CHAPTER 1.9

Malawi

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Introduction

Cassava mosaic disease (CMD) is caused by cassava mosaic begomoviruses, transmitted by the whitefly *Bemisia tabaci* (Gennadius) and through virus-infected planting material (Harrison, 1987). The disease has gained significance as a major constraint to production in many areas of Malawi where cassava (*Manihot esculenta* Crantz) is grown, especially in the lowlands, where conditions are warmer; infection reportedly exceeds 90% in some plantings (Nyirenda et al., 1993).

A survey was conducted in three target areas selected to represent the major cassava growing areas in Malawi: the central lakeshore (Salima and Nkhotakhota, at 500-800 m altitude); the northern lakeshore (Rumphi and Nkhata Bay, 500-800 m); and the central plateau (Dedza, Lilongwe and Dowa, 1000-1500 m) (Figure 1). The key objectives of the study were to identify whiteflies and whitefly-transmitted viruses and to characterize producer knowledge of these problems on cassava in Malawi. Although assessments of sweetpotato virus disease (SPVD) also were planned initially, surveys were done at a time (July-September 1998) when crops of sweetpotato (*Ipomoea batatas* [L.] Lam.) mostly had been harvested, so disease and vector incidence could not be assessed adequately.

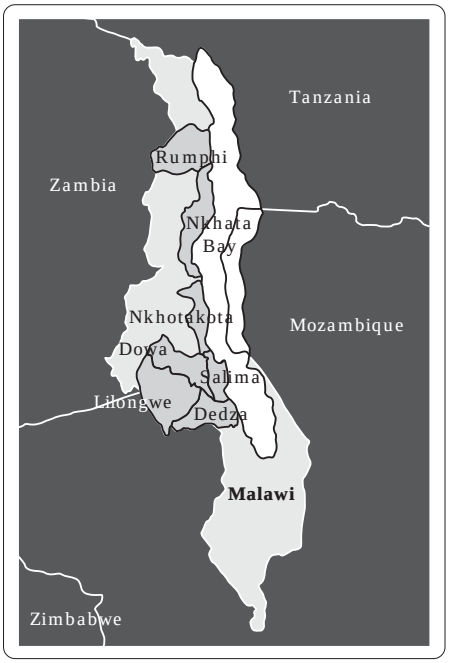

Figure 1. Areas surveyed for whitefly incidence and cassava mosaic disease in Malawi.

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Increased Biological Understanding

Whitefly species and abundance

Two whitefly species, *B. tabaci* and *B. afer* (Priesner and Hosny), were identified on cassava. Altogether, 212 whitefly samples were collected on the crop. Of these, 65 were *B. tabaci* and 147 were *B. afer*. The relative abundance of the two species varied among survey areas. *B. afer* was especially abundant in the central mid-altitude plateau, where it comprised 97% of the whitefly samples collected. The adult whitefly population did not vary significantly among the regions surveyed (Table 1).

Disease incidence and symptom severity

The incidence of CMD ranged from 11.4% in the central plateau survey area to 62.2% for the central lakeshore (Table 1). The use of diseased cuttings was the main source of infection in all three survey areas. Symptoms of CMD were moderately severe in each of the survey areas and averaged 2.8 overall.

Whitefly parasitoids

Only one species of whitefly parasitoid, *Encarsia sophia* (Girault and Dodd) was identified and this was from the northern lakeshore.

Increased Socio-Economic Understanding

Farmers' assessment of whitefly-related problems

Forty-four percent of the farmers interviewed were able to recognize whiteflies on the crop but only 32% considered them a problem. Most farmers (61%) were able to recognize CMD as a disease of cassava and gave it a range of local names. Less than half the farmers (42%) recognized the disease as a problem to cassava production and most (64%) noted that it occurs yearly. Only 22% believed that CMD was becoming more severe, with 1997 noted as the year of most severe disease symptoms. About one quarter (27%) of the farmers believed the disease to be affected by climate. There was no consensus on the effect of rainfall on CMD but 39% of farmers

Table 1. Cassava mosaic disease (CMD) incidence (%), disease symptoms and whitefly counts in selected areas of Malawi, 1998.

Target area	Provinces/ districts	No. fields	Whitefly counts	CMD[a]			
				Whitefly infection	Cutting infection	Total incidence	Severity
Central lakeshore	Salima and Nkhotakota	20	1.5	27.5 (54.7)	34.7	62.2	2.8
Northern lakeshore	Rumphi and Nkhata Bay	9	1.0	19.6 (34.4)	32.6	52.2	2.7
Central plateau	Dedza, Lilongwe and Dowa	12	1.3	3.3 (3.7)	8.1	11.4	3.0
	Mean		1.3	16.8 (25.4)	25.1	41.9	2.8

a. Figures are means for each region. Whitefly counts, whitefly abundance on cassava (number of whiteflies per top five leaves); whitefly infection, figures in parentheses transformed to multiple infection units to allow for multiple infection (Gregory, P. H. 1948. The multiple infection transformation. Ann. Appl. Biol. 35:412-417); severity of disease measured on an ascending 1-5 scale, from low to severe.

considered that the disease was most severe during periods of high temperature. Farmers' estimates of the losses attributable to CMD varied considerably, ranging from "none" to "total crop loss".

Managing whiteflies and whitefly-transmitted viruses

Only 7.3% of farmers attempted to control CMD; 2.4% rogued, 3.7% selected for healthy planting material at planting, while some 1.2% de-topped CMD-infected plants to reduce plant shoots with disease symptoms in the field. Farmers who selected their planting material mainly used the absence of disease symptoms as the selection criterion. Farmers who rogued gave three reasons for doing so—prevention of disease spread (7%), reduction of disease (7%) and removal of poorly growing plants (5%). Most of the roguing was done before the crop was 4 months old. Only 5% of farmers considered selection and 7% considered roguing as highly effective in controlling the disease. Some farmers (10%) reported the occasional shortage of clean planting material, with 5% reporting abandoning production of the crop in 1990 and 1992. This may have been associated with the severe damage caused by the cassava mealybug, *Phenacoccus manihoti* Matile-Ferrero, at this time. Improved varieties, primarily developed for their superior yield and agronomic characteristics, were grown by only 5% of the farmers, who considered their performance to be better than that of local varieties. Very few farmers (5%) had received any technical assistance in the management of whiteflies. However, a large proportion (40%) of farmers were willing to monitor whitefly and disease problems if it would help in the management of the disease.

Conclusions

Prospects for managing CMD successfully are good in most locations sampled, since the use of diseased cuttings was the main source of infection. However, despite the majority of farmers recognizing the disease as a production constraint to cassava, their knowledge of the disease was weak. The incidence of CMD was relatively high in the lakeshore survey areas and, given that moderate symptoms were observed, it is likely that significant yield losses are being experienced. Given that there appears to be very limited CMD spread due to the activity of whiteflies, and that *B. afer*, a non-vector, is the predominant cassava whitefly species in Malawi, phytosanitation may provide an effective approach to CMD management. However, before an appropriate regime for the use of roguing and the selection of CMD-free planting material can be proposed, basic information will be required on yield losses and rates of infection in the major cassava-growing areas for the most commonly grown varieties. These results should be used to develop a programme of participatory evaluation with farmers of both phytosanitation and new varieties. This should be closely linked with an educational programme targeted at increasing farmers' knowledge of CMD and the whitefly vector and of the range of possible management approaches.

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