

The genetic diversity of banana

Over a period of thousands of years, population migrations and movement of plant material have placed banana in very different ecological contexts in the various continents. Farmers have succeeded in profiting from the natural mutations resulting from vegetative multiplication. This combination of natural reproduction and selection by man since ancient times results in the present genetic diversity.



Bananas originated in South-East Asia as wild seminiferous plants. Natural crosses built up a large base of genetic diversity that still exists today. These crosses were the origin of the seedless varieties. These bananas have food qualities that soon interested man, who incorporated them in agriculture using their vegetative multiplication potential.

From the botanical point of view, the genus *Musa* is divided into seminiferous species with inedible fruits and parthenocarpic varieties with fleshy seedless fruits. The *Eumusa* section includes *Musa acuminata* (genome symbol: A) and *Musa balbisiana* (genome symbol: B). These are wild species at the origin of the cultivated varieties.

The latter are classified according to their ploidy level and their genetic make-up. Some 1 200 varieties have been counted and classified around the world.

The inedible wild species with seed-containing fruits can be used for purposes other than human foodstuff (fibre, livestock feedingstuff, etc.). They are all diploid (AA and BB). About 180 have been counted to date, all from South-East Asia, but the census is not definitive (especially for the BBs). These fertile varieties are nonetheless important since they possess different levels of resistance to pests and diseases. They therefore form base material for the various present and future

conventional genetic improvement and varietal creation programmes. Numerous cultivars have been bred by man. They are classified in groups according to their genetic make-up and then in subgroups assembling the various cultivars derived from each other by natural mutation starting from a common genetic ancestor. Distinction is made between the following groups:

- diploid groups: AA (such as Figue sucrée or Frayssinette) and AB. These total about 290 cultivars grown mainly in South-East Asia where they originated;
- three triploid groups (650 cultivars): AAA, AAB and ABB. The subgroups of each of these distinguish between the dessert varieties richer in sugar at maturity, cooking varieties with fruits that are firm and not sweet even when ripe, and sometimes bananas for beer-making by fermentation of the pulp (East Africa).

Even if the plants within the same subgroup display only weak genetic diversity, they do have a great range of phenotypes, resulting essentially from mutations and many centuries of selection by man. This is the case of the Cavendish (more than 20 cultivars), East African highland bananas (more than 50) and central and West African plantain (more than 150) subgroups.

Although the intensive cultivation system used for approximately

25 percent of world production favours monovarietal production, it is important to remember that most production is based on less intensive family farming with stress on varietal mixing. This contributes to the continuing of selection and hence ensures the diversity of banana ■

A few definitions

Conventional breeding: improving plants by sexual reproduction.

Cultivar: a cultivated banana.

Genetic improvement: improving plants with regard to a given character.

Parthenocarp: the spontaneous development of a fruit without stimulation of flowers by fertilisation.

Phenotype: a set of individual properties of a plant expressed in conjunction with a given environment.

Ploidy: number of sets of basic chromosomes:
diploid: 22 chromosomes
triploid: 33 chromosomes
tetraploid: 44 chromosomes

Seminiferous: fruits containing seeds, more or less encased in pulp.

Vegetative multiplication: in contrast with sexual reproduction (by seeds). It means multiplying or reproducing a plant by suckers or *in vitro* multiplication.