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First record of cassava mealybug, *Phenacoccus manihoti* (Hemiptera: Pseudococcidae), in Malaysia

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Cassava (*Manihot esculenta* Crantz, Euphorbiaceae) is an important staple food crop in tropical countries. The leaves and tubers are used for human consumption and livestock feed. The tubers are processed into starch (Winotai *et al.* 2010) and biofuel (Howeler 2007). In Africa, cassava is a particularly important crop because the tubers can be stored to provide staple food during severe droughts (Calatayud & Le Rü 2006).

In the 1970s, an undescribed mealybug (Hemiptera: Pseudococcidae) of Neotropical origin was accidentally introduced into West Africa and devastated the cassava crop, causing up-to 84% loss of yield (Nwanze 1982) and endangering the subsistence of about 200 million people (Herren & Neuenschwander 1991). The mealybug has since spread to 24 countries in Africa South of the Sahara (Ben-Dov 2015).

The cassava mealybug was described under the name *Phenacoccus manihoti* Matile-Ferrero (Matile-Ferrero 1977), and several years were spent searching for its area of origin in South America before an effective natural enemy, *Apoanagyrus lopezi* (De Santis) (Hymenoptera: Encyrtidae), was found (Löhr *et al.* 1990). This parasitoid wasp was then introduced to West Africa for biological control of the mealybug (Herren & Neuenschwander 1991; Lorh *et al.* 1990). The biological control programme was very successful and has provided good control of the pest in Africa (Zeddies *et al.* 2001).

In 2008, cassava mealybug was discovered in Asia for the first time, damaging cassava in Thailand (Winotai *et al.* 2010). Subsequently it was found in Indonesia in 2010 (Muniappan *et al.* 2011), and in Cambodia and Vietnam in 2012 (Parsa *et al.* 2012). *Phenacoccus manihoti* has also been recorded in Laos (FAO 2014).

Since Malaysia is in the cassava belt of southern Asia and lies adjacent to Thailand, where the mealybug is present, a survey for cassava mealybug was carried out in Peninsular Malaysia by Dewi Sartiami and Mohd. Hanifah in 2014 to check for its presence.

The survey began in Selangor, then extended to five other states (Johor, Kedah, Pahang, Perak and Terengganu). Each sample location was recorded using GPS. Mealybug-infested cassava was collected into labeled plastic bags in the field before being taken to the laboratory at Malaysian Agricultural Research and Development Institute (MARDI). A stereo microscope with 10x to 40x magnifications was used to sort, preserve and slide-mount adult females using the methods described by Sirisena *et al.* (2013). The specimens were stained with acid Fuchsin and mounted in Canada Balsam before being viewed under a compound light microscope with magnifications of 40x to 400x. The mealybugs were identified using keys provided by Cox & Williams (1981), Williams & Granara de Willink (1992) and Williams (2004). Slide mounts were deposited at the Centre for Insect Systematics, Universiti Kebangsaan Malaysia (CIS-UKM), 43600 Bangi, Selangor, Malaysia; Strategic, Environment and Natural Resource Research Centre, Persiaran MARDI-UPM, 43400 Serdang, Selangor, Malaysia; Crop Protection Quarantine Division, Department of Agriculture (CPQDOA), Jalan Gallagher, 50480 Kuala Lumpur, Malaysia; and the California State Collection of Arthropods (CSCA), Plant Pest Diagnostic Center, 3294 Meadowview Road, Sacramento CA 95832, California, U.S.A.