Abstract

The introduction of bananas into New Caledonia is directly linked with the arrival of various peoples on the islands of the Pacific. The genetic characterization of bananas cultivated in Asia and in the Pacific (Carreel 1993, 1994, Lebot et al. 1993) has enabled their relation with wild species to be demonstrated which in turn can be used to put forward strong hypotheses concerning the various migrations of people in the Pacific area and to better understand the socio-cultural role that the banana cultivars Maoli and Popoulou occupy in New Caledonia’s Kanak society some 3500 years after their introduction. At the present time there are still “true” bananas and “others”. The former which were introduced by the first people to arrive have a sacred ancestral value as well as a social role, while the latter, introduced during the period of colonisation have gradually become revenue generating crops.

Introduction

The introduction of bananas into New Caledonia is directly linked with the arrival of various peoples on the islands of the Pacific. The genetic characterization of bananas cultivated in Asia and the Pacific (Carreel 1993, 1994, Lebot et al. 1993) has enabled their relation with wild species to be demonstrated which in turn can be used to put forward strong hypotheses concerning the various migrations of people in the Pacific area and to better understand the cultural and/or socio-economic roles that bananas have in today’s Kanak society.

Origins of the Banana in the Pacific

The original peopling in the Pacific islands

It has been shown that the peoples living in Oceania originated in South East Asia (Sand 1989). Both the languages and the alimentary resources introduced by man, with the exception of the sweet potato, originate in that area.

About 40,000 BC during the quaternary ice age, sea levels were lower that they are today. New Guinea, Australia and Tasmania made up a single continental land mass, called Sahul by prehistorians. It was separated from Asia...
by a marine trench, Wallacea, several hundreds of kilometers wide. By means of navigation from island to island across this strait (island hopping) Sahul was populated in a few millennia. The present day descendants of these first occupants of Sahul are Papuan of New Guinea and the Aborigines of Australia. By 30,000 BC, some islands just to the east of New Guinea, notably the Solomon Islands, were occupied. Towards 10,000 BC the gradual rise in sea level led to the separation of New Guinea, Australia and Tasmania, thus pushing the people of New Guinea to occupy the eastern mountains where they began to practice horticulture (Sand 1989).

From about 3,500 BC, the north coast of New Guinea, which was already inhabited saw the arrival of new waves of people from South East Asia, the Austronesians, some of whom settled in the northern Melanesian islands (Sand 1989).

Similar pottery has been discovered in archaeological excavations in the Solomon Islands and New Caledonia. This could mean that there were relations between the two archipelagos dating from about 1,600 BC, as radiocarbon dates made on Gifford and Shuttler’s material excavated in New Caledonia in 1956 have shown. From New Guinea and the Solomon Islands these Austronesians settled in the islands of central and southern Melanesia (including New Caledonia) founding small communities. New Caledonia was an important relay point in the eastwards progression of the first Oceanians. Some pirogues traveled further in the Pacific. New villages were built, new canoes departed. All the large islands in the western Pacific, as far as Samoa and Tonga, were populated by the end of the second millennium BC (Sand 1989). After Fiji and the Marshall Islands, the whole of Polynesia was reached, as far as Easter Island and Hawai (about 200 AD), and then, by a south westerly movement to New Zealand which was peopled by 900 AD.

From the middle of the first millennium BC relations between the islands of the western and eastern Pacific began to decline. Two geographical groups evolved, each developing its own cultural and economic characteristics. The gradual separation between the east and west did not mean that voyages between the two no longer occurred (Sand 1989).

The Austromelanesians who populated New Caledonia during this period traveled with their food plants. It could be supposed that everyone brought three or four clones of each species. Fertile plants could then have given rise to new varieties of clones in fallow areas that were discovered by the horticulturists who multiplied them; this is true of yams, taros and sugar cane. Plants producing vegetatively, which are often sterile, would have had some of their clones widely distributed and these would be remained unchanged in fallow areas even after thousands of years of shifting cultivation (Leenhardt 1932, Barrau 1954, Haudricourt 1964).

Ever since European discovery of New Caledonia numerous ethnologists, ethnothecnologists and botanists have described the species of bananas supposed to have been introduced at the time of the original peopling of the archipelago (Barrau 1954,1959, Dubois 1975, Haudricourt 1964, Jeanneney 1891, Leenhardt 1932, Viellard & Deplanche 1862). These bananas belong, as far as is known, to the two subgroups Popoulou and Maoli. Despite searches during fieldwork, no diploid Musa acuminata Colla has been found outside cultivation, a few Musa balbisiana Colla plants, probably introduced at the same epoch, are still present in the north of the island. Other bananas have been introduced during the European era: installation of missionaries (from 1843), installation of French settlers (from 1853), the coming of Asia groups [Chinese, Indians, Indonesians, Japanese and Vietnamese] (from 1874), as well as West-Indians, Tahitians, ‘uveans (Wallis Island) and the other peoples of Oceania. The recently introduced bananas are mainly dessert types in the Cavendish, Figue-Pomme or Silk, and Mysore subgroups.

