

SPATIAL PATTERN OF AFRICAN CASSAVA MOSAIC VIRUS SPREAD

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From 1981 to 1986, the spread of African cassava mosaic disease (ACMV) into several healthy trial cassava fields was recorded. With insect-transmitted viruses patterns of infection depend on the vector movements and on the wind direction (2). So, the distribution of the vector, Bemisia tabaci, was recorded in relation to the wind directions.

Disease distribution. Table 1 indicates for each field, the planting date, the field area, a brief description of the ecological situation, the way of survey, and the disease incidence in the up-wind borders, the center of the field and the down-wind borders. As indicated in Fig. 1 there is a prevailing southwest oriented wind. The patterns of virus incidence show several common features: infection was not homogeneous throughout the fields as the wind-exposed south and west borders had a higher disease incidence than the north and east borders or the center of the field. Following a SW-NE direction there is a sharp decrease of the disease incidence from the up-wind edges, then a plateau around the middle of the fields and eventually an increase towards the down-wind edges (Table 1). These gradients of contamination are established early. Afterwards, there is a tendency for a blurring of the gradients (1).

This pattern of disease spread is a general feature as it was observed in most fields whatever their ecological situation and the year of planting. However, during a five-year program, we observed a few exceptions: 1) in several small fields (0.07 ha) such as Field 6, the gradients were sometimes faint or sometimes not established; 2) in several varietal trials (sub plots of different clones), the pattern of spread was not that observed with fields planted with a single clone; and 3) the presence of a 3-m wide path across field 5 modifies the general pattern as the highest incidence was observed along these inside paths.

Vector distribution. Several kinds of traps were used to study the whitefly distribution in the cassava fields. Yellow water traps and white sticky traps were set at different heights. In addition, sampling of the whitefly population on the plants was carried out. Despite the different ways of catching and counting, the patterns of whitefly distribution share several common features. The distribution of the catches is not homogeneous throughout the field. More whiteflies were trapped and counted near the wind-exposed borders than in the center of the fields or near the down-wind borders ("Field dispersal of Bemisia tabaci, vector of ACMV," same issue).

The vector distribution suggests that airborne whiteflies carried by the south-west prevailing wind alighted preferentially on cassava plots on the up-wind edges of the fields. Several observations suggest that reduction of the wind speed on the borders of the fields allows the

incoming whiteflies to control their flight and to land. (See "Bemisia tabaci cassava field dispersal," same issue). This behavior of the vector would explain the ACMV pattern of spread which is common with other whitefly-transmitted diseases such as okra leaf curl (Fargette & Hamon, unpublished results). The quoted exceptions to the general pattern of spread could be due to unusual wind modifications such as those induced by small fields or by paths in the fields.

When considering the whitefly movements and the position of the fields there are indications that both the reservoirs of virus and vectors are located at some distance up-wind from the field, a distance up to several km being possible.

REFERENCES

1. Fargette, D, Fauquet, C, and Thouvenel, J-C. 1985. Ann. Appl. Biol. 106:285-294.
2. Thresh, J. M. 1976. Ann. Appl. Biol. 82:381-406.

Table 1.

Field	Date of planting	Area	Ecological situation	Survey	Disease incidence (%)		
					up-wind	center	down-wind
1	Feb 1982	0.7 ha	Fully exposed to the wind	R*	70	15	40
2	Oct 1982	1.0 ha	Surrounded by a wind break	L**	76	20	37
3	Oct 1982	1.0 ha	Surrounded by the forest	L	86	22	37
4	Jul 1983	0.5 ha	Southwest orientation	R/L	58	18	30
5	Oct 1984	4.0 ha	Fully exposed to the wind	L	54	19	27
6	Each month	0.07 ha	Southwest orientation	R	75	38	17

*Diseased plants were removed. ** Diseased plants were kept and labeled.