

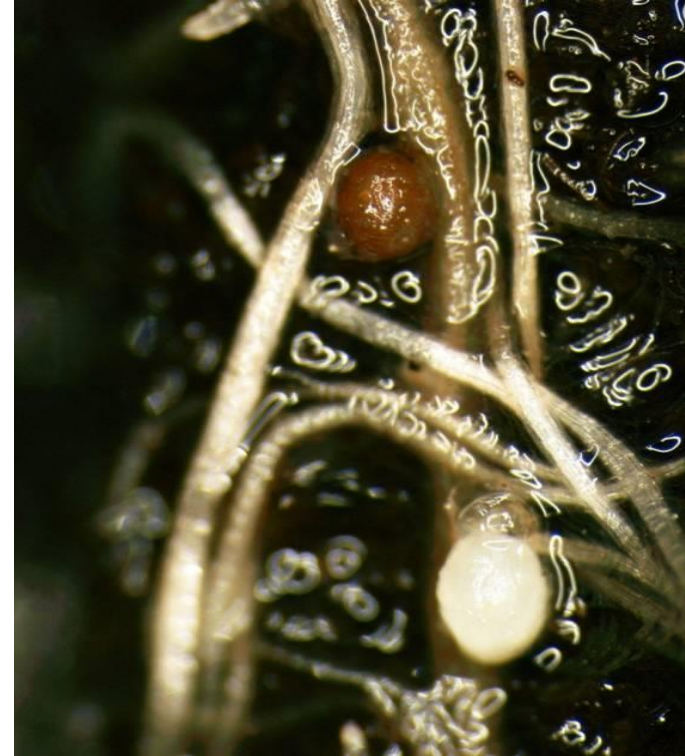
NIR applications in plant breeding

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Nematodes cysts counting by NIR hyperspectral imaging system



What is the issue ?



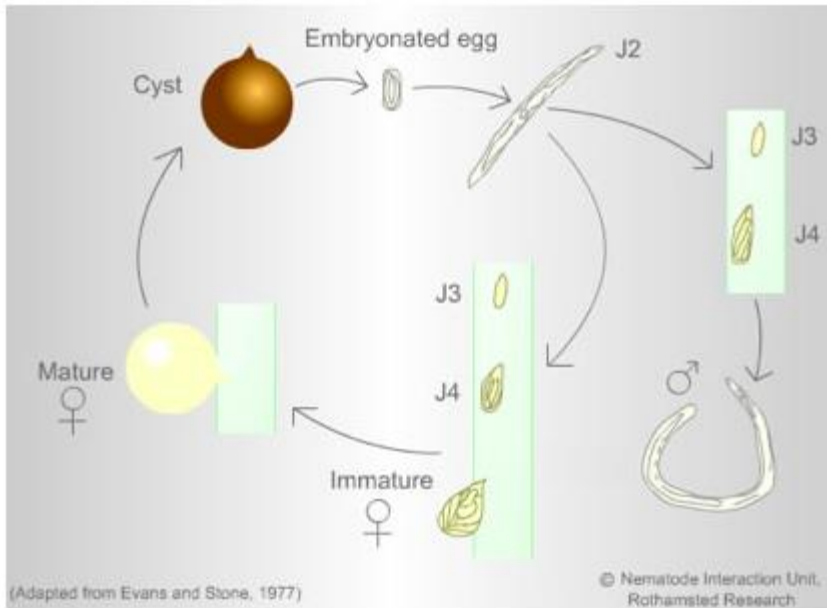
Yield reduction in relation to the cyst nematode number in the sugar beet roots

Brown and white cyst nematode (*Heterodera schachtii*)

How to control the contamination?



