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Development of Spectroscopic Protocols to Study the Relationship between Epicuticular Surface Chemistry and Flora during Stress and Ripening

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Expanding human populations require increased land use and increased efficiency of land use, which makes it important to mitigate the effects of environmental stress on native flora and crops. The wax coating on the surface of plant leaves (epicuticular waxes) holds important physiological functions to protect plants against environmental stress, for example, minimising water loss, UV protection, protection from disease, as well as acting as an anti-feedent. Studying the composition and distribution of epicuticular waxes on the surface of plant leaves can provide valuable insight into plant fitness and the presence of environmental stressors. Current methods to study plant waxes require extraction of the wax from the leaf surface. This approach reveals substantial insight into chemical composition of plant waxes; but, destroys valuable information relating to the spatial distribution of waxes on the leaf surface. The development of analytical methods that can directly image epicuticular waxes across the surface of plant leaves is therefore, sought after to complement existing bulk analyses. I will present initial work on the development, adaption and validation of direct spectroscopic imaging methods, specifically Fourier transform infrared (FTIR) spectroscopy, to enable investigation of the epicuticular wax distributions on plant leaves. This methodology may provide deeper understanding of how wax composition and distribution changes in response to altered plant physiology during environmental stress. Such information may be used to help monitor health and fitness of native flora populations, or assess fruit ripening processes.

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