SELECTION OF HEALTHY CASSAVA PLANTS OBTAINED BY REVERSION IN CASSAVA FIELDS

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We call reversion the biological phenomenon that allows a virus-infected plant to produce a symptom-free plant in the next generation. As this phenomenon is actually found in cassava, we were able to select, like Bock (1983) in Kenya, healthy plants right in virus-infected cassava fields. In addition, although this phenomenon is by nature very unstable, the limited results obtained suggest that it may be genetic, and therefore could be considered a component of the resistance of cassava.

These are still very speculative results, but they are useful enough and unusual enough to merit further attention. If our hypotheses are confirmed, this could offer a new route for the selection of plant material and a new method for controlling African Cassava Mosaic.

OBTAINING HEALTHY MATERIAL BY REVERSION

The percentage of symptom-free plants in a field of virus-infected casava was often extremely low, of the order of 0.1 to 0.01. For some varieties of cassava, we never found a single plant without symptoms. However, despite this low percentage, in 1979 we began selecting healthy plants from six different clones: CB, Ta 49, H57, H58, BR, and BB.

This selection was based solely on visible symptoms, and was done by systematically roguing all plants presenting symptoms, however slight.

Since the goal was to multiply healthy material, the plants selected were planted in a region of the Ivory Coast with a low inoculum pressure, taking care not to put the new plants downwind of virus-infected cassava. In these conditions, the percentage of plants rogued for clone CB, which is moderately susceptible, fell progressively over 3 years, from 50% to 20% and then 5%, and then stabilized at this value.

The same thing happened with the six other clones selected, though with values that varied depending on the clones' natural susceptibility to the disease. For the clone Bonoua Blanc, for example, we observed levels of contamination ranging from 100% to 60% , and for clone 86, from 98% to 95%! Obviously the plants that were not displaying symptoms at the time of selection were nevertheless contaminated, and they therefore produced the virus-infected plants.

The fact of having symptom-free plants is obviously no guarantee of obtaining a virus-free plant; however, we can report that our entire epidemiological programme was based on this principle, and throughout our experiments we have not met with any problems that could be attributed to this cause. Every month for 6 years we have planted approximately 1000 cuttings derived from symptom-free plants, and we have not recorded any level of contamination that could not be explained in other ways.

GENETIC ORIGIN OF REVERSION

Reversion is a biological phenomenon which, though unstable, is probably genetic. The same virus-infected clones observed during several successive years showed highly variable percentages of reversion, ranging from 0% to 100%. On the other hand, when reversion did occur, the phenomenon was general for all the clones, with variable percentages specific for particular clones.

In a collection of 10 clones resistant to African Cassava Mosaic, the percentage of reversion in 1986 ranged from 0% to 10%. In the same year, on a single site, we found for 10 different clones a highly significant correlation of 0.79 between the two experiments (Table I).

Table I. Percentage of "reversion" (plants showing no symptoms after plantation) for 10 cassava clones, coming from East Africa, in two different trials.

CLONES	EXPERIMENT I	EXPERIMENT II
7	77	32
13	97	88
14	76	68
17	58	36
18	81	39
19	31	0
20	65	72
21	84	50
22	51	3
23	53	5

The climatic and/or biological conditions which give rise to this phenomenon are not yet known. It may depend on the "history" of the cutting during the preceding cycle, or, in contrast, on the conditions in which the cuttings were stored, or, finally, on the growing conditions in the plantation in which the phenomenon was observed. It is noteworthy that reversion phenomena have been observed following cultural accidents, such as a very severe attack of mites which practically destroyed the apical meristems; in this case, the secondary meristems started without symptoms.

REVERSION IS THE RESULT OF A COMPONENT OF RESISTANCE

The phenomenon is probably related to the diffusion of virus in the plant and, consequently, to the component of resistance previously called R5. When the symptoms of mosaic disease on cassava are recorded over time, for certain clones the intensity of symptoms decreases considerably and even, in some cases, falls to zero: this is reversion of the symptoms.

We have characterized this decrease in symptoms by the slope of the curves considered; this estimation is independent of the quantification of symptoms which is performed to characterize the resistance to their expression. It must be noted also that we are not talking about a general phenomenon: some varieties do not show it at all, and always produce strong symptoms. On the other hand, in the six varieties tested for their reversion ability, there may be a relation with the decrease of symptoms.

This preliminary result obviously needs to be confirmed, but it is sufficiently interesting to merit further attention.

It has been shown, furthermore, that in the case of cassava the correlation between symptoms and virus concentration is very strong, so it is possible that this decrease in the intensity of symptoms is correlated with a decrease in the concentration of viral particles in the leaves, at least for the clones considered.

It seems that there may be, in each cell of each cassava leaf, a kinetic of synthesis of viral particles that is dependent on the cell's resistance mechanisms. This equilibrium will depend, of course, on the genome of the plant, but it will also depend on the conditions of the cell: age of the leaf, particular physiological conditions, climatic conditions, etc.

In certain conditions, which remain to be defined, the concentration of viral particles reaches a critical threshold whereby the plant of the next generation derived from this cutting will remain free of virus.

If this biological phenomenon is confirmed to be truly dependent on plant genes and if we succeed in finding out in which conditions they are expressed, a new route could open up for selecting clones with a high percentage of reversion in natural conditions. This would be a new method, self-regulated and independent of any technology, for controlling African Cassava Mosaic.

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