Improving the quality of late blight DSS through airborne inoculum quantification

CROUQUET ADRIEN1,4, DUJARDIN FLORENCE1,4, ROMAY GUSTAVO1, LIENARD CHARLOTTE1, CESAR VINCENT2, ROSILLON DAMIEN2, LEBRUN PIERRE3 & LEGREVE ANNE1

1 Earth and Life Institue, UCLouvain, Louvain-la-Neuve (Belgium)
2 Centre wallon de Recherches agronomiques (CRA-W), Libramont (Belgium)
3 Filière wallonne de la pomme de terre (FIWAP ASBL), Gembloux (Belgium)
4 Both authors contributed equally to this work
Improving the quality of late blight DSS through airborne inoculum quantification

CROQUET Adrien, DUJARDIN Florence, ROMAY Gustavo, LIENARD Charlotte, CESAR Vincent, ROSILLON Damien, LEBRUN Pierre & LEGREVE Anne

*Earth and Life Institute, UCLouvain, Louvain-la-Neuve (Belgium); †Centre wallon de Recherches agronomiques (CRA-W), Libramont (Belgium); ‡Fédération wallonne de la pomme de terre (FWAPWASP), Genval (Belgium)

Both authors contributed equally to this work.

Context

Decision Support Systems (DSS) are key tools for the integrated management of potato late blight (PLB) caused by Phytophthora infestans. Weather data are used to predict infection risks as well as inundation curves. However, DSS are generally based on the assumption that there is no inoculum limitation. Therefore, we investigate the relationship between airborne inoculum and disease outcomes. By means of spore traps and quantitative PCR assays, we draw up profiles of airborne inoculum during potato cropping seasons. Results of the 2016 season are presented below and compared to the spray warnings given by the Walloon DSS (operated by CEMEPI ASBL, Ath, Belgium) [Fig. 1].

Material & Methods

Field trial

The experimental field (50ha), located in Louvain-la-Neuve (Walloon, Belgium), was planted withlette potato cultivar (16,800 plants/ha) and was initially set up for a fungicide trial. Four subplots of 10m² remained untreated during the 2016 cropping season. On the other plots, fungicides were applied following the Walloon Decision Support System (DSS). PLB disease intensity was evaluated periodically by visual observation.

Spore sampling

A 2.5 meter receiver Burkard spore trap was placed in the field near the experimental plots. The orifice of the spore trap was 1 meter above the ground and the throughput was set at 0.5 liters per minute, which corresponds to a daily volume of 14.4 m³. The spore trap aspiration head exposed to the air was collected every week and cut into daily segments following the method of Decker et al. (2013). Spore trapping was effective from the 11th of August 2016 to the end of December 2016.

Airborne inoculum quantification

Total DNA was extracted from each daily segment using a protocol based on Lee et al. (1996). The quantification of the airborne inoculum of P. infestans was assessed by quantitative PCR using a Taqman probe and specific primers amplifying a 167 bp product from P. infestans [Fig. 2].

Results

In order to evaluate whether the quantification of airborne inoculum can improve PLB DSS, a network of spore traps is set up throughout the Walloon potato growing region during the 2016 potato cropping season.

Four Burkard spore traps are placed in four reference experimental fields, each of them supplied with a weather station (CRA-W/Thermoyal meteometric) and a homemade passive spore trap (Fig. 4). Eight other passive spore traps are also set up in potato growing fields. Data on airborne inoculum will be compared to PLB disease intensity as well as the infection risk predicted by the Walloon DSS.

Next step: 2019 potato cropping season

In order to evaluate whether the quantification of airborne inoculum can improve PLB DSS, a network of spore traps is set up throughout the Walloon potato growing region during the 2016 potato cropping season.

Four Burkard spore traps are placed in four reference experimental fields, each of them supplied with a weather station (CRA-W/Thermoyal meteometric) and a homemade passive spore trap (Fig. 4). Eight other passive spore traps are also set up in potato growing fields. Data on airborne inoculum will be compared to PLB disease intensity as well as the infection risk predicted by the Walloon DSS.

References


Acknowledgements

This project is funded by Service public de Wallonie (SPW-DG2). We thank J.Y. Viau for providing the wallowing potato late blight DSS and D. Lebrun for providing the spore traps.