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Thesis Title

OCCURENCE OF BANANA *XANTHOMONAS* WILT IN KENYA AND POTENTIAL APPROACHES TO REHABILITATION OF INFECTED ORCHARDS

Thesis Abstract

Banana *Xanthomonas* wilt (BXW) caused by *Xanthomonas campestris* p.v. *musacearum* (Xcm) affects all banana cultivars and causes up to 100% crop loss. The disease was first reported in western Kenya in 2006, spreads very fast and has no single effective control measure available, no natural resistance among the banana cultivars. This study was carried out to establish the spread of BXW in banana producing areas and develop integrated management options.

Two minute dipstick and FTA Whatman cards DNA capture techniques in polymerase chain reaction (PCR) diagnosis of the disease was evaluated using 258 samples of BXW from Burundi, D. R. Congo, Kenya, Rwanda, Tanzania and Uganda. The captured DNA by field kits were subjected to PCR and results compared with directly DNA isolated from fresh samples analysed by PCR and Enzyme–Linked Immunosorbent Assay (ELISA). The occurrence of BXW in banana growing regions of Kenya was determined

	through a survey. Diversity of insects associated with BXW in disease epidemic areas of western Kenya was determined by collecting insects visiting banana flowers and fruits in BXW affected and healthy farms. The effectiveness of single stem rouging and replanting in managing BXW was evaluated under field experiments in banana orchards with over 80% BXW incidence. Single stem rouging options evaluated included cutting at the base, uprooting of infected plants, injection with herbicide and total removal of whole mats. Efficacy of replanting was tested by total removal by uprooting all the plants in the affected orchard and replanting after three, four and six months. Susceptibility of the locally available banana germplasm was evaluated by inoculating 46 banana cultivars from eight genome groups with Xcm under screen house conditions. The Two minutes dipstick DNA capture was most efficient in capturing Xcm DNA under field conditions and was comparable with PCR and ELISA on fresh samples. Out of 258 field samples of Xcm, 25.9% were positively diagnosed using 2 minutes DNA extraction capture field kit and only 1.5% with FTA cards. The survey confirmed presence of BXW only in Busia, Kakamega, Siaya and Kisumu. Stingless bees (*Apis* sp) were the most abundant insects found associated with banana as potential vectors for BXW. Injection with herbicide and uprooting of the infected plants were the most effective single stem rouging option in reducing BXW. The disease was significantly controlled after six months and bunch yield recovered after one year. Replanting banana on the affected fields three to four months after destruction of the BXW affected orchards reduced disease incidence to less than 2% for the five banana cultivars used. All the forty six banana cultivars evaluated were susceptible to BXW. Cultivars Mokoyo, Namukhila and Horn Plantain were most susceptible while cultivar Mysore, an apple dessert banana of genome AAB was least susceptible. Two minutes dipstick was efficient in capturing BXW pathogen DNA for PCR diagnosis at field level. Banana *Xanthomonas* wilt was confirmed in Western and Nyanza regions of Kenya. Use of infected

	suckers, pruning implements and stingless bees contribute to BXW spread. Banana *Xanthomonas* wilt incidence was reduced by over 80% and 70% yields recovery within one year by rouging only the BXW symptomatic plants instead of destroying entire orchard