Tolerant sugar beet plants breeding

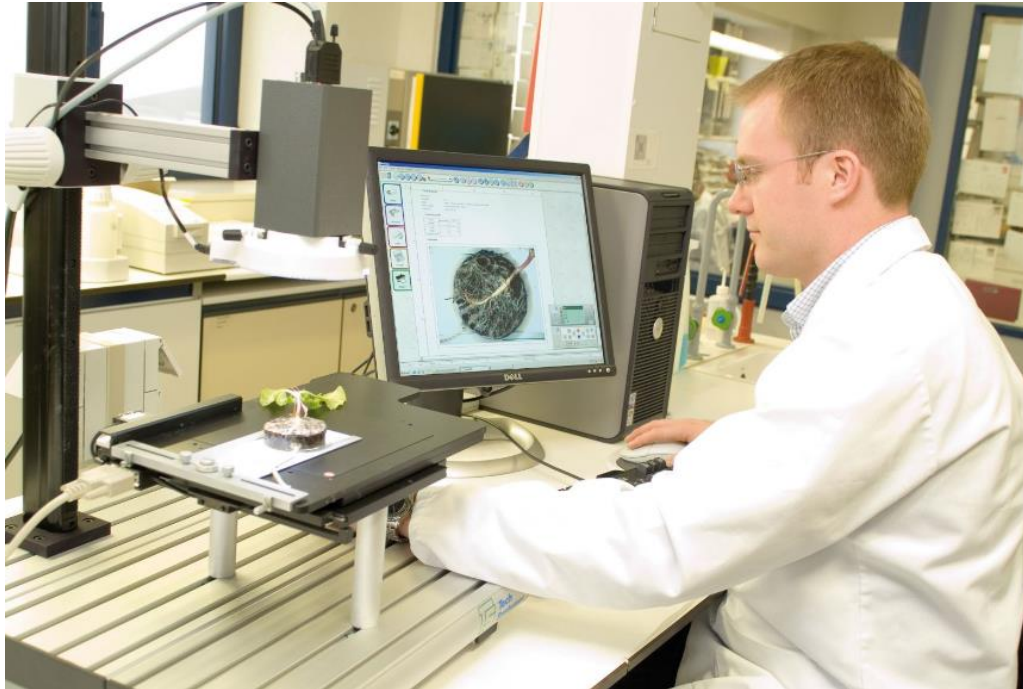


Cyst nematode development cycle

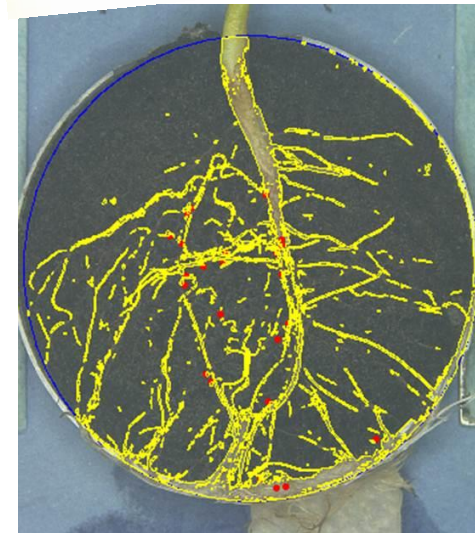


Cysts at different development stages (optical microscope)

Status of the analytical aspects?



Cysts counting by optical microscopy using a camera system at SES VANDERHAVE



Cysts = red spots

SWIR ImSpector N25E spectral camera (Specim Ltd)
Conveyor belt (Burgermetrics)



