

Transmission of Cassava Mosaic Virus by *Bemisia tabaci*

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ABSTRACT

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Four cassava cultivars from different sources were evaluated in the screenhouse for resistance to cassava mosaic virus. Test plants were exposed to 1-15 viruliferous whiteflies (*Bemisia tabaci*). The virus was transmitted by single whiteflies, but percent transmission increased with the number of insects per plant. The cultivars from South America were highly susceptible to the disease. A technique for quick screening of cassava for mosaic resistance is suggested.

Cassava mosaic disease has been reported in all parts of East, West, and Central Africa (6) and more recently in India (4). It does not occur in the Americas, the recognized origin of the crop (3). The disease is spread by vegetative propagation of infected material and by the whitefly *Bemisia tabaci* (2,5).

Although whiteflies may be efficient vectors of cassava mosaic virus (CMV), no critical studies have been made. Storey and Nichols (6) used 100 adult whiteflies in each transmission test, and Chant (1) generally used batches of 30-50 insects. Chant (1) showed that CMV could be transmitted by single whiteflies and that

transmission of the virus increased with the number of infective whiteflies per plant until whitefly populations exceeded 15 per plant. The presence of non-viruliferous whiteflies did not affect the rate of transmission by viruliferous whiteflies (1).

The objectives of the work reported here were to determine the rate of transmission of CMV by individual whiteflies and to investigate the response

of four cassava varieties to different dosages of CMV.

MATERIALS AND METHODS

Experiments were conducted at the Coast Agricultural Research Station, Mtwapa, in an insect-proof screenhouse sprayed twice weekly with dimethoate 40% EC. Cassava cultivars used were 46106/27 (East Africa), a third backcross of *Manihot esculenta* × *M. glaziovii* derivative to *M. esculenta* and highly resistant to cassava mosaic disease; 5318/34 (East Africa), an intercross of third backcrosses of *M. esculenta* × *M. glaziovii* derivative to *M. esculenta* (one of the parents was 46106/27) and very highly resistant to the disease; Aipin Valenca (Brazil), a pure *M. esculenta* and highly susceptible to cassava mosaic disease; and N Mex 55 (Colombia), whose pedigree and reaction to the

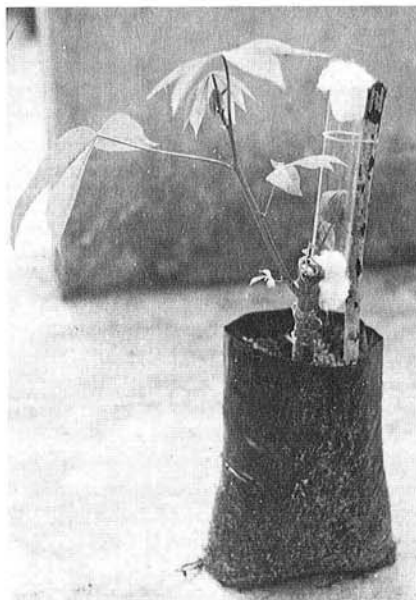


Fig. 1. Glass-tube cage for *Bemisia tabaci* (whitefly) transmission tests on cassava.

