

Determination of the appropriate fallow period for the rehabilitation of Xanthomonas Wilt destroyed banana plantations in Uganda

Laban Frank Turyagyenda¹, Guy Blomme¹, Eldad Karamura¹, Fred Ssekiwoko² and Simon Eden-Green³

¹Bioversity International, P.O. Box 24384, Kampala, Uganda G.Blomme@CGIAR.org (Author for correspondence), and f.turyagyenda@cgiar.org, ²National Agricultural Research Organization (NARO), National Banana Research Programme, P.O.Box 7065, Kawanda, Uganda fssekiwoko@kari.go.ug, ³EG Consulting, 470 Lunsford Lane, Larkfield, Kent ME20 6JA, UK egc@eden-green.co.uk

Introduction

Xanthomonas Wilt, a non-selective disease, caused by *Xanthomonas campestris* pv *musacearum* threatens food security and household income of banana farmers in east and central Africa as all the banana cultivars succumb to it. The disease initially reported on Enset and banana plants in Ethiopia, and later on banana plants in Uganda, is confirmed present in DR-Congo, Rwanda, Tanzania, Kenya and Burundi. Xanthomonas Wilt is primarily spread from diseased to healthy banana plants; by insects via the inflorescences, by cutting garden tools and by infected planting materials. The affected plants externally show wilting of male bud bracts, drying of the rachis, premature fruit ripening and drying, yellowing and wilting of leaves and eventually die. Internally, cross-sections of the pseudostems and flower stalks show yellow bacterial ooze, while the cross-sections of the fruits show rusty brown stains. The discoloration of the fruits and the yellow bacterial ooze are the main visual characteristics that distinguish Xanthomonas Wilt from Fusarium wilt.

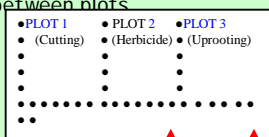
Aim of the study

In fields where infection is severe, complete plant removal has been advocated. The plot can then be fallowed or planted with another non-host crop before banana is replanted. However, field trials to determine persistence of the bacteria in the field after destruction and clearing of infected plants had not been carried out. The objective of this study was therefore to determine the most appropriate fallow period required to prevent re-infection when replanting is done with clean planting materials.

Methodology

The experiment was carried out on-farm at three sites in Luwero district in fields that had the following disease incidence: Zirowbe, (58%), Kalagala (68%) and Kasagombe (76%). The selected fields were divided into three equal plots of 42m x 27m to accommodate 160 plants at a spacing of 2m x 3m (Fig 1). In plot 1- plants were cut down and subsequent sprouts were continuously cut down (Cutting), in plot 2- plants were killed by injecting a herbicide (2,4-D - Herbicide) and in plot 3- plants were manually cut down and their corms were completely dug out (Uprooting). The banana plants and corms were removed from the plots and piled on ridges between plots.

Re-planting in rows was carried out monthly for eight months using tissue culture plantlets of 'Pisang Awak' (AABB group) and 'Mporogoma' (AAA-EA group). The growing plants were observed for Xanthomonas Wilt symptoms up to five months after the last planting.



First month replanting
Eighth month replanting

Replanting was done using tissue culture plantlets



Plants injected with 2,4-D had fallen by two weeks and corms had started rotting

Results

For all treatments the survival of the plantlets planted increased with an increase in the number of months allowed for the field to fallow. Plants planted after a one month fallow period only had a 25% survival rate, while plantlets planted after 7 and 8 months of fallowing had a 100% survival rate.

Matooke cultivars were more susceptible to soil born Xanthomonas Wilt than 'Pisang Awak'

Different sites had different survival rates suggesting that probably different soils and soil conditions affect the survival of the bacteria.

The cutting treatment had more dead plants followed by the herbicide treatment, while complete uprooting had the least number of deaths. The cutting treatment had more dead plants probably because the re-sprouting infected plants supplied a constant inoculum, while the uprooting treatment effectively removed the inoculum and the bacteria could not survive in the soil 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.

Cultivar/month	1	2	3	4	5	6	7	8	
Dead Matooke	34	21	27	25	10	2	0	0	
Dead 'P. Awak'	11	6	5	0	8	0	0	0	
Survival Treatment/month	2	5	8	3	5	7	9	10	10
Dead in Cutting	23	13	19	15	12	02	0	0	
Dead in Herbicide	16	08	09	07	06	0	0	0	
Dead in Uprooting	06	06	04	03	0	0	0	0	
Total Death	45	27	32	25	18	2	0	0	

Table 1. Survival rate of different cultivars by month

Table 2. Number of dead plantlets per treatment per month

(n=Total plants planted per month = 60)

Conclusions and Recommendations

The fallow period should be at least 6 months

Complete uprooting of infected plants and removal of all banana plant parts from the field is the best option. However, this option is time consuming and labour intensive and should be advocated only when the land is scarce and when the farmers want to replant the field with banana before the recommended six months. On the other hand, if the land is not scarce and the farmer is able to fallow the field for six months or more, or can crop rotate the field with Xanthomonas Wilt non-host plants, then the herbicide treatment is cheaper, simple and less time consuming, and thus recommended

Acknowledgements

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A farmer stands in front of a line of healthy banana plants planted in a previously Xanthomonas Wilt infected field



References

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P. O. Box 24384 Kampala, Uganda
Tel: +256 414 286948, Fax +256 414 286949