Detecting BSR-infected oil palm seedlings using thermal imaging technique

Basal Stem Rot (BSR) is the most destructive disease instigated by a white wood rotting fungus called Ganoderma boninense, which cause great economic setback in oil palm productivity. It attacks the basal stem of oil palm trees, causing them to slowly rot. It also affects the xylem tissues that eventually interrupt water transportation to the upper part of the oil palm, turning the leaves at the frond become yellow. This problem should be prevented during nursery stage by separating between healthy and BSR-infected seedling. Therefore, this study focuses on the potential use of thermal imaging for detecting BSR in oil palm at seedling. Thermal images of oil palm seedling from healthy and BSR-infected were captured and processed to extract several thermal properties of the seedling, i.e., maximum, minimum, mean, and standard deviation of pixel intensity value. These values were then undergone statistical analysis to identify its significant different in differentiating healthy and BSR-infected seedling. Several classification models were tested including Linear Discriminant Analysis (LDA), Quadratic Discriminant Analysis (QDA), Support Vector Machine (SVM) and k-Nearest Neighbour (kNN). Principal Component Analysis (PCA) was used to reduce the dimensionality of the dataset. The results demonstrated that the highest accuracy achieved at 80.0 % using SVM (fine gaussian) classification model with PC1 and PC3 as the input parameter. This summarizes the potential of thermal imaging in detecting BSR-infected oil palm trees at seedling stage.