Parameters

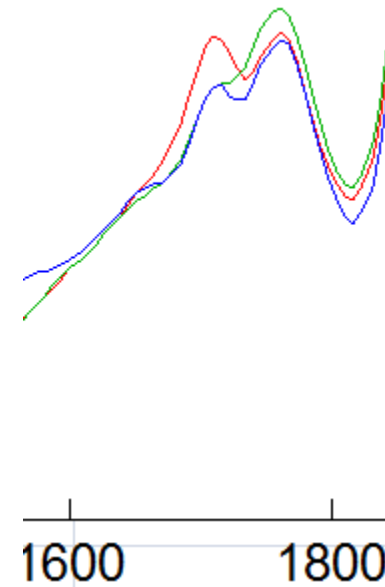
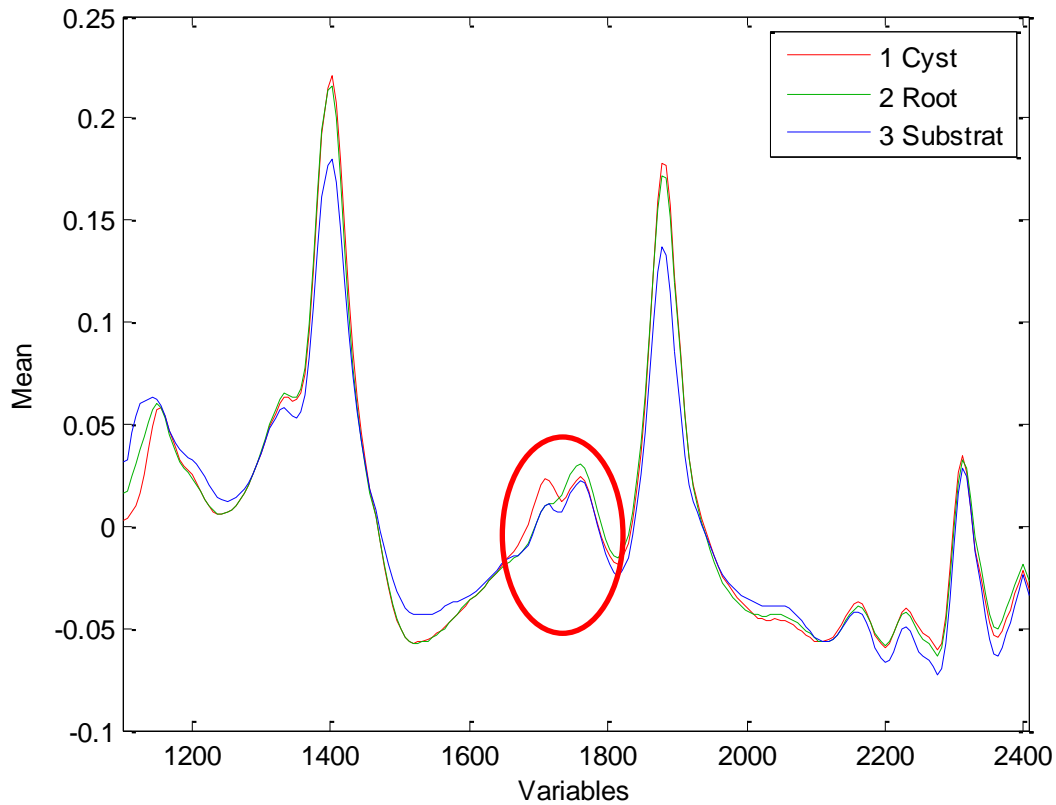
- Wavelength range: 1000-2500 nm by step of 6 nm
- 1 line = 320 pixels = 320 spectra
- 1 box = 100 000 spectra
- Time of acquisition for 1 box = 1 min



NIR image acquisition of one box

Spectral libraries

Spectral data preprocessed

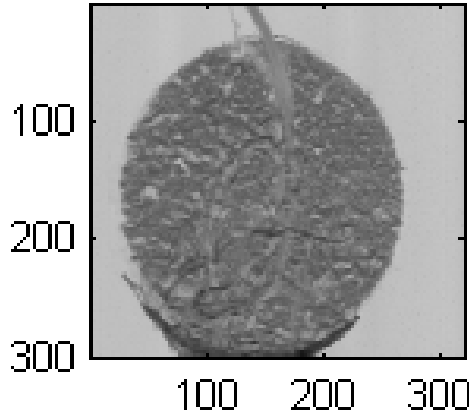


Data treatment: Applying of 3 discrimination equations and DBSCAN

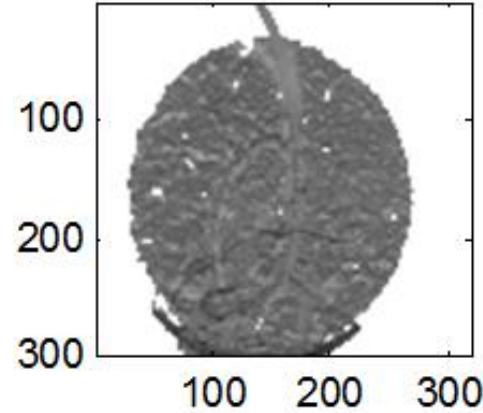
Picture DQ110053-08



Image at 1720 nm

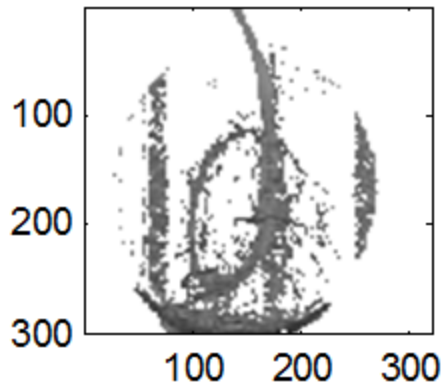


Removing background (Eq1)

