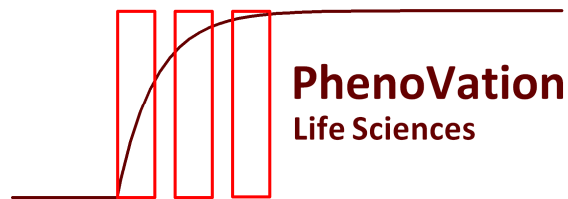


This information is provided by PhenoVation B.V.



## Spectral imaging of plants for measuring anthocyanin distribution

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## Introduction

The CropReporter uses LED (light emitting diode) induced direct fluorescence imaging technology to image the plant health/stress status by calculation of  $F_v/F_m$  (variable fluorescence over saturation level of fluorescence). Within a short time interval ( $\approx 800$  ms) multiple images are captured. For each pixel of the fluorescence image  $F_v/F_m$  is calculated and presented as an image that correlate with the quantum yield of PSII photochemistry. The advantage of the technology lies in the imaging of photosynthetic parameters of whole plants within a short time interval and detectable before it can be seen by eye.

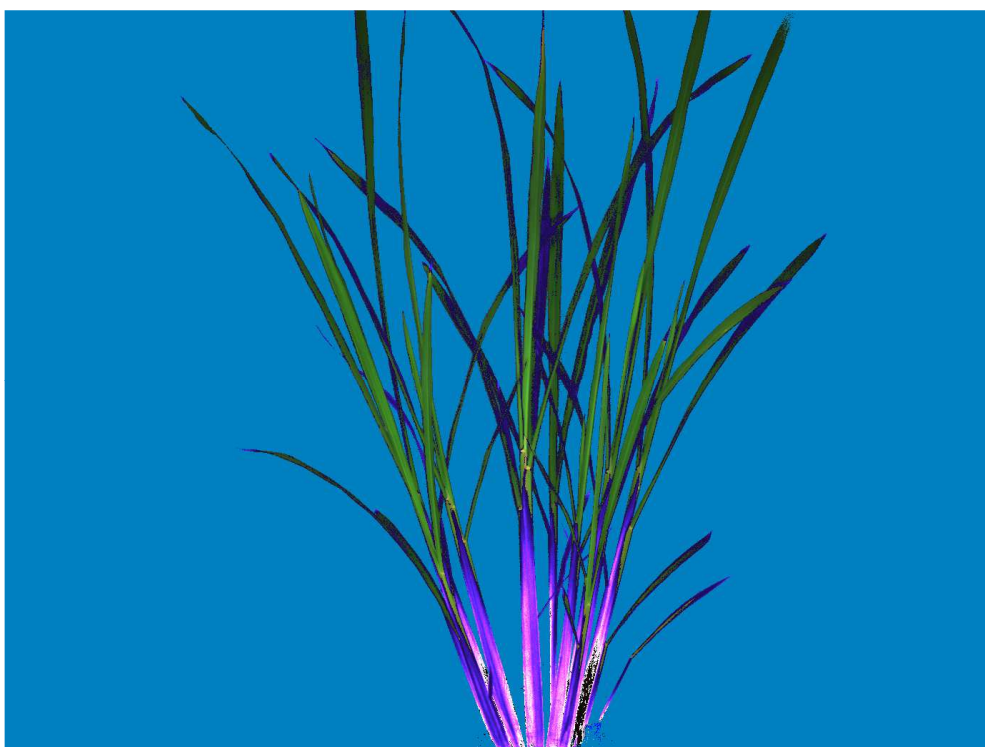
Inside the CropReporter there is place for 6 different optical filters. With these filters the following images can be made:

- Chlorophyll fluorescence images
- Separate red, green and blue images
- Chlorophyll reflection images
- Anthocyanin reflection images
- Near Infra Red (NIR) reflection images.

In this example a colour image was calculated from the red, green and blue images (Fig. 2A). Using the reflection image of the anthocyanin filter and a reference image in the NIR an image was calculated that is a measure for anthocyanin content and displayed as an overlay onto the colour image (Fig. 2B). From this image an average anthocyanin index with standard deviation can be calculated.



*Figure 1. CropReporter for side view imaging of monocotyledons. Using high intensity red light emitting diodes fluorescence images are being captured, white light emitting diodes together NIR lighting are being used for spectral imaging at six different filter bands. Images are captured at a resolution of 1.4 Mp and 14 bit digital grey values.*



*Figure 2. A) Colour image constructed from separate red, green and blue images of a rice plant (Oryza). B) Image showing the overlay of anthocyanin distribution onto the colour image with false colours ranging from dark purple for low content to white for high content.*



*Figure 3. Detail of the lower part of the rice plant showing the overlay of anthocyanin distribution in false colours on the colour image with from dark purple for low content to white for high content.*

### **Conclusion**

The CropReporter was able to capture high resolution colour images and reconstruction of the anthocyanin content as an overlay onto the colour image. The application of the CropReporter was demonstrated having great potential for measuring compounds like anthocyanin which is an indicator of stress in plants.

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