

Molecular Diagnosis of a Virus Associated with Red Tip Disease and Its Detection by Non Destructive Sensor in Pineapple (*Ananas comosus*)

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Abstract : Pineapple (*Ananas comosus*) is a common crop in tropical and subtropical areas of the world. Malaysia once ranked as one of the top 3 pineapple producers in the world in the 60's and early 70's, after Hawaii and Brazil. Moreover, government's recognition of the pineapple crop as one of priority commodities to be developed for the domestic and international markets in the National Agriculture Policy. However, pineapple industry in Malaysia still faces numerous challenges, one of which is the management of disease and pest. Red tip disease on pineapple was first recognized about 20 years ago in a commercial pineapple stand located in Simpang Renggam, Johor, Peninsular Malaysia. Since its discovery, there has been no confirmation on its causal agent of this disease. The epidemiology of red tip disease is still not fully understood. Nevertheless, the disease symptoms and the spread within the field seem to point toward viral infection. Bioassay test on nucleic acid extracted from the red tip-affected pineapple was done on *Nicotiana tabacum* cv. Coker by rubbing the extracted sap. Localised lesions were observed 3 weeks after inoculation. Negative staining of the fresh inoculated *Nicotiana tabacum* cv. Coker showed the presence of membrane-bound spherical particles with an average diameter of 94.25nm under transmission electron microscope. The shape and size of the particles were similar to tospovirus. SDS-PAGE analysis of partial purified virions from inoculated *N. tabacum* produced a strong and a faint protein bands with molecular mass of approximately 29 kDa and 55 kDa. Partial purified virions of symptomatic pineapple leaves from field showed bands with molecular mass of approximately 29 kDa, 39 kDa and 55kDa. These bands may indicate the nucleocapsid protein identity of tospovirus. Furthermore, a handheld sensor, Greenseeker, was used to detect red tip symptoms on pineapple non-destructively based on spectral reflectance, measured as Normalized Difference Vegetation Index (NDVI). Red tip severity was estimated and correlated with NDVI. Linear regression models were calibrated and tested developed in order to estimate red tip disease severity based on NDVI. Results showed a strong positive relationship between red tip disease severity and NDVI ($r= 0.84$).

Keywords : pineapple, diagnosis, virus, NDVI

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