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Rehabilitation of banana farms destroyed by *Xanthomonas* wilt in Uganda

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Abstract

Xanthomonas wilt of banana, caused by *Xanthomonas vasicola* pv. *Musacearum* (*Xvm*) was first reported in Kayunga district in Uganda in 2001. The disease has since spread to more than 33 districts resulting in up to 100% yield loss. This has threatened food and income security of poor banana farmers. Over 70% of farmers in Uganda depend on banana for their livelihood and they regard *Xanthomonas* wilt as the most important threat to household food and income potential. When wilt was initially detected in Uganda several measures were recommended, e.g. de-budding, disinfection of garden tools and destruction of diseased plants/mats to eradicate or reduce disease spread, based on experience in controlling other banana wilt diseases with similar epidemiology. However, the adoption rate for these options has been low and the disease has reached epidemic levels, especially where the

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'Pisang Awak' (*Musa* ABB) variety is dominant. Many 'Pisang Awak' farmers whose farms are infected have lost hope and have abandoned their plantations. Destruction and removal of the infected plants followed by a fallow period or planting of a crop that is not a host of Xvm, and subsequent replanting with healthy banana suckers could restore banana plantations in areas affected by wilt. However, knowledge on the suitable duration of fallow or crop rotation periods has not been available. Farmers also lack knowledge of the most cost-effective method for destroying and managing infected plants and fields.

A study was carried in Luwero district in central Uganda to determine the most effective method of destroying infected plants and an appropriate fallow period to ensure replanted suckers are not re-infected. Trials were carried out at three sites in fields with 68-76% of mats infected at the beginning of the experiment. The fields were divided into three equal plots. In the first plot plants were killed by injecting a herbicide (2,4-D) into the pseudo-stems; in the second plot, plants were manually cut down and their rhizomes dug out; while in third plot, the plants were cut down at ground level and re-sprouting suckers were continuously mechanically removed. The banana plant debris was removed from the plots and piled on ridges between the plots. Replanting with healthy banana suckers started one month after clearing the diseased plants, using tissue culture plantlets of cultivar 'Pisang Awak' (ABB, syn. 'Kayinja') and 'Mpologoma'(AAA, East African Highland subgroup). A portion of the field was replanted each month up to eight months after the onset of the trials. Each row consisted of 10 plantlets of each cultivar in a random mix. An economic viability analysis of the different options of destroying infected plants was carried out. Data on material and labour costs, and

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farmer's preferences were collected by interviewing farmers using a pre-tested structured questionnaire.

Results showed that banana suckers planted after a one-month fallow period had a 25% survival rate, while all suckers planted after seven and eight months of fallowing survived. This suggests that a fallow period of at least six months is required to restore health to farms after infection by *Xanthomonas* wilt. Generally, more dead plants were recorded with cv. Mpologoma than cv. Pisang Awak, suggesting that cultivars may respond differently to *Xvm* inoculum in the soil. Incidence of re-infection was highest in the plots where re-sprouting suckers were being continuously removed and lowest in plots where plants had been completely uprooted. This indicates that the bacterium could not survive in the soil free of host tissue for long. In the herbicide-treated plots, the bacterium probably survived in decaying debris from the rhizomes and roots, resulting in intermediate levels of re-infection. It is concluded that complete uprooting of infected plants and removing plant debris onto ridges is the best option for managing *Xanthomonas* wilt. However, the economic viability analysis indicated that farmers preferred to use herbicide to kill the plants rather than uprooting because complete uprooting is laborious and expensive. The use of herbicide is hence recommended followed by a 6-month fallow or crop rotation period.