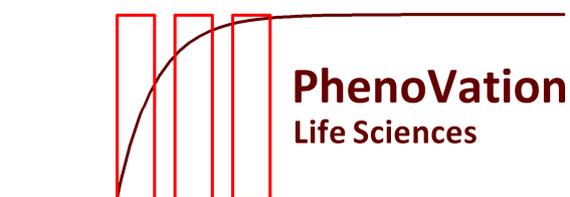


This information is provided by PhenoVation B.V.



## Mode of action and quantification of herbicide formulation

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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, quantitative, non-destructive and measured within a short time interval. Herbicide can directly inhibit the photosynthesis process, like bentazon and metribuzin, or indirectly have influence on the growing of plants, especially the growing points.

## Results

Plants of black nightshade (*Solanum nigrum* L.) were used in this example. To demonstrate the influence of two different types of herbicides, plants (whole plants) were sprayed with a formulation with the active ingredient bentazon. This is a herbicide that inhibits the photosynthesis on a whole plant level. The second formulation with the active ingredient glyphosate is a systemic herbicide that shows effects on the photosynthesis on young leaves at the growing point. The plants were measured 24 hrs after the spraying and after the plants were dark adapted.

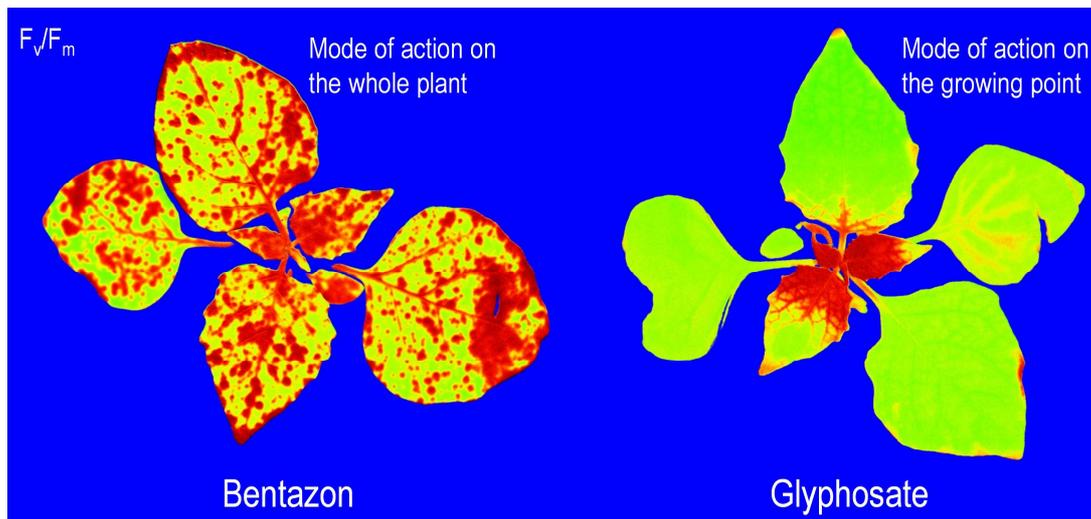


Figure 1. Two different modes of action induced by two different herbicide ingredients, bentazon and glyphosate, as measured on the maximum efficiency of photosynthesis of PSII in false colours using the CropReporter. Green indicates a high efficiency of photosynthesis, while red means low.

The influence of adjuvants was demonstrated by using the same active ingredient of glyphosate but using two different adjuvants, here called X and Y. Black nightshade (*Solanum nigrum* L.) plants were sprayed and measured using the CropReporter at different time points, 6, 30 and 126 hrs. It is clearly demonstrated that adjuvant Y shows the largest inhibition of the photosynthesis.

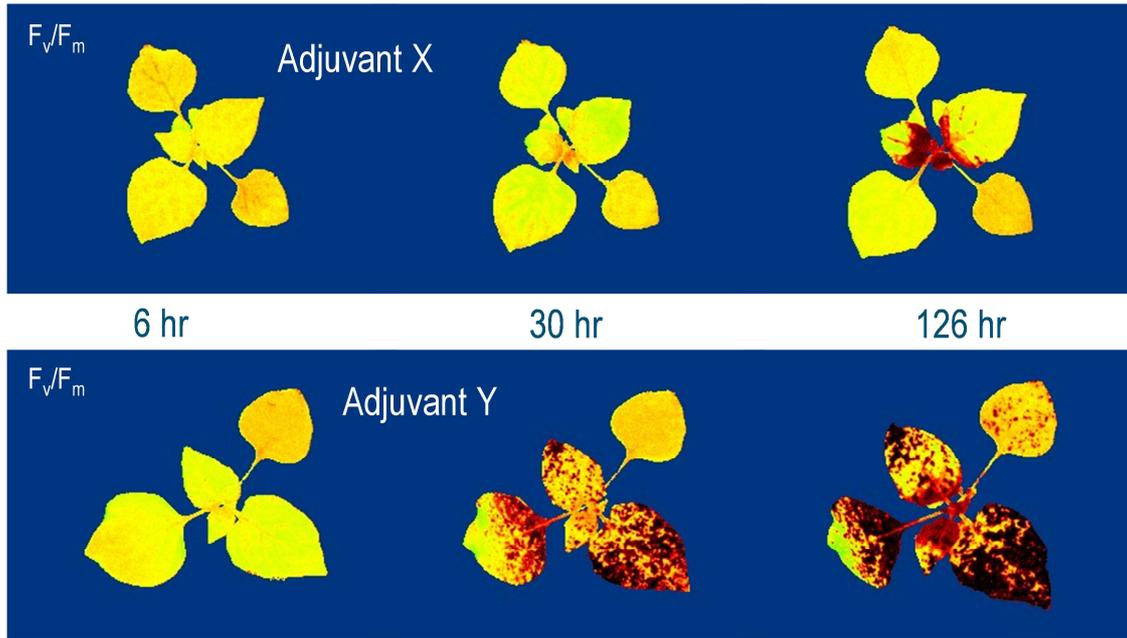


Figure 2. Two different adjuvants were used in a formulation with the active ingredient glyphosate at a concentration of 0.5 mM. Images were captured at different time points using the CropReporter and the maximum efficiency of photosynthesis of PSII was calculated.

### Conclusion

The CropReporter was able to show the differences in mode of action of two different herbicides, bentazon and glyphosate, on the maximum efficiency of photosynthesis of PSII. Furthermore, the efficacy of two different adjuvants was demonstrated using the same active ingredient glyphosate at the same concentration. The application of the CropReporter was demonstrated having great potential for optimisation of active ingredients of herbicide and the formulation by adding adjuvants.

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