The genetic diversity and origin of the Popoulou and Maoli bananas

All bananas which are cultivated for their fruit are parthenocarpic, that is to say that their fruit is fleshy and develops without fertilization. They have their origin in bananas with seed, called wild bananas. These are found in damp, but well drained, valleys and glades in low and middle altitude forests, in the intertropical zone of southern and South-East Asia and in the Pacific, from the Indian peninsular to the islands of Samoa.

All bananas cultivated in the world are descendants of the wild species Musa acuminata (section Eumusa 2n=2x=22) in a monospecific way or, more often, in association with Musa balbisiana (section Eumusa, 2n=2x=22). The bananas cultivated in New Caledonia are triploid. Some of these bananas have a monospecific origin AAA. They belong to the Cavendish sub-group which in the Pacific, as in all banana producing regions, are cultivated mainly for sale and for export. Other bananas found in the Pacific are of type AAB. Among these, morphological and molecular characters distinguish the dessert type subgroups (Figue-Pomme or Silk, Mysore) from the cooking type subgroups (Plantain and Popoulou/Maoli/Iholena).

The ancestral bananas Maoli and Popoulou which are also called Pacific Plantains (and make up part of the subgroup AAB) can be easily differentiated morphologically from South East Asian plantains. All the same the term Plantain is hardly an error for they have much in common with the South East Asian Plantains at the molecular level, as much nuclear as cytoplasmic. The cultivars mak-
ing up this subgroup are known by their Hawaiian names Popoulou, Maoli and Iholena. They distributed throughout the south, east and central Pacific as well as Hawaii and were first described by Pope in 1926 (Pope 1926, Daniells 1990, Lebot et al. 1994). The distribution of these cultivars is intimately linked with the aboriginal populations of these islands.

The cultivar Iholena is not present on New Caledonia. On the other hand a great morphological diversity exists among the Maoli and Popoulou cultivars. These last have morphological and physiological characters in common: quite erect fronds, a weak inhibition of suckers which can be tall at the moment of harvesting, relatively short stout fruit with obtuse apices in Popoulou and truncated apices in Maoli. Genetic diversity in Maoli and Popoulou

Morphological taxonomic descriptions (Daniells 1990, Sharrock 1990, Simmonds 1954, Stover & Simmonds 1989, Tezenas du Montcel 1990,1991) of Popoulou and Maoli demonstrate the great morphological diversity observed within these cultivars. However the study (Lebot et al. 1993) of the genetic diversity of the bananas (563 clones) through enzymes (malate dehydrogenase MDH, phosphoglucose isomerase PGI and phosphoglucomutase PGM) has shown, no matter where the material was collected (Hawaii, French Polynesia, Samoa, Tonga, New Caledonia, Vanuatu or PNG), an absence of polymorphism among the various clones of the same subgroup Maoli or Popoulou, despite the existence of much morphological variation. The study shows how to differentiate between the Popoulou and Maoli subgroups using PGI. The distinction Popoulou/ Maoli has also been found during a molecular study by Restricted Fragment Length DNA (RFLP) (Carreel 1993) in particular at the level of the mitochondrial genome in some varieties. Only some bands distinguish between them at the nuclear level and they have exactly the same chloroplast profile. A larger scale study will be put into effect during the next two years with the aid of nuclear markers of the Sequence-Tagged Microsatellite Site (STMS) which are more discriminatory.

The origin of Maoli and Popoulou

Little polymorphism has been found up to now in the species Musa acuminata at either the morphological or molecular levels. On the other hand there is great variability in Musa acuminata due to proliferation and differentiation into subspecies following periods of geographically variable isolation. The molecular study of over 240 parthenocarpic bananas, monospecific or interspecific and of different types (dessert or cooking) has shown that no matter which clone is studied it is related to the wild bananas Musa acuminata ssp. banksii (occurring in PNG) and/or to Musa acuminata ssp. errans (occurring in the Philippines). What is more, Simmonds (1962) reported the existence of Musa acuminata ssp. banksii in which the fruits had an unusually high proportion of flesh/seed. Thus the first area of domestication corresponding to the selection of fleshy fruits that can be described as partially parthenocarpic would be that of the Philippines-PNG.

