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Delivering Cassava modified with RNAi technology for Resistance to Cassava Brown Streak Disease to Benefit East African Smallholder Farmers

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Food and economic security for smallholder cassava farmers in sub-Saharan Africa is threatened by Cassava brown streak disease (CBSD). CBSD causes brown necrotic lesions within the storage roots, rendering them inedible and unmarketable. RNAi technology was applied to develop cassava with durable, high-level, resistance to CBSD. Sequences from the coat proteins (CP) of CBSV and UCBSV were fused to produce an inverted repeat construct and transgenic plants regenerated. Resistance to CBSD in the greenhouse and under field conditions in East Africa was correlated with the level of CP-specific siRNAs accumulated, with the best performing lines remaining disease free across multiple years in multiple locations in Kenya and Uganda. Best performing RNAi events underwent breeding programs, with the resulting F1 progeny lines inheriting the T-DNA and expressing CP-specific siRNAs in the predicted 1:1 ratio. F1 lines were cultivated over five 12-month growing cycles across six locations in Kenya and Uganda and selected for resistance to CBSD, Cassava mosaic disease and plus other farmer-required traits. A regulatory application was submitted to, and approved by the Kenyan National Regulatory Authority, to establish elite F1 lines within National Performance Trials. Parallel work has been initiated to develop the seed systems required to multiply and distribute CBSD resistant RNAi cassava to smallholder farmers in East Africa. Additional work has successfully stacked RNAi-mediated CBSD resistance with technology to elevate levels of iron and zinc in cassava storage roots to levels that would beneficially impact the nutritional status and health of cassava consumers. The presentation will illustrate the steps, processes and hurdles encountered in developing and delivering a modified orphan crop to smallholder farmers in Africa.

Primary author: TAYLOR, Nigel (Donald Danforth Center Plant Science Center)

Co-authors: KURIA, P. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya); WAGABA, H. (National Agricultural Research Organisation, Kampala, Uganda); WILLIAMS, E. (National Agricultural Research Organisation, Kampala, Uganda); OBIERO, H. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya); NARAYANAN, N. (Donald Danforth Plant Science Center, St Louis, MO); KAREMBU, M. (International Service for the Acquisition of Agri-biotech Applications, Nairobi, Kenya); IRAKI, B. (International Service for the Acquisition of Agri-biotech Applications, Nairobi, Kenya); KARIUKI, J. (Mennonite Economic Development Associates, Nairobi, Kenya); NDUWUMUREMYI, A. (Rwanda Agriculture and Animal Resources Development Board, Kigali, Rwanda); TARACHA, C. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya); NARAYANAN, N. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya); ALICAI, T. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya); MIANO, D. (Kenyan Agricultural and Livestock Research Organization, Nairobi, Kenya)

Presenter: TAYLOR, Nigel (Donald Danforth Center Plant Science Center)

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