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 ■

Thierry Lescot, Cirad
thierry.lescot@cirad.fr

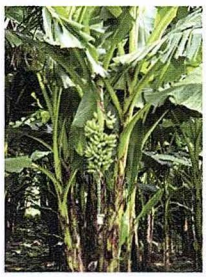
Banana — Estimated world production in 2005

Tonnes	Cooking bananas		Dessert bananas		Total
	Plantain AAB group	Highland bananas + ABB group + others	Cavendish	Gros Michel + others	
North America	0	9 000	10 000	100	19 100
South America	5 947 703	737 120	11 338 510	5 076 430	23 099 763
Central America	980 703	117 000	6 107 938	602 000	7 807 641
Caribbean	897 994	804 056	1 284 257	427 253	3 413 560
West and Central Africa	8 035 702	987 145	2 071 687	481 083	11 575 617
East Africa	1 196 871	14 056 285	1 961 106	721 560	17 935 822
North Africa & Middle East	3	3 030	1 615 160	1 078	1 619 271
Asia	1 067 020	10 068 640	22 537 590	5 875 327	39 548 577
Oceania	1 381	824 900	296 905	65 164	1 188 350
Europe	1	5	395 350	5	395 361
World total	**18 127 378**	**27 607 181**	**47 618 503**	**13 250 000**	**106 603 062**

Source: Thierry Lescot - Cirad after references, surveys, professional sources, FAO, etc.

The main banana groups and subgroups				
Group	**Subgroup**	**Cultivar (representative)**	**Fruit type**	**Distribution**
AA				
	Sucrier	Pisang Mas, Frayssinette, Figue Sucrée	dessert-sweet	World-wide
	Pisang Lilin	Pisang Lilin	dessert	Indonesia, Malaysia
	Lakatan	Pisang Berangan, Lakatan	dessert	Indonesia, Malaysia, Philippines
AAA				
	Cavendish	Lacatan, Poyo, Williams, Grande Naine, Petite Naine	dessert	World-wide, exporting countries
	Gros-Michel	Gros-Michel, Highgate, Cocos	dessert	World-wide
	Figue-Rose	Figue-Rose rose, Figue-Rose verte	dessert	World-wide
	Mutika Lujugira	Intuntu, Mujuba	beer - cooking	Central and East Africa, Colombia
	Ibota	Yangambi km5	dessert	Indonesia, Africa
AB				
	Ney Poovan	Safet Velchi, Sukari	dessert - acidulous	India, East Africa
AAB				
	Figue-Pomme	Maçà, Silk	dessert - acidulous	World-wide
	Pome	Prata	dessert - acidulous	India, Malaysia, Australia, W. Africa, Brazil
	Mysore	Pisang Ceylan	dessert - acidulous	India
	Pisang Kelat	Pisang Kelat	dessert	India, Malaysia
	Pisang Rajah	Pisang Rajah Bulu	cooking	Malaysia, Indonesia
	Plantain	French, Corne, Faux Corne	cooking	Central & West Africa, Latin Am., Caribbean
	Maia Maoli/ Popoulou	Popoulou	cooking	Pacific
	Laknao	Laknao	cooking	Philippines
	Pisang Nangka	Pisang Nangka	cooking	Malaysia
ABB				
	Bluggoe	Bluggoe, Matavia, Poteau, Cacambou	cooking	World-wide
	Pelipita	Pelipita	cooking	Philippines, Latin America
	Pisang Awak	Fougamou	dessert	India, Thailand, Philippines, East Africa
	Peyan		cooking	Philippines, Thailand
	Saba	Saba	cooking	Philippines, Indonesia, Malaysia

Source: Cirad


AA - Sucrier


AAA - Cavendish


AAA - Gros Michel


AAA - Figue rose


AAA - Mutika Lujugira


AB - Ney Poovan

A great diversity of bananas


AAB - Figue Pomme

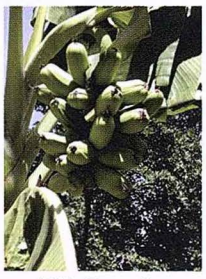

AAB - Pome


AAB - Mysore


AAB - Pisang Kelat


AAB - Pisang Rajah


AAB - Plantain


AAB - Popoulou


AAB - Laknao

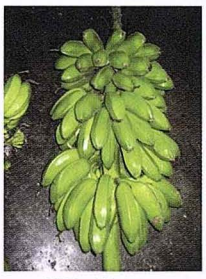


ABB - Bluggoe


ABB - Pelipita


ABB - Saba

Photos © Thierry Lescot