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| **Early Detection of Myrtle Rust on Pōhutukawa Using Indices Derived from Hyperspectral and Thermal Imagery** |
| Myrtle rust is a very damaging disease, caused by the fungus Austropuccinia psidii, that which has recently arrived in New Zealand and threatens the iconic tree species pōhutukawa. Canopy level hyperspectral and thermal images were taken repeatedly within a controlled environment, from 49 inoculated (MR treatment) and 26 uninoculated (control treatment) pōhutukawa plants. Measurements were taken prior to inoculation and six times post-inoculation over a 14-day period. Using indices extracted from these data, the objectives were to (i) identify the key thermal and narrow-band hyperspectral indices (NBHIs) associated with the pre-visual and early expression of myrtle rust and (ii) develop a classification model to detect the disease. The number of symptomatic plants increased rapidly from three plants at 3 days after inoculation (DAI) to all 49 MR plants at 8 DAI. NBHIs were most effective for pre-visual and early disease detection from 3 to–6 DAI, while thermal indices were more effective for detection of disease following symptom expression from 7 to –14 DAI. Using results compiled from an independent test dataset, model performance using the best thermal indices and NBHIs was excellent from 3 DAI to 6 DAI (F1 score 0.81–0.85; accuracy 73–80%) and outstanding from 7 to –14 DAI (F1 score 0.92–0.93; accuracy 89–91%). |

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