

AFRICAN CASSAVA MOSAIC
FROM A GENETIC POINT OF VIEW

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The papers presented during this seminar concerning the breeding of cultivars resistant to African Cassava Mosaic enabled us to gather general information about the work done in different African countries and India by regional institutes such as IITA and ORSTOM and by national programmes (India, Uganda, Zaire, East Africa and national reports). Jennings and Silvester, moreover, presented an historical survey of the work done in East Africa and Madagascar. Several presentations made up for Dr. Hahn's absence and informed us about the evolution and applications of IITA's cassava breeding programme.

A basic question was discussed, i.e. which strategy should be adopted to develop slightly infected cassava crops.

SANITATION OR RESISTANT VARIETIES

A clear answer was given: the most efficient method consists of the combination of sanitation and breeding. Sanitation schemes allow a rather rapid multiplication of healthy plants, but in an infected environment their efficacy is limited. By contrast, the culture of resistant varieties following a long period of research and extension, enables a reduction of pressure of contamination in the field. This parallel evolution of both approaches was successfully achieved in East Africa, Madagascar and India.

African Cassava Mosaic was of course given the priority during this seminar, but several speakers insisted on the fact the other selection criteria should be taken into account, i.e. all parasitic diseases (bacteriosis, mealy bugs, mechanisms of level of production and of adaptation of cultivars (drought, altitude), of the plant morphology and of the product quality (sweet cassava, quality of leaves, starch, protein).

The selection schemes used in the different countries are arranged around breeding and sexual selection.

- In the course of sanitation, the regeneration of a variety must be carried out according to the cultivar breeding model.

Apart from the choice of healthy families, it allows the restoration of a clone.

- The virus resistance having a recessive, polygenic determinism, the IITA polycross method is recurrent selection. It allows the accumulation of favourable genes at each selection cycle; it causes a regular and cumulative increase of favourable genes. This procedure is moreover efficient for all other quantitative characters if they are positively correlated (mosaic and bacteriosis).
- This method as well as the genetic progress are limited by the parental clones used in the polycrosses. We noticed the important role played by hybrids descendants with M. glaziovii in the creation of varieties resistant to African Cassava Mosaic (Tanzania, IITA, Madagascar).
- National programmes develop the creation of cultivars based on breeding the descendants of the IITA material and the free descendants of local cultivars (example of PRONAM in Zaire), In Cameroon and in other African countries. This strategy makes the most of the variability of traditional varieties and of the sources of foreign genes, thanks to the allogamous reproductive mode of the species and to the vegetative multiplication. Thus, the choice individuals which have the characters researched for in a given country are multiplied in order to be distributed.

SEXUAL SELECTION AND VARIETAL SELECTION

These are two complementary strategies.

The work of cassava improvement enhances the role played by the outset material, traditional cultivars on the one hand and wild species on the other hand. Considering the importance of introgressions and of naturel genetic exchanges in the species Manihot, the use of germplasm came up against the risks associated with the transport of this material. At the moment, those barriers are technically overcome thanks to:

- the in vitro meristem culture associated with thermotherapy,
- the methods of indexing of mosaic,
- the in vitro conservation of germplasm.

Surveys and exchanges of both wild and cultivated material must be continued in order to increase the possibilities of breeding more efficient cultivars.

THEMES OF RESEARCH

From the discussions and propositions made, three themes of research have emerged to further progress in the control strategies of cassava, related to the varietal improvement:

- Study of the components of resistance to mosaic and of their relationships, arising out of their genetic determinism, so as to direct the selection towards different levels, the final aim remaining resistance in the field.

- Development of the knowledge about the genetic variability. This research is linked to the surveys and collections. It allows better identification of cultivars and appreciation of the genetic distance which exists between groups of cultivars having the same genomic combinations (choice of polycrosses). The relationship between wild, cultivated or adventitious species are stated, which allow for the determination of intermediate species for genetic exchanges. A regional coordination of such evaluations might be established.

- Review of biotechnologies suitable for cassava, particularly of genetic engineering. In cassava, the applications of genetic engineering are limited to regeneration and to molecular biology levels. The progress in such fields of research is rapid in specialized laboratories and we can be confident for the future.

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