# MULTICOMPONENT RESISTANCE OF CASSAVA TO AFRICAN CASSAVA MOSAIC VIRUS

C. Fauquet, D. Fargette, J. Dejardin, F. Leylavergne,
L. Colon, and J.-C. Thouvenel

Laboratoire de Phytovirologie, ORSTOM, BP V 51, Abidjan, Ivory Coast.

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Storey conducted in East Africa, in 1938, the first program of selection of cassava (Manihot esculenta) against the African cassava mosiac virus (ACMV) (5). Intra-specific hybrids were initially done, using the African clones and a javanese one (F279), creating the hybrid 37244E. Then, he accomplished inter-specific hybrids and particularly the hybrid, Manihot esculenta x M. glaziovii, followed by three back-crosses with M. esculenta, selecting in this manner a resistant clone, the 46106/27. The same source of resistance was then used by Jennings in 1951 (4) who selected the hybrid 5318/34. Ekandem in 1958, working in Nigeria with seeds coming from this selected resistant hybrid, produced the clone number 58308 (1). The latter was the source of resistance to ACMV, used in the selection program of IITA (2). Hahn concluded (3) that the ACMV resistance of cassava 1) is polygenic and recessive, 2) is resistant to inoculation and to movement of the virus in the plant, and 3) there is no resistance to the vector itself.

In order to test the resistance of the selected clones in comparison to local clones in the Ivorian conditions and to determine the different levels of resistance, we have studied the different resistance components to ACMV. According to Russell (6) we have distinguished six different types of resistance: RC field resistance, R1 resistance to the vector, R2 resistance to inoculation, R3 resistance to the virus multiplication, R4 resistance to symptoms, and R5 resistance to movement of virus.

## MATERIALS AND METHODS

Collection of clones. The clones are of nine different origins: Ivory Coast, Togo, Nigeria, Central Africa, Zaire, Kenya, Malagasy, India and South America. We conducted an experiment in 1984 with 28 clones including the East African resistant clones and another experiment in 1985 comprising the East African and the Nigerian resistant clones.

Experimental trials. The experimental trial consisted of four repetitions of 15-m wide plots facing the prevailing wind ("Spatial pattern of ACMV spread," same issue). Each plot was composed of a random series of tested clones of 20 plants, surrounded by two lines of the CB clone considered as susceptible.

Evaluation technique. The study is based on two principles: first, the variables are registered without any a priori classification; second, each of them is measured, if possible, a great number of times (1 to 25) to minimize climatic, agronomic and experimental effects. Curves representing the evolution in time of these variables are reduced by transformation to one characteristic number. The six different types of

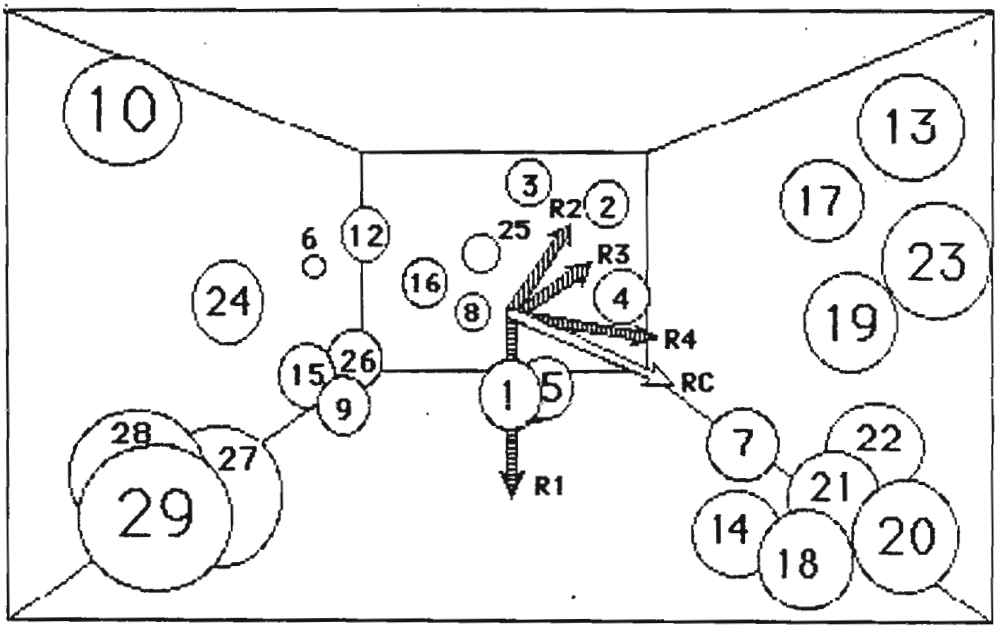
resistance are represented by: -RC, an approximation of the curve surface of the cumulative percentage of contamination in time; -R1, the cumulative number of counted whiteflies on the plants; -R2, the regression of the change of the ratio of the cumulative number of whiteflies on the cumulative percentage of contamination; -R3, the virus content of the diseased plants (only one measure in 1984); -R4, the intensity of the symptoms (mean of three different counts); R5, the regression of the time change on the intensity of the symptoms (only in 1985).

Data analysis. We analyzed the correlations between the variables, then we performed principal components analysis and hierarchical classifications and finally multiple regressions.

## RESULTS AND DISCUSSION

A correlation matrix of these resistance components was established, showing that the field resistance (RC) is significantly correlated with all the others ($r = 0.48$ to $0.80$). The most independent type of resistance is the vector resistance (R1). The R2, R3 and R4 were also significantly correlated.

The principal component analysis aims at describing the five different resistance components of the cassava clones to ACMV.




The figure above is a three-dimensional diagram representing 93% of the total variability and the correlation coefficient for each resistance type; the three axes vary between 0.75 and 0.95. Axis 1 is mostly represented by the RC and the R4, while axis 2 is only the R1, and axis 3 is more correlated with R2 and R3. The same analysis performed in 1985 with another cassava collection leads to a similar diagram.

A hierarchical classification of the cassava clones according to the different types of resistance divides them into several groups ranging from the most susceptible to the most resistant one. The resistance groups contain not only all the hybrids from East Africa and Nigeria but also the local clones from Kenya, two clones from India and Aipin Valenca, which was the most widely used clone in the selection schemes.

Using multiple regressions, it is possible to connect field resistance (RC) to the other resistance types with a high level of correlation ($r = 0.85$); consequently field resistance (RC) is a good criterion of the general cassava resistance to ACMV.

## REFERENCES

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