**Occurrence of *Banana Blood Disease* in Malaysia**

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**ABSTRACT**

Banana is one of the most important fruit crops in Malaysia with most of the bananas produced in the country consumed locally. Banana cultivation is carried out largely by smallholders who are often not trained well in disease management, and diseases are the major constraint to the banana industry in Malaysia. In 2007, outbreaks of banana wilt and fruit rot symptoms were observed in many banana plantations in the state of Johor, Malaysia. The outbreaks of this disease were reported after the December 2006/January 2007 massive flood incidents in Johor. Symptoms consisted of yellowing , wilting and necrosis of leaves, followed by death of the whole plant. Bacterial ooze exuded from the cut surface of infected pseudostems and fruits. Subsequently, banana vascular wilt disease status survey was carried out in Johor to evaluate its spread. The survey reported 60.7 % of 3,212 ha banana orchards were found to be infected by banana bacteria wilt (*Ralstonia solanacearum* species complex) and 23.5% were infected by panama disease (*Fusarium oxysporum* f.sp. *cubense*/ *Foc*). Almost all cultivated varieties were affected by bacterial wilt disease including Nipah, Berangan, Rastali, Mas, Kapas, Nangka, Raja, Raja Udang, Tandok, Awak, Awak Abu, Lilin, Lemak Manis, Masak Hijau and Pisang Abu except Pisang Boyan. Crop losses due to these bacterial vascular wilt of banana were up to 100%. A disease status survey conducted by Department of Agriculture throughout Peninsular Malaysia indicated that in 2007 to 2009, a total of 1,976 ha banana were infected by bacterial wilt, 882 were infected by *Foc* and 27 ha were infected by both diseases. In 2012-2013 similar symptoms were observed in Negeri Sembilan, Selangor, Penang and Sabah.

A Phylotype-specific multiplex PCR was used to verify the phylotypes of *Ralstonia solanacearum* species complex and BDB in infected banana samples. All *R. solanacearum* strains should produce a band (282 bp) with the 759/760 primers, as well as another band for each of the Phylotypes (I=144 bp; II= 372 bp; III=91 bp; IV= 213 bp). The Blood Disease Bacterium (BDB) is very close to *R. solanacearum*, if not a member of the species complex. It has yet to be formally described, or placed in a strain, however, it resides among other members of Phylotype 4, as do some members of Biovar I and *R. syzygii*. A diagnostic protocol for this bacterium uses the BDB primer set: 121F CGT ATT GGA TGC CGT AAT GGA and 121R AAG TTC ATT GGT GCC GAA TCA. Fresh or dried materials of infected banana tissue were usedin the analysis. Infected banana samples from Johor, Negeri Sembilan, Selangor, Penang and Sabah were found to be infected by *R. solanacearum* species complex, *R. solanacearum* phylotype IV and BDB.

Blood disease of banana which previously limited to Indonesia has spread to Peninsular Malaysia and Sabah. To the best of our knowledge, this is the confirmation of Banana Blood Disease in Malaysia. Department of Agriculture has developed a Standard of Procedure which stated the action plan and various control measures to mitigate this disease from affecting the banana industry in Malaysia.