

## **Selection of a spectral index for detection of orange spotting disease in oil palm (*Elaeis guineensis* Jacq.) using red edge and neural network techniques**

### **ABSTRACT**

Spectral screening can play an important role in successful detection of viroid-infected oil palm seedlings from nursery stage prior to transplanting into the field. Coconut cadang-cadang viroid (CCCVd) is the main causal agent of orange spotting (OS) disease. OS disease is an emerging disease in Malaysian plantation. In this study, a glasshouse experiment was conducted with fifteen CCCVd-inoculated and five healthy oil palm seedlings in the growing season of 2015. Spectral screening was performed using a hyperspectral spectroradiometer, Analytic Spectral Device HandHeld 2 (325–1075 nm). The red edge, a steep gradient in reflectance between red and near-infrared bands (680–780 nm), was used for selection of red edge bands. A maximum point (i.e., 700 nm) and minimum point (i.e., 768 nm) of red edge were selected from healthy and inoculated spectra. Shifts of red edge inflection point from healthy to inoculated spectra were also studied. Four well-known spectral indices, namely simple ratio, red edge normalized difference vegetation index, two-band enhanced vegetation index 2 (EVI2), and chlorophyll index red edge, were evaluated using selected red edge bands. The multilayer perceptron neural network model was used to establish a nonlinear relationship between selected spectral bands and each spectral index. EVI2 was selected as a best spectral index which resulted in zero errors at the training, testing, and validation datasets. The highest coefficient of correlation ( $r= 1$ ) was recorded between spectral bands (input values) and EVI2 (target values).

**Keyword:** Orange spotting; Spectroradiometer; Red edge; EVI2; MLPNN