Diseases Caused by Viruses

First Report of Banana Bunchy Top Virus in Banana and Plantain (*Musa* spp.) in Tanzania

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Banana (including plantain; *Musa* spp.) is an important vegetatively propagated food staple grown as a semiperennial crop in fields and backyard gardens in Tanzania. Banana bunchy top disease (BBTD), caused by the banana bunchy top virus (BBTV, genus *Babuvirus*), is the most economically important viral disease of banana, infection of which results in severe stunting and reduction in fruit production by 90 to 100% within two seasons (Kumar et al. 2015). The virus is spread by the banana aphid, *Pentalonia nigronervosa*, and through vegetative propagation of infected sources. BBTV is an introduced virus first reported in sub-Saharan Africa (SSA) in the 1960s in the Democratic Republic of Congo (Kumar et al. 2011). Since then, BBTV spread was confirmed in 15 countries in the Central, Southern, and Western African regions but was not detected in any previous surveys in the East African sub-region (Kumar et al. 2011). Surveys of banana pests and diseases conducted in December 2020 to January 2021 in Buhigwe District in the Kigoma Region of Tanzania revealed banana plants with typical BBTV symptoms

(severe stunting, leaves with shortened petioles, chlorotic streaks, and yellow leaf margins) in several banana fields in Muhinda (longitude 29.78662, latitude -4.53672) and Mwayaya (longitude 29.8218, latitude -4.49203) villages. Most of the affected plantations were 5 to 15 years old. Leaf samples ($n = 21$) from symptomatic ($n = 6$) and asymptomatic ($n = 15$) banana plants were collected and used for total DNA extraction and BBTV detection by polymerase chain reaction (PCR) using the primer pair BBTV-1 and BBTV-2 to amplify ~240-bp sequences of DNA-R encoding for core master replication initiator protein gene (Mansoor et al. 2005). All samples from symptomatic plants tested positive and asymptomatic plants were negative. To further confirm the virus identity, four samples each from symptomatic (PCR positive) and asymptomatic (PCR negative) plants from Muhinda and Mwayaya villages were tested by triple antibody sandwich enzyme-linked immunosorbent assay (TAS-ELISA) using BBTV ELISA reagent set (catalog no. SRA24700-1000; Agdia) following the manufacturer's protocol. Samples from symptomatic plants reacted positively in TAS-ELISA and asymptomatic plants were negative. The 240-bp PCR product of two isolates was purified and both strands were sequenced. A BLAST search of the nucleotide sequences (NCBI GenBank accession nos. MW711671 and MW711672) revealed 99% identity with DNA-R sequences of several other BBTV isolates from Africa (accession no. JF755994). Further analysis of the 240-bp nucleotide sequences with maximum-likelihood phylogenetic analysis using MEGA-X software has grouped the two BBTV sequence isolates with the SSA subclade of the South-Pacific group (Kumar et al. 2015). To our knowledge, this is the first report of BBTV infecting bananas in Tanzania and East Africa, endowed with rich banana diversity and the popular East African Highland banana clone. BBTV presents a new threat to banana production in this subregion due to the high risk of further spread through vegetative propagation, traditional planting material exchange practices, and the ubiquitous banana aphid vector. This study warrants delimitation surveys to assess the extent of spread, with simultaneous efforts to raise awareness about BBTD recognition and control measures among banana growers, including eradicating infected mats and replanting with healthy planting material to recover banana production.

References:

- Kumar, P. L., et al. 2011. Virus Res. 159:171.
- Kumar, P. L., et al. 2015. Adv. Virus Res. 91:229.
- Mansoor, S., et al. 2005. Mol. Biotechnol. 30:167.

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