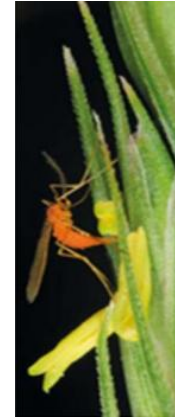


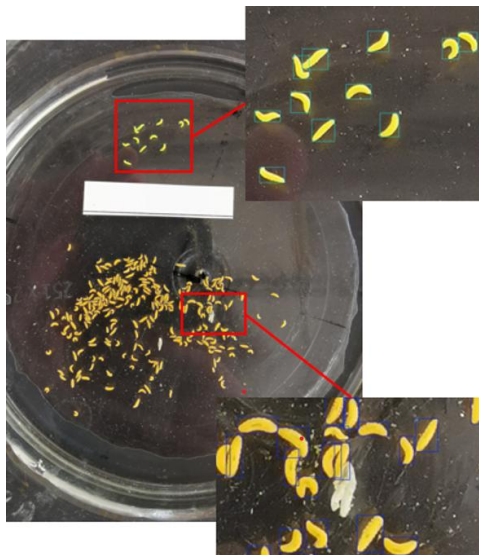


CONTEXT & OBJECTIVE

Using **resistant varieties against orange and yellow wheat blossom midge (OWBM & YWBM)** is the main strategy to prevent the risk of grain quality decreasing and yield losses. Up to now, **visual counting** of larvae is performed to assess the disease susceptibility of cereal varieties, which **takes time**. This problem was solved using an application **COYL** (Counting Orange and Yellow Larvae) to **count automatically those larvae** on RGB images acquired using smartphone.



OWBM adult laying eggs on a wheat ear at the flowering stage



Automatic detection of OWBM/YWBM larvae collected in Petri dish after simulating heavy rainfall on ears

ADVANTAGES

- **Quick RGB image acquisition** in the greenhouse
- **Automatic detection** of larvae for each ear
- **Separately count** of OWBM & YWBM larvae
- **Storage of RGB images** useful when doubtful results

PERFORMANCE

Several YOLO-based object detection architectures were evaluated through a coarse-to-fine strategy to identify the most effective configuration. The best-performing model (YOLOv26m) achieved high detection performance with an F1-score of 0.972 and an mAP50 of 0.982. Counting performance was satisfying, with a mean absolute error (MAE) of 3.0 larvae per image and a relative counting error (CE) of 1.828%. The model successfully distinguished between the two visually similar species, although slightly better performance was observed for OWBM.

This study highlights the potential of RGB imaging associated with a deep learning approach to count larvae and, for the breeders, to quickly evaluate the susceptibility of wheat varieties to the two midge species.



IN PRACTICE

- **RGB image acquisition**
using smartphone
in the greenhouse
one image in a few seconds
- **Image processing**
is performed in real time or deferred
by using the PC COYL App



RESULTS

Compteur de larves de cécidomyies
Application de comptage par "deep learning" de larves sur base de photos sur coupelles
La résolution des photos doit être suffisante (ex: 3000 x 4000 pixels)

Étape 1: Upload des Images

Déposez vos images ici ou
[Sélectionner des photos](#)

Résultats

Le traitement des images est terminé. Vous pouvez télécharger les résultats ci-dessous.

Téléchargement des résultats

[Nom photo & Larves comptées](#) [Ensemble des photos traitées](#)

Résumé des comptages

Nbr	Larves comptées	Temps	Image traitée	Télécharger
1	262	1.71s	Voir	iphone_mlx_1.jpg

CRA-W has developed a **PC user interface** called "COYL", to visualize on the Web the number of larvae counted by the model.

At the time of writing these lines, the online application is only available for the members of the CRA-W, but **further web developments** could be made to secure the connection and open it to the web.

WANT TO LEARN MORE?

The complete process, from the problem to the practical solution is described in Plant Phenomics Journal (under review): Antoine Deryck et al. Automatic detection and counting of *Contarinia tritici* and *Sitodiplosis mosellana* larvae using smartphone images and deep learning. Labelled datasets and models are available on <https://doi.org/10.5281/zenodo.19402333>

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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