



*Redefining Pest Management - a Holistic Approach*

## Practice Abstract N° 5

### Detection of downy mildew on grape leaves with deep-learning on high resolution RGB images

Downy mildew (*Plasmopara viticola*) is an endemic disease that affects vineyards worldwide. The disease can cause severe crop loss when it is not detected in an early stage. Early detection as part of an integrated pest management (IPM) system would be enormously beneficial to not just the farmer but also to the wider environment. In the scope of OPTIMA WP2, a state-of-the-art decision support system (DSS) will be used to determine the risk of disease outbreak. In this research, we investigated the early detection of downy mildew with deep-learning and spectral analysis, as input to the DSS, in order to precisely localise and quantify the infection, so that appropriate plant protection product type, dose, timing and location will be recommended. Image data was acquired in the field and in the greenhouse, using a high spatial resolution colour camera (10 Mp). Disease spot classification was done with deep-learning using a convolutional neural network (CNN) that was trained and tested on the high resolution RGB images. Ground truth annotations were done by experienced crop experts. The CNN (we used YOLOv3) had a precision of 89.5% and a recall of 82.3%. From our research, we conclude that downy mildew can be detected in an early stage with RGB image based deep-learning.



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