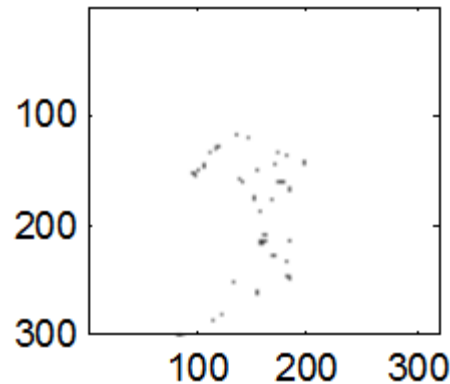


ES

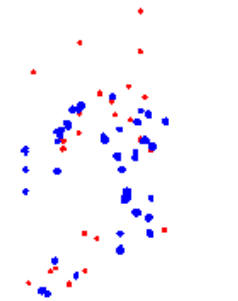
Removing substrat (Eq2)



Removing root (Eq3)



DBSCAN



Nematodes cysts counting by line scan HIS

DQ110053-08 – Plot 302 - Sensitive plant

Ref value: 80

Predicted value: 80

1 cyst = 4 pixels



Nematodes cysts counting by line scan HIS

DQ110053-20 – Plot309 – Tolerant plant

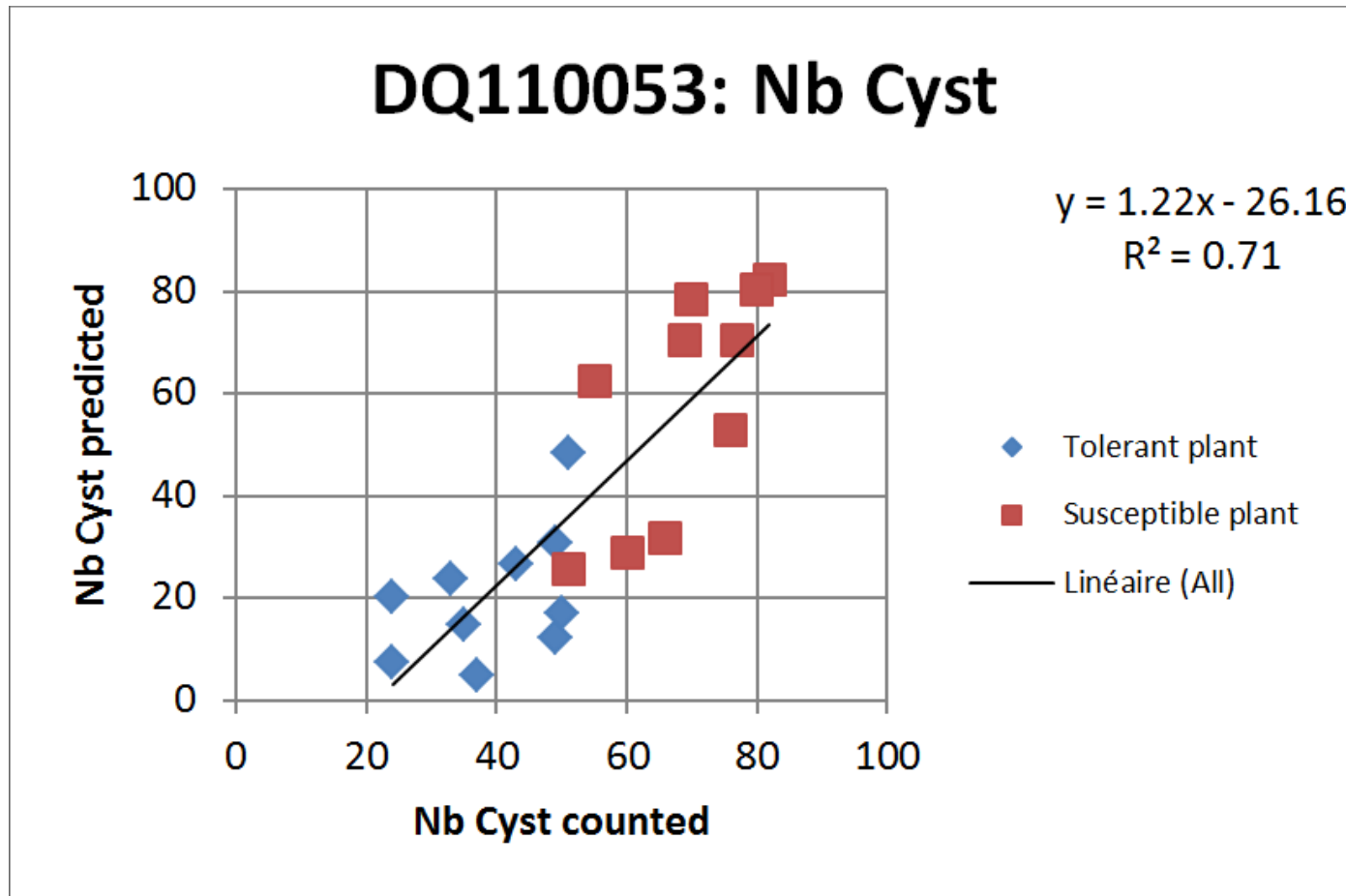
Ref value: 49

Predicted value: 31