The interspecific hybrids originated in crossings between semi-sterile and partially parthenocarpic Musa acuminata and Musa balbisiana. These bananas are to be found side by side in the geographical region situated bounded by India, southern China, the Philippines and PNG (Stover & Simmonds 1989). The crossings and natural hybrids then led to greater variability in the diploids and to the creation of the subgroup of triploids which are natural hybrids between the diploids AA, AB and BB with some exceptions.

The study of the nuclear genomes by RFLP (Carreel 1994) shows that triploid dessert bananas have several A genomes and have a pluri-intraspecific origin. In particular, as is the case with all cultivated bananas, they are related to Musa acuminata ssp. banksii but they are also related to Musa acuminata ssp. malaccensis (occurring in Malaysia) and in some cases to Musa acuminata ssp. zebrina (occurring in Indonesia). Thus their origin is very complex and they would be a later development more likely to have occurred on the Asian continent than on the islands. This would explain their recent introduction into the Pacific.

Studies or both zymograms and RFLP profile show that the cooking bananas Popoulou, Maoli, Plantain and Laknão all have their two A genomes related to Musa acuminata ssp. banksii from PNG-Philippines rather than to Musa acuminata of South East Asia. The nuclear genome of the Popoulou is very close to that of the Maoli, but they are all also very close to that of the Plantains.

In more details, the study of the cytoplasmic genome A by RFLP has revealed the potential and preferential relation of the Popoulou and Maoli with Musa acuminata ssp. banksii from PNG by the presence of the same chloroplast genome (of maternal origin). On the contrary, at the level of the mitochondrial genome (of paternal origin), the Maoli which seem to be rather more related to the Musa acuminata ssp. errans (from the Philippines) is distinguished from the Plantains and the Popoulou which would be themselves related to Musa acuminata ssp. banksii from PNG.

No AAB cultivar which could belong to the group of Pacific Plantains has ever been described from Asia or the Philippines, while cultivars showing zymotypes identical with those of the Maoli cultivars exist in PNG. Thus the hypothesis of a New Guinea origin is reinforced. Conversely no cultivar showing a zymotype identical with that of the Popoulou cultivar has been found in PNG. However this cultivar is widely distributed in Vanuatu and New Caledonia. Popoulou could be the result of a somatic mutation of Maoli which was then selected by man: it could thus be of Melanesian origin (Lebot 1993). As shown above the
Popoulou and the Plantains have their two A genomes related to Musa acuminata ssp. banksii from PNG and thus could have originated in this region. Little data exists on the B genome. The New Guinea origin of Musa balbisiana is very controversial and two hypotheses are possible:

- people brought Musa balbisiana to PNG
- people took Musa acuminata ssp. banksii from PNG to Philippines or to neighbouring islands.

After this the Plantains would have travelled weswards and the Popoulou eastwards. If this were the case, the latter could not have originated as a mutation of the Maoli.

As far as Maoli are concerned exchange between the Philippines and New Guinea would have had to have occurred. Then the Papuans would have left with some partially parthenocarpic Musa acuminata ssp. banksii for the Philippines where crossing with and AB (errans Xbanksii) took place. The formation of these cooking bananas necessitates, none-the-less, fewer crossings and migrations that of the dessert bananas in which the origin is more recent and occurred in the eastern part of the area where bananas have their origin.

So, some questions remain which we hope to answer by further studies and fieldwork. Collections of Musa balbisiana and Musa acuminata ssp. errans need to be extended and studies undertaken by analyses using more polymorph STMS markers.

If these data concord with present knowledge about the peopling of the Pacific islands, they would allow us to consider population migrations and the various exchanges through the chronology of the domestication of these bananas. But apart from making a contribution to prehistory, the origin of these bananas gives us a greater understanding of their importance in Kanak society in New Caledonia.

The Importance of the Banana in Kanak Society in New Caledonia

The first arrivals would have brought with them a great deal more that the food plants necessary for their survival. They would have brought and cultivated everything which represented their identity. Traditional Kanak society is marked by attachment to the land, and their horticultural techniques and socio-cultural customs are linked to the myth of the land which nourishes. Even though it comes second to yams and taros, the banana is never-the-less a subsistence plant anchored in Kanak traditions.

Even today, two classes of bananas are distinguished from each other:

- autochthonous, or “true”, or “ancient” bananas, which include the Popoulou and Maoli, which were introduced during the original peopling of New Caledonia. These bananas have different vernacular names according to the linguistic areas. They are called Do pwi in the Xârâcûû language.

  ■ the “other” bananas, introduced since European contact with the island, called Pwi pwagara in the Xârâcûû language (White men’s bananas). These are the “dessert” type bananas of the subgroups Cavendish, Figue-Pomme or Silk, and Mysore.

