

FIELD AND LABORATORY MONITORING OF CALSOL USING OPTICAL DEVICES MOUNTED ON AERIAL AND TERRESTRIAL VEHICLES

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A total of six flights over the Villena test field in four different dates between July and August 2016 were carried out by Aurea Imaging using an unmanned aerial vehicle (UAV) with an on board multispectral camera capable of acquiring images in five bands in the visible (red, green, and blue), red-edge, and near infrared (NIR). Maps of the field showing several indexes of the vegetation were obtained such as normalized difference vegetation indices (NDVI, green NDVI, and Red Edge Index (NDRE)), anthocyanin reflectance index (ARI) or carotenoid reflectance index (CRI). No signs of *Candidatus Liberibacter solanacearum* (CaLsol) were found in the crop nor in the spectral information acquired during the monitoring period. Therefore, other two flights were done in October 2016 at different ground sample resolutions in a field of carrot in La Roda (Albacete) where some plants (approx. 75%) had clear symptoms of CaLsol infection. In combination to flights, several monitoring tests have been carried out at ground level by IVIA. Static VIS/NIR hyperspectral and thermal images were acquired on selected plots of the Villena test field. Moreover, an electric vehicle was built and used to transport colour, NIR and NDVI high-resolution cameras along the whole field acquiring images of the carrots. Additional static tests using the colour, NIR and NDVI cameras were also carried out on November, monitoring the carrot field in La Roda. Finally, several tests have been done at laboratory conditions analysing potentially healthy and infected plants (carrot and celery) using hyperspectral, colour, NIR, NDVI and UV-induced fluorescence imaging (IVIA), and NIR spectroscopy (Aurea Imaging). The plants (7 healthy, 4 infected by CaLsol, 4 infected by phytoplasmas, and 46 infected by both pathogens) without visible clear symptoms in the field except if the stalks are carefully observed, were analysed by the department of bacteriology of IVIA using PCR to precisely determine the presence/absence of CaLsol and/or phytoplasmas. Data are still being analysed but first results indicate that using colour and NIR images the detection of infected plants seems not be possible. As a remarkable result, it was observed the presence of UV-induced fluorescence in one plant of celery with curled stems that was positive both for CaLsol and phytoplasmas, although this finding has to be reproduced in the future to ensure that it was not due to external factors.