB symptoms on wheat heads using Yolov11 model. The second is a two-step process: first, wheat heads are detected using Yolov5 model, followed by FHB symptom detection on the identified heads using Yolov11 model. Both approaches showed strong correlations (R^2 >= 0.78) between FHB predictions and visual scores from the field if they are performed from 350 to 500°C days post inoculation.

This study highlights the potential of RGB imaging associated with an instance segmentation model based on the Yolov11 model to detect and quantify FHB on winter wheat ears. This study led to a proof of concept for the use of RGB images and deep learning instead of visual counting to classify the varietal resistance against FHB for the purposes of plant breeding and registration in the catalog. This study opens the way for automated monitoring, which could accelerate the plant breeding process while reducing the workload for experts.

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IN PRACTICE



- **RGB image acquisition**
  using smartphone or camera
  on trial plots in the field
  one image in a few seconds
- **Image processing**
  is performed in real time
  by using the smartphone FusaSeyd App

RESULTS



GEVES has developed a PC user interface and a smartphone application, called “FUSASEYD”, to visualize on the Web the symptoms predicted by the model. This application design still needs improvement and is being validated during the ongoing campaign 2026 in the trials for registration in France.

The image analysis result shows the areas on the wheat heads where FHB symptoms have been detected (in red) and healthy areas (in green). This type of analysis can be carried out with one or several images. With several images, the interface allows to download an Excel file containing the results of fusarium-infected area rate.

WANT TO LEARN MORE?

The full study is described in Journal of Experimental Botany: “Plant Phenomics & Enviromics Across Scales" special issue (under review): V. Cadot et al. Resistance assessment of wheat varieties against fusarium head blight using artificial intelligence on RGB images

Check-out the **Phenet** project sheet on https://www.cra.wallonie.be/en/phenet
Check-out the **Mobilab** project sheet on https://www.cra.wallonie.be/en/mobilab

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