

## Abstract

# Assessment of Cercospora leaf spot development on sugar beet leaves by near infrared hyperspectral imaging

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## Introduction

Damage caused by *Cercospora* leaf spot (*Cercospora beticola* Sacc.) on sugar beet leads to a yield reduction. The method currently used to assess the necrosis level on leaves consists of visual observations. The current work aims to assess the development of *Cercospora* on sugar beet leaves by NIR hyperspectral imaging spectroscopy within the framework of a breeding programme for tolerant lines. The objective of the study is to discriminate between *Cercospora* leaf spots and healthy leaves as well as to quantify the disease area.

## Materials and Methods

For this experiment, sugar beet plants (4 tolerant and 4 sensitive to *Cercospora* leaf spot) were grown in plastic pots in a greenhouse. The plants were infested by spraying with *Cercospora beticola*. Then, some leaves were analysed using a linescan NIR hyperspectral imaging system during 6 days from the moment that the first symptoms were visible. All images consist of lines of 320 pixels that are acquired at 209 wavelength channels (1100-2400 nm). For the necrotic area assessment, discriminant models were built using two spectral libraries corresponding to the *Cercospora* leaf spots and the healthy leaves. Partial Least Squares Discriminant Analysis (PLSDA) and Support Vector Machines (SVM) were used as classification methods for the construction of these models. Models were applied to all the individual pixels in the images of the plants in order to isolate and quantify the *Cercospora* leaf spots.

## Results and Discussion

The results showed clear differences between tolerant and sensitive plants. Disease development was slower on tolerant plants and the necrosis covered less than 20% of the leaf area. For the sensitive plants, the infection was faster and 100% of the leaf area could be infested at the same time. Similar conclusions were achieved using PLSDA or SVM models.

## Conclusion

This study has shown the potential of the NIR hyperspectral imaging to discriminate *Cercospora* leaf spots from healthy leaves and to follow disease development.

Reference paper as:

P. Vermeulen, J.A. Fernández Pierna, A. Tossens, O. Amand, P. Dardenne and V. Baeten (2012) Assessment of *Cercospora* leaf spots development on sugar beet leaves by near infrared hyperspectral imaging (abstract), in: Proceedings of the 15th International Conference on Near Infrared Spectroscopy, Edited by M. Manley, C.M. McGovern, D.B. Thomas and G. Downey, Cape Town, South Africa, p. 341.