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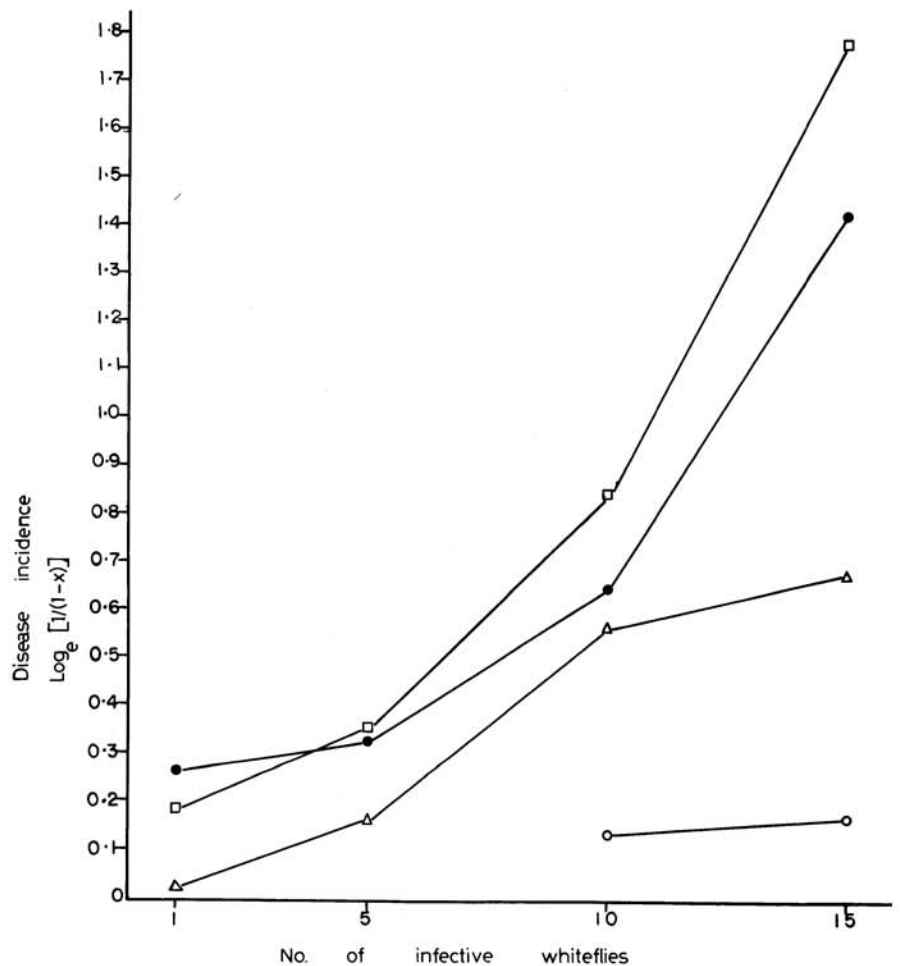


Fig. 2. Incidence of cassava mosaic disease in relation to dosages of cassava mosaic virus on four cultivars: Aipin Valenca (□), N Mex 55 (●), 46106/27 (Δ), and 5318/34 (○).

Table 1. Percent transmission¹ of cassava mosaic virus by viruliferous *Bemisia tabaci* on four cassava cultivars

Cultivar	No. whiteflies/plant				Mean ²
	1	5	10	15	
Aipin Valenca	16.7	30.0	56.7	83.3	46.7 a
N Mex 55	24.0	28.0	48.0	76.0	44.0 a
46106/27	3.3	15.4	43.3	50.0	28.0 b
5318/34	0.0	0.0	12.8	15.0	6.9 c
Mean	11.0	18.8	40.2	56.1	31.4

¹Based on the number of plants that developed cassava mosaic disease symptoms in a total of 50 plants tested.

²Means followed by the same letter are not significantly different according to Duncan's multiple range test ($P = 0.05$).

disease were unknown.

Response of the cassava cultivars to different dosages of CMV was determined by exposing test plants to 1–15 viruliferous whiteflies. The maximum number of whiteflies was restricted to 15, the critical population threshold for CMV transmission (1). Healthy cuttings (20 cm long) of each of the four cultivars were rooted in soil in polyethylene bags (15 × 25 cm). Viruliferous whiteflies were collected from a block of CMV-infected Kibandameno cassava plants with an aspirator and introduced into glass-tube cages (2.5 × 15 cm) fitted over stem apices of test plants to enclose the young, developing leaves and growing points of the stems (6) (Fig. 1). The whiteflies were allowed to feed for 24 hr and were then released outside the screenhouse.

Mosaic symptoms were noted after 2–3

wk. If no symptoms appeared, plants were cut back and observations were made on the new flush of growth.

RESULTS AND DISCUSSION

CMV was transmitted by the feeding of a single infective whitefly; the number of successful transmissions increased with the number of whiteflies per plant (Table 1). Mean transmission rate was 11% with single insects and increased to 56% with 15 whiteflies.

There was a highly significant ($P < 0.01$) linear relationship between incidence of cassava mosaic disease and CMV dosage in all four cultivars (Fig. 2). The dosage of CMV was significantly ($P < 0.01$) less for Aipin Valenca and N Mex 55 than for 46106/27 and 5318/34, indicating high susceptibility of the exotic American cassava to CMV. Of the four cultivars,

5318/34 appeared most resistant to CMV, followed by 46106/27 (Fig. 2).

These results indicate that the threshold number of whiteflies for CMV transmission depends on the level of resistance of the cassava cultivar. Chant (1) worked with a known susceptible variety, CGH7, in determining the critical population of whiteflies for CMV transmission.

The microcage technique used in the transmission studies could prove a useful tool to cassava workers for quick preliminary screening of large quantities of material for resistance to cassava mosaic before field testing.

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