1 cyst = 4 pixels



Nematodes cysts counting by line scan HIS



	10 Tolerant plants	10 Sensitive plants
Reference values	40 (24-51)	69 (51-82)
Predicted values	21 (5-49)	58 (26-82)
(1 cyst = 4 pixels)		

Cercospora leaf spots assessment by NIR hyperspectral imaging system





SESVANDERHAVE
value through synergy

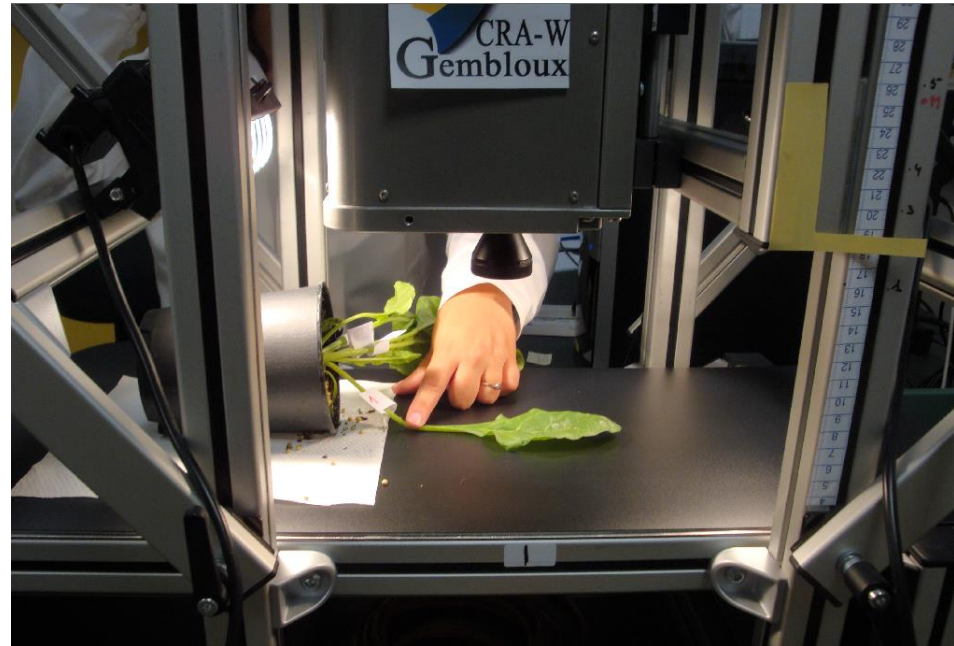
Cercospora leaf spots assessment by line scan HIS



Samples (DQ100742-01 to 08)

