Evaluating the effectiveness of UAS obtained imagery at detecting early stages of phylloxera incursion in vineyards.

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Abstract: (Maximum 500 words + Optional figure + Optional table).
Grape phylloxera (*Daktulsphaira vitifoliae* Fitch) is a serious economically important invasive insect pest of European grapevine *Vitis vinifera* L.. Although widely present in most grape-growing countries worldwide, its distribution within Australia is limited , mainly due to strict biosecurity measures in place at farm, regional and state levels. As the insect is very small, and primarily lives underground on the roots of the grapevines, it is very hard to detect until the symptoms of infestation appear (slow stunted growth and premature yellowing of leaves), usually after 2-3 years (although in some instances this can be longer).
Early detection of phylloxera within the first year, would allow vineyard managers to implement phytosanitary measures to restrict or slow the spread of the pest and reduce future costs and losses in production. Previous research (Powell *et al*., 2006., Renzullo *et al.* 2006, 2007), indicated that early infection of grapevines by phylloxera can be detected with hand-held spectroradiometers and changes in leaf and canopy level reflectance were associated with changes in leaf chemistry (Blanchfield *et al.*, 2006).
This research, part of a Plant Biosecurity CRC project on "Optimising Plant Biosecurity Surveillance Protocols for Remote Sensing using Unmanned Aerial Systems", applies these prior learnings, and evaluates air-borne RBG, thermal, multi- and hyper-spectral imagery at detecting symptoms of phylloxera infestation at two different vineyards, multi-variety grapevines, two separate time periods and under different levels of phylloxera infestation. Datasets from each imagery type will be compared to existing phylloxera detection practises; visual inspection, ground-based insect traps, soil DNA probes as well as being overlain with EM38 ground conductivity survey data. The ultimate aim of this study is to move towards a more targeted integrated approach for phylloxera detection and is the first study of its type to focus on a soil borne pest of biosecurity significance.

Figure 1. Multi-rotor UAV with hyperspectral camera over infested vineyard.

References: (Maximum of 5 references in Harvard referencing style)

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