



First report of *Pineapple mealybug wilt associated virus-2* infecting pineapple in Ghana

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Mealybug wilt of pineapple (MWP) is a major viral disease of pineapple (*Ananas comosus*) worldwide, including Ghana (Sether & Hu, 2002; Sarpong *et al.*, 2017). In Ghana, MWP causes yield loss estimated at about US\$248 per hectare (Sarpong *et al.*, 2017). Recently, Nyarko & Asare-Bediako (2019) detected *Pineapple mealybug wilt associated virus-1* (PMWaV-1) and PMWaV-3 (genus *Ampleovirus*) from 9 of 24 MWP-symptomatic pineapple plants from Ghana. However MWP is also associated with three additional ampeloviruses PMWaV-2, PMWaV-4 and PMWaV-5 (Gambley *et al.*, 2008) and further testing was done to determine if these viruses contributed to the disease in Ghana.

Nucleic acid extracts of the same 24 pineapple plants (Nyarko & Asare-Bediako, 2019), which had typical MWP symptoms, including tip dieback, downward curling, reddening, and wilting of the leaves and in which PMWaV-1 or PMWaV-3 were detected, were tested using RT-PCR with the 223/224 primer pair which targets the HSP70h gene region of PMWaV-2 (Sether *et al.*, 2005). PMWaV-2 was detected in 15 of the samples (62.5%), suggesting its abundance in pineapple fields in Ghana.

Five amplicons corresponding to the expected size (610 bp) were purified and directly sequenced in both directions. Sequence comparison using BLASTn showed that all the Ghanaian PMWaV-2 isolates (GenBank Accession Nos. MN427642-MN427645) shared 98.9-100% nucleotide identity with each other and 98.2-100% nucleotide identity with sequences of isolates in GenBank (e.g. KT322167, HE583226 and FN825676). To the best of our knowledge, this is the first report of the presence of the PMWaV-2 in Ghana, as well as in Africa.

So far, this work and that of Nyarko & Asare-Bediako (2019) has shown the presence of PMWaV-1, PMWaV-2 and PMWaV-3 in Ghanaian pineapple. Sixteen out of the 24 samples (66.7%) tested were infected with at least one of the three species of ampeloviruses identified. PMWaV-2 had the highest infection rate (62.5%), followed by PMWaV-1 and PMWaV-3 with infection rates of 33.3% and 8.3% respectively. Mixed viral infections were detected in seven of the sixteen PMWaV-infected pineapple samples, where five were co-infected by PMWaV-1 and PMWaV-2 and the other

two were co-infected by PMWaV-1, PMWaV-2 and PMWaV-3. This has serious implications for the epidemiology and management of MWP. Mixed infections can result in recombination of viral species leading to the generation of variants showing novel genetic features, which may cause severe damage to crops (Syller, 2012). MWP has been reported to be highly prevalent in pineapple fields in Ghana (Sarpong *et al.*, 2017). There is therefore the need to identify an effective strategy to manage the disease in order to ensure the sustainability of the pineapple industry in Ghana.

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