Domestication of the banana

The domestication of the banana is the process that transformed fruits full of seeds into parthenocarpic seedless fruits that develop in the absence of pollination[1][2]. The founding events took place in the humid tropical belt that extends from India to the Solomon Islands, the natural range of the wild species of bananas, which belong to the genus Musa. The earliest archaeological evidence of domesticated bananas is from Papua New Guinea and has been dated to at least 7,000 years before present[3].

Africa is a secondary centre of diversification for at least two large groups of bananas, the Plantains and the East African highland bananas[4].

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The ancestors

Cultivated bananas were domesticated from a small subset of wild species of bananas. The best known ones are Musa acuminata and Musa balbisiana. Their genetic signature, especially Musa acuminata's, is found in the vast majority of cultivars known today. The ancestor of a group of bananas domesticated independently in the Pacific region, the Fei bananas, has not been identified.

Like human beings, wild bananas are diploid, that is they have two copies of each gene-bearing chromosome, one from each parent. Those with a genetic predisposition to parthenocarpy (the ability to produce a fruit in the absence of pollination) set the stage for the domestication of seedless edible bananas.

Sexual phase

From wild bananas to edible diploids

The potential to produce parthenocarpic fruits has been traced to genes present in Musa acuminata[5]. Domestication for edibility most likely started with farmers transplanting the offshoots (suckers) of plants that were edible by virtue of having less seeds and more pulp. But since these plants were still fertile, they continued mating with other fertile banana plants. The latter could be
plants from the same or different *Musa acuminata* subspecies or *Musa balbisiana* species.

Under the nomenclature system developed by Norman Simmonds and Kenneth Shepherd, those sexual events became the foundation of the AA and AB genome groups, the letter A standing in for acuminata and B for balbisiana.

**From diploids to triploids**

Some bananas went on to produce triploid plants when one of the diploid parents normally passed on one copy of its genome, while the other contributed both copies (a phenomenon called meiotic restitution). This process produced three main genome groups: AAA, AAB and ABB.

**Asexual phase**

Sterility is most likely due to a combination of structural and genetic factors\(^6\). The structural factors are linked to matings between distant relatives (between different subspecies of *Musa acuminata* or between different species, mainly *Musa acuminata* and *Musa balbisiana*), as inheriting mismatched chromosomes made it difficult for the progeny to produce fertile ovules and pollen. But scientists also believe that farmers preferentially propagating the plants that produced fruits with the least seeds might have selected for genes that contribute to sterility\(^6\). Triploidy made further sexual reproduction extremely unlikely.

From that point on, further diversity was produced by farmers propagating mutant plants that exhibited desirable traits. Diploid and triploid cultivars that are related to each other through a series of mutations are said to form a subgroup. Two examples are the Plantains of Africa and the East African highland bananas, which have upwards of 100 cultivars each. This diversity is the result of farmers propagating mutants of the triploid ancestors introduced to the continent.

**References**

4. The hidden side of banana diversity, published 24 October 2017 in *InfoMus@'s News & analysis*.
6. *InfoMus@ news on GWAS and the parthenocarpic banana*.

**Also on this website**

*Musapedia page on the nomenclature system for classifying cultivated bananas*

*Banana breeding's explorer* explains how diploid cultivars are used to breed triploid bananas.
Further reading

Special issue on the history of banana domestication in Ethnobotany Research & Applications.

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