SPECTRAL-BASED DETECTION OF *GANODERMA* DISEASE INFECTION IN OIL PALM

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Abstract

In this paper, a research on the use of hyperspectral remote sensing techniques for detection and mapping of Ganoderma disease in oil palm is presented. Basal Stem Rot (BSR) diseases in oil palm are caused by the attack of a group of wood decaying fungi called Ganoderma. This fatal disease is considered as the most serious disease of oil palm in Malaysia where losses can reach up to 80% after repeated planting cycles. Ganoderma produces enzymes that will degrade the oil palm tissue and affect the infected oil palm xylem thus causing serious problems to the distribution of water and other nutrients to the top of the palm tree (Mazliham et. al, 2007). The research involves the use of field spectroradiometer measurements and airborne hyperspectral data acquisition to determine the feasibility of hyperspectral data in discriminating different levels of infestation at leaf and pixel scales. Several techniques were evaluated to determine the most suitable method for detecting the disease at an early stage. A modified vegetation index was developed to improve the detection capability. A wavelet-based noise reduction technique was also implemented to deal with the noise in the data in order to improve separation of classes (Shafri and Mather, 2005). The best bands for spectral discrimination were analysed further to help in new index development. An airborne hyperspectral data acquisition was carried out to further assess the possibility of large scale mapping of disease infection in an oil palm plantation. The leaf scale study reveals the need of using wavelet-based technique in dealing with noise effectively and to

improve detection accuracy. Wavelet coefficients are also useful in early detection of disease. Several vegetation indices were tested and new indices developed in this study helped to improve the detection further. Lagrangian red edge technique worked the best if red edge based technique is to be utilised. Further study on the pixel scale indicates that red edge based techniques are the most successful with hyperspectral imagery and the new vegetation index can be implemented for detecting oil palm disease from airborne data.

References:

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