- 4 cerco tolerant plants
- 4 cerco sensitive plants

Instrument : Line scan HIS



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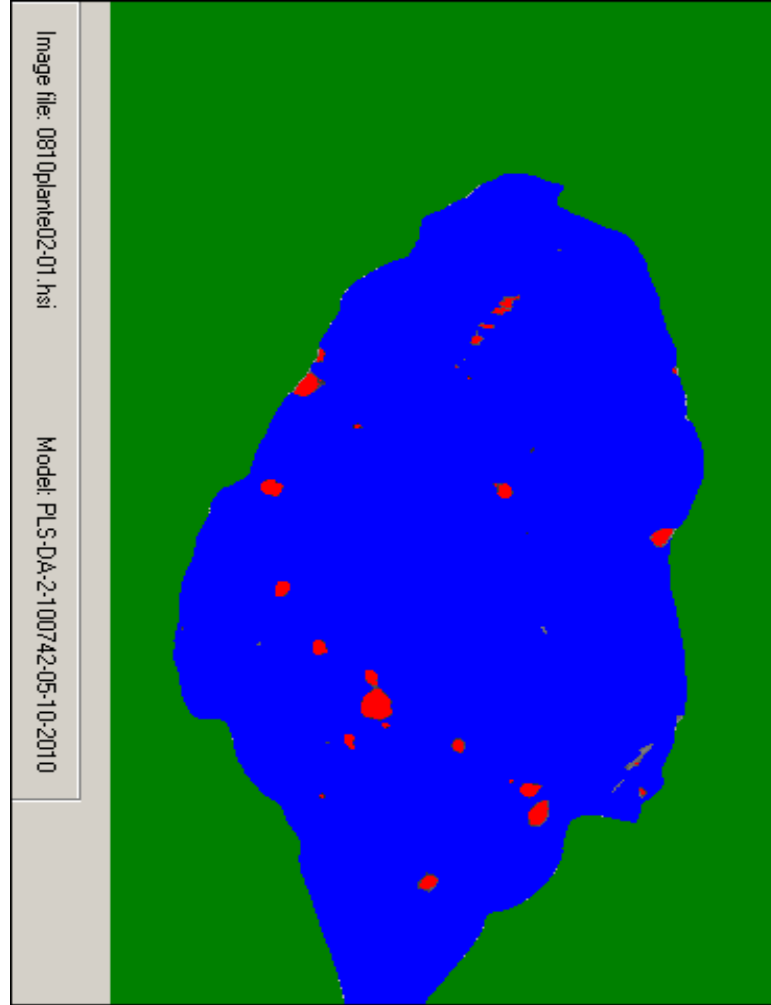
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SES VANDERHAVE
value through synergy

Cercospora leaf spots assessment by line scan HIS

DQ100742-02 : Prediction on-line (PLSDA model)



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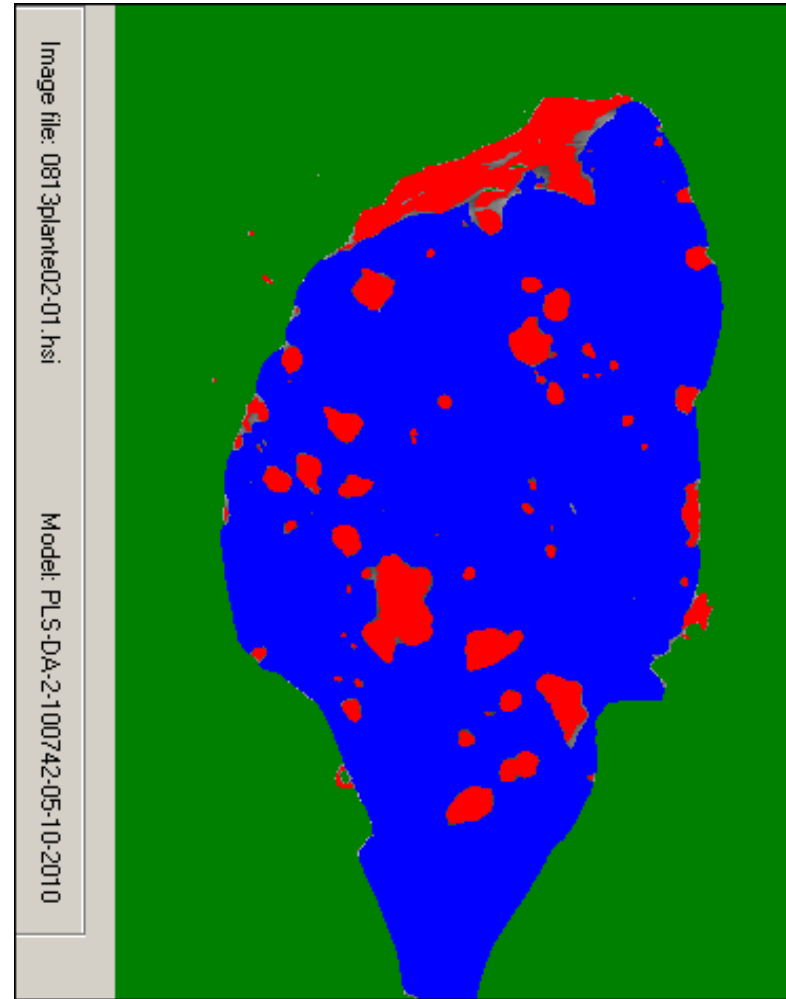


