DEVELOPMENT OF AFRICAN CASSAVA MOSAIC VIRUS AT A REGIONAL LEVEL IN THE IVORY COAST

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The African cassava mosaic virus (ACMV) is transmitted in two modes: by the Aleyrodidae Bemisia tabaci, and by diseased cuttings. The experiments conducted in East Africa concluded that the farmers themselves were the main vector (1), and that the role of the natural vector was minor. The conclusions based on results of epidemiological studies done in West Africa, were that vectors were the main source of virus spread (2,3). In order to determine the role of the vector in different ecological conditions we have conducted, in the Ivory Coast, an experiment at the regional level. The infection dynamics of healthy cassava plants, the vector populations, the ecological and environmental situations of the fields and the plant growth were considered.

MATERIALS AND METHODS

Most of the trials were planted with the CB cultivar (susceptible clone coming from Congo), and we also used the H58 clone (very susceptible clone originated from Malagasy) and the BR clone (Bonoua Rouge, resistant clone from Ivory Coast) among several cassava clones.

The experiments took place in two very different regions of the Ivory Coast: the first one is situated in the two rainy-seasons part of the forest area, in the south of the country (= 2000 mm of precipitation); the second one is situated in the savannah region, in the central part of the country, with only one rainy season (= 1000 mm of precipitation).

In the forest area, we experimented with one cultivar (CB) but in different environmental conditions, during one year. In the savannah region, we compared the H58 and BR clones in two different environmental conditions, during one year. Finally, the two different regions were compared by following reinfestation of fields of several clones during several years or at different planting dates for the same clone. In each region, field areas were varied from 0.06 ha to 1 ha, always oriented in the prevailing wind direction, in order to get a homogeneous infection of the plots (2).

The infection of the plants, the populations of the vector and the plant growth were recorded each month during 9 months. The whitefly populations were estimated by counting the adults directly on the apical leaves of 25 different plants per plot. The plant growth was estimated by measuring the diameter and the height of the principal stem of 25 plants per plot. Infection percentages and whitefly populations were analyzed by comparing cumulative numbers. We have also compared the ratio between the cumulative number of whiteflies per plant and the cumulative percentage of infected plants per plot to get the "Apparent

Transmission Power" (ATP) of the whiteflies with time and in different regions.

RESULTS

Comparison between the forest and the savannah regions. Whatever the year or the clone considered, infection was always more severe in the forest than in the savannah region.

Clone	BR	H57	CB	TA49	H58	BB
Forest region 1982	32	45	82	-	88	81
Forest region 1983	10	25	74	67	84	69
Forest region 1984	-	-	49	-	-	-
Savannah region 1982	3	3	1	-	5	20
Savannah region 1983	1	2	3	1	2	7
Savannah region 1984	-	-	4	-	-	-

Similarly, cassava plots planted at different dates within the same year had higher infection rates in the forest than in the savannah region.

Plantation date	March	April	May	June	July
Forest area 1984	91	58	49	42	50
Savannah area 1984	4	43	11	4	12

Comparison between two sites in the savannah region. We have compared infection rates of two different clones (H58 and BR) in the savannah region. In one case the fields were free of diseased cassava plants up-wind and in the second case the fields were planted in the middle of a huge diseased cassava plantation. In the latter case the infection rate was 25 higher for the BR clone and 40 higher for the H58 clone than in the former. The whitefly number was always higher in the site with the higher infection rate but was not in the same range as the infection rate.

Whitefly number	Savannah 1	Savannah 2	Forest area
BR Clone	2.4	9.5	3.0
H58 Clone	3.7	9.2	4.3

Comparison of different sites in the forest region. Five different 0.06 ha were planted with the CB clone in the forest area, along a south-north axis, beginning near the sea (field 1), and ending 10 km inland (field 5). All the sites were different in the cassava environment and in the diseased cassava area which was swept by the prevailing wind coming from the south-west. A sixth field planted on the research station was considered as a reference (field 6). The highest infection rate was registered in fields 2 and 5, and the lowest in field 1. The highest whitefly population was in field 1 with lower populations in fields 3 and 4. The ATP was similar in all the fields excluding field 1 where it was about 10 times lower. The plant growth pattern could not account for these differences.

DISCUSSION

The differences between the dynamics of infection of cassava fields are variable within the same region and between different regions. Neither the climatic conditions nor the plant growth were predictors of the infection rate. Within a site there is a good correlation between the whitefly number and the infection rate (2,3). However, from one site to another and from one region to another these are not related. Comparing the ATP we distinguished two situations: 1) field 1 in the forest area (ATP = 300) and field 1 in the savannah area (ATP = 1000); 2) all other situations (ATP = 40 to 80). The fields with a high ATP had no up-wind diseased cassava fields, whereas those with a low ATP were surrounded with viral infected cassava fields. These results support the hypothesis that cassava is the reservoir for both ACMV and its vector, Bemisia tabaci.

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