



NEW DISEASE REPORT

First report of the *Pineapple mealybug wilt-associated viruses 1, 2 and 3* causing pineapple mealybug wilt disease in East Malaysia, Borneo

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KEYWORDS

Ampelovirus, *Ananas comosus*, Sarawak

Mealybug wilt of pineapple (MWP) is associated with three pineapple mealybug wilt-associated viruses (PMWaVs) which negatively impact crop production globally (Dey et al., 2018). MWP symptoms include wilting, marginal leaf curl, reddish-yellow colouration of the leaves beginning at the tip, and a desiccated appearance of the plants (Dey et al., 2018). Pineapple farmers in Sarawak, Borneo have consistently reported the widespread occurrence of MWP symptoms since 2021 (Figure 1). The roots and fruit of diseased plants were observed to be infested with mealybugs.

Three samples of diseased pineapple leaves, mainly of the cvs. Josapine, MD2, Morris and Sawit, were gathered from each of four different pineapple plantations in Bintulu, Miri, Sibul and Kuching, in the north, centre and south of Sarawak between 2021 and 2022. The pineapple leaves were pooled according to their localities, sliced into pieces 1 × 2 cm, preserved in RNAlater (Thermo Fisher, USA) and then transported to the laboratory. RNA was extracted from the leaves using the SEPa Plant Isolation Reagent Kit (1st BASE, Singapore) according to the manufacturer's guidelines. A two-step RT-PCR was performed to amplify the heat shock protein 70h gene of PMWaV-1, -2, and -3

(Green et al., 2020). PCR products of the expected size were Sanger sequenced (Apical Scientific Sdn. Bhd., Selangor) and the sequences were deposited in GenBank (Table 1). BLASTn analysis confirmed detection of PMWaV-1, -2, and -3 in each of the 12 samples. The percentage nucleotide identities of PMWaV-1, PMWaV-2 and PMWaV-3 with other isolates of each species ranged from 99.1–99.8, 99.6–100.0 and 98.4–99.8%, respectively (Table 1)

There is limited research on PMWaV in Malaysia. Previous studies have demonstrated the presence of three species in Peninsular Malaysia (Sether et al., 2001; Mohd Anuar et al., 2023). However, there has been no report of PMWaV in Sarawak, located on the island of Borneo, until now. This study updates Malaysia's PMWaV data and provides the first report of PMWaV-1, -2, and -3 infection in Sarawak. Six different PMWaV species have been reported globally (Dey et al., 2018; Larrea-Sarmiento et al., 2021) and further investigation is needed to understand the presence of additional species in Malaysia and their association with MWP symptoms. The findings of this research provide fundamental insights into the epidemiology of PMWaV in Sarawak's pineapple cultivation. This data

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TABLE 1 The GenBank accession numbers of the heat shock protein 70h gene sequences of Pineapple mealybug wilt-associated virus (PMWaV) 1, 2 and 3 isolates from four regions in Sarawak, Borneo, Malaysia, and the nucleotide identity and GenBank accession number of the isolates with which they share the closest identity

Region	PMWaV-1		PMWaV-2		PMWaV-3	
	GenBank accession number	nucleotide identity with closest isolate	GenBank accession number	nucleotide identity with closest isolate	GenBank accession number	nucleotide identity with closest isolate
Bintulu	OR679072	99.83% HQ129930.1 (Cuba)	OR679076	100.00% MH704741.1 (Hawaii)	OR679079	99.78% OQ672494.1 (Peninsular Malaysia)
Miri	OR679074	99.13% HG940514.1 (Thailand)	OR679077	99.81% MH704741.1 (Hawaii)	OR679081	99.00% OP860287.1 (Hawaii)
Sibu	OR679075	99.83% HG940514.1 (Thailand)	OR679078	99.61% KM870780.1 (Brazil)	OR679082	98.59% OP860287.1 (Hawaii)
Kuching	OR679073	99.65% HG940514.1 (Thailand)	OR619812	100.00% KM870780.1 (Brazil)	OR679080	98.39% OP860287.1 (Hawaii)



FIGURE 1 Pineapple crops in Sibu, Sarawak showing symptoms of mealybug wilt of pineapple; the plants appear to be wilted and desiccated with leaves curling at the margin and turning reddish yellow from the leaf tips

can inform strategies for disease management, reducing the spread of PMWaV, safeguarding pineapple production and sustaining East Malaysia's pineapple industry.

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