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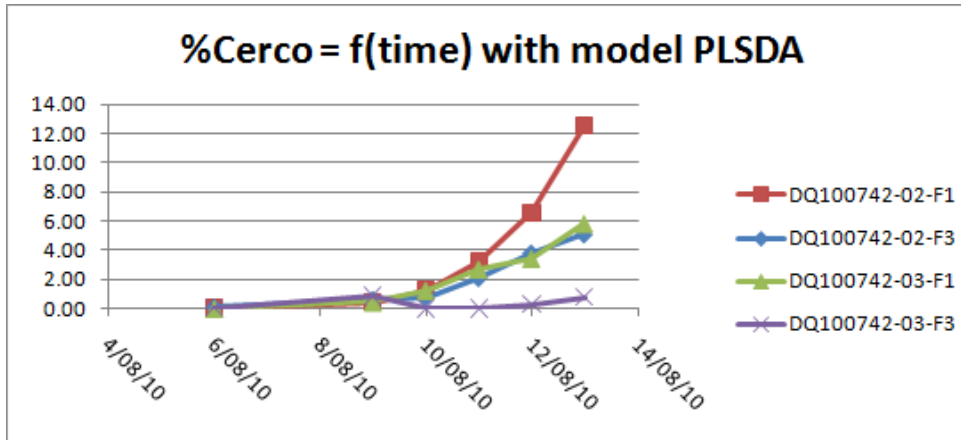
Cercospora leaf spots assessment by line scan HIS

DQ100742-02

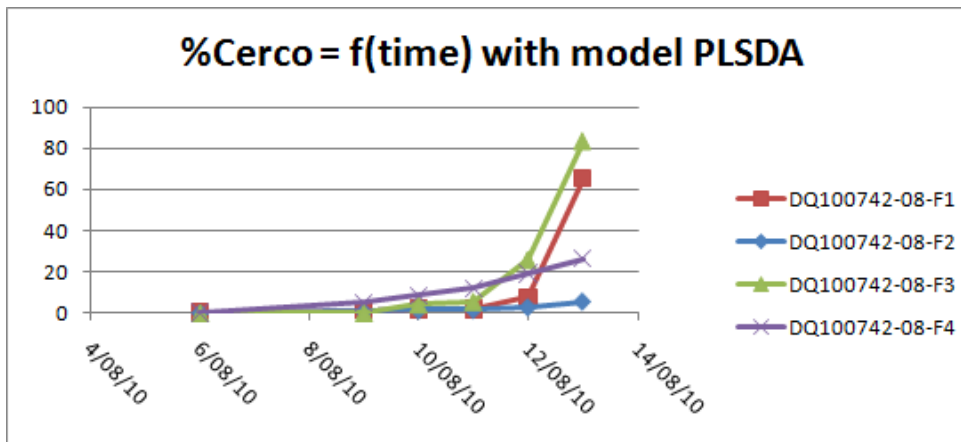
3 days after



Tolerant plant



Sensitive plant



THANK YOU FOR YOUR ATTENTION

Acknowledgements

Olivier Amand
Alain Tossens



Fernández Pierna J.A., Vermeulen P., Amand O., Tossens A., Dardenne P. & Baeten V. (2012) NIR hyperspectral imaging spectroscopy and chemometrics for the detection of undesirable substances in food and feed. *Chemometrics and Intelligent Laboratory Systems*, 117, 233-239.