Ancestral “sacred” value

In Kanak society, the bond with the land is very important. Melanesians are, above all, a people of place: their identity is inherited through the bond with places of origin and it is strengthened by a constantly maintained relation with them (Bonnemaison 1989). Place represents the land of ancestors, the myths, the tradition. Melanesian subsistence horticulture is a shifting horticulture required by soil exhaustion. The soil is perceived as the identity of a group, the living space of a family community. Each group preserves the record of its travel in oral tradition. The “true” banana represents the reincarnation of the spirit and the body of the ancestors.

Areal hierarchy exists among these “true” bananas. Some Maoli which have a pseudostem colored black or red, the colors symbolizing wealth, are considered to have a superior cultural value to the other Maoli and in particular to Popoulou. They are highly regarded and are the object of special care and attention, being an integral part of Kanak social and spiritual life. Each clan appropriates several clones with recognized morphological identities: this is the identity of their ancestor and therefore of themselves. As such, the presence of these “true” bananas is profoundly felt in daily life. Melanesian people’s working days are entirely devoted to the production of food crops: yams, taros, bananas and sugar cane. Each person is limited by the necessity to produce food. It is a necessary custom because food plants are the basis of life and even their harvest is conditioned by ancestral or totemic propitiation. Thus one finds bananas with a symbolic or magic function planted in places of worship (altar, rain, births and totem emplacements). Sacred “banana” stones are buried in banana gardens in order to invoke the gods to arrange the conditions necessary for a good harvest. Planted nearby, the “true” bananas protect places of habitations, yams gardens and taro terraces. In horticultural tradition the line of “true” bananas indicates the male side of a mound (airy and dry) for yam planting.

Bananas leaves are used to make incubators for newborn babies during the first 15 days or their lives (B.Wedoye pers. comm.), or serve to line the bath hollowed out in the earth for the newborn. Apart from their role of protection and fortifying (blood, the sap is the nourishing liquid which brings life, strength), the leaves are plaited together so
These “true” bananas, thought of as the life of ancestors and considered as food for chiefs, have been forbidden, by the chief, to be sold. Poygûna (1993) found, as oral tradition at Gomen that only the Poingo cultivar of the subgroup Popoulou was authorised to be sold along with other introduced produce. Should one suppose that the Poingo banana is not a “true” banana but that it is a later introduction? The distinction between Maoli and Popoulou exists at a genetic level and a deeper knowledge might be able to explain the hierarchical difference between the two cultivars. It is true that the denomination of chiefly banana is reserved exclusively for the Maoli and that, curiously, the Poingo/Popoulou banana is one found most frequently today in the commercial markets, becoming gradually integrated alongside the “other” revenue generation crops.

The role of the “other” bananas

The “other” bananas, introduced much later, are cultivated apart without particular attention and have a primary role as food and a secondary economic one. The “other” bananas are planted in isolated tufts of in small parcels, both within the tribal living area and along the tracks that lead to the gardens. Bananas are everywhere in the New Caledonian landscape. They are eaten daily, at any time, and constitute the best of the gathered food. Anywhere a Melanesian travels he can obtain half-ripe or fully-ripe bananas as by gathering them along the track (whether he is the owner or not) and he eats them grilled at his workplace. Gathering along the track for personal uses as food is accepted customarily. The banana is serving as a “snack” both for those working in their gardens and for children at anytime of the day. Today these “other” bananas have gradually become revenue generating crops of considerable importance to Melanesians. Whether they are sold at the roadside or enter into recognized commercial circuits, they bring in a far from negligible income to Kanak families. They are still today the most important of the bananas commercialized by the Kanaks, although during the last ten years, the Poingo (Popoulou) bananas have also found a place in commerce.

Conclusion

As has been shown, in New Caledonia there are “true” bananas and the “others”. They can be distinguished by their prehistory and by their date of introduction into New Caledonia. Molecular markers show that the “true” bananas, or cooking bananas, are very probably among the first triploid bananas created. Very ancient, they originated in the Philippines-PNG area. Thus they could have come very early to the Pacific where somaclonal variations gradually appeared which were selected and maintained by man. (Their “brothers”, the South East Asia Plantains, must have been created at the same time but traveled westwards in Africa where they too became very diversi-
fied through mutation). The “other” bananas, of a dessert type, have a more complex and more recent origin in continental Asia. They are of much later introduction into New Caledonia.

Knowledge of the origin of Maoli and Popoulou bananas through scientific work in archaeology and genome studies helps to explain the importance of these bananas, which have lasted in cultivation for 3,500 years after their introduction, in Kanak society. Even in some rituals have now disappeared, the symbolic nature of the “true” bananas remains very strong indeed. Customary practices follow clonal classifications which vary from one clan to another. The “true” bananas still represent a clan’s identity and have a privileged position in the family food garden which, even if changes have occurred, still conserves the major components of the traditional system.

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