

A brief history of bananas

BANANAS are the most popular of tropical fruits. Native to tropical Asia, they were spread in cultivation to Africa about 3000 years ago and to America after Columbus. However, banana origins in tropical Asia are shrouded in mystery.

By Francis S. P. NG

“There is another tree which is very large and has wonderfully sweet and large fruit; it is used for food by the sages of India who wear no clothes”. This was the first published description of the banana in the West. The author was the ancient Greek philosopher-botanist Theophrastus (371 - 287 BC), whose information about Indian plants was provided by men in the army of Alexander the Great who had taken part in the invasion of India.

In the East, an early description of the banana appeared in a book by the Chinese scholar Chi Han in about AD 304. This book has been translated into English by Hui-Lin Li under the title *Nan-fang ts’ao mu Chuang: A Fourth Century Flora of Southeast Asia*. The geographical region that Chi Han referred to was the area covering present-day North Vietnam, Guangxi and Guangdong. In Chi Han’s time this was the southernmost limit of the Chinese world, and Chi Han was describing an exotic flora. He described the banana (*kan-chiao*) thus: *“The kan-chiao, seen from afar, resembles a tree. The larger plants are over one armspan in circumference. The leaves are ten feet long, or sometimes seven to eight feet, and over one to almost two feet broad. The flowers are as big as a wine cup, with the shape and colour of a lotus. Over one hundred pods are attached together at the end of the stem, called a fang (spathe). They are sweet and palatable and can also be preserved in honey. The roots resemble taro,*

the largest as big as a carriage wheel. Fruiting follows flowering, and the flowers, which have a cluster of six pods each, develop successively. The pods are not formed simultaneously and the flowers do not drop at the same time. It is also called Pa-chiao or Pa-chu. Removing the peel of the pod, the yellowish-white interior with a taste like the grape appears, sweet and soft. It satisfies hunger also. There are three kinds. The kind with pods the size of a thumb, long and pointed, resembling a sheep’s horn in shape, is called Yang-chiao-chiao (sheep’s horn banana), and is the sweetest and most delicious in taste. Another kind with pods the size of a hen’s egg and resembling a cow’s udder is called Niu-ju-chiao (cow’s udder banana), and is slightly inferior to Yang-chiao-chiao. A third kind is the size of a lotus rootstock; the pods are six to seven inches in length, squarish in shape, and considered the most inferior. The stem is separable into fibres, and when treated with lime, can be woven into thin cloth, called Chiao-ko (banana linen).”

Chi Han’s ‘sheep’s horn’ banana could be related to the Cavendish or Pisang Serendah bananas of the present because of the long, pointed and curved shape. His ‘cow’s udder’ banana could be related to Pisang Jari and Pisang Lemak Manis in which the swollen fruit narrows into a pronounced teat. His squarish banana is reminiscent of Pisang Abu.



Distribution area of wild bananas

**Chi Han's description of the banana
c.AD 304**

甘蔗望之如樹，株大者一圍餘。葉長一丈，或七八尺，廣尺餘二尺許。花大如酒杯，形色如芙蓉，著莖末百餘子大，名為房，相連累，甜美，亦可蜜藏。根如芋魁，大者如車轂。實隨華，每華一閩，各有六子，先後相次，子不俱生，花不俱落。一名芭蕉，或曰巴苴。剝其子上皮，色黃白，味似蒲萄，甜而脆，亦療飢。此有三種，子大如拇指，長而銳，有類羊角，名羊角蕉，味最甘好。一種子大如鷄卵，有類牛乳，名牛乳蕉，微減羊角。一種大如藕，子長六七寸，形正方，少甘，最下也。其莖解散如絲，以灰練之，可紡績為絛絡，謂之蕉葛。雖脆而好，黃白不如葛赤色也。交廣俱有之。《三輔黃圖》曰：漢武帝元鼎六年，破南越，建扶荔宮，以植所得奇草異木，有甘蔗二本。

Globalization

In about 1418, the Portuguese began to look for a sea route from Europe to India and China. The enormous landmass of Africa, at that time

of unknown size and shape, was blocking the way. To find a passage, the Portuguese sent one expedition after another down the coast of Africa. The Portuguese, like other Europeans of that time, believed that the earth was flat, and if one sailed too far from land, one would be swept over the edge of the ocean. Going too far south could also bring one closer to the sun to be killed by the heat. The Portuguese

sailors kept close to the African coastline, each expedition daring to go a little further than the previous one and then turning back with samples of plants and animals. These samples were examined for reassurance that normal life was possible down south. Then the next expedition would set off with mixed emotions of hope and fear. One of these expeditions came across the banana—in West Africa.

After 70 years, and dozens of expeditions, an expedition under Bartholomew Diaz finally sailed



A cow's udder banana: Pisang Lemak Manis

past the Cape of Good Hope, in 1488. The crew refused to go further, but Diaz realised that they had discovered and passed the southern limit of Africa and opened the way to India. Diaz determined the latitude of the Cape and this information was to play a crucial role in the next expedition.

Meanwhile, in Spain, Christopher Columbus persuaded the Spanish Government to sponsor an expedition to India by sailing west, based on the idea that the world is round. Columbus thought that by sailing west, he could reach India ahead of the Portuguese. In 1492, his expedition was approved and he set sail. From the Canary Islands off the west coast of Africa, he sailed westward into the ocean. For 20 days, his ships were out of sight of land and his crews got more and more terrified each day. Columbus himself was about to give up and turn back when flights of birds were spotted. Following the birds, they reached land on 12 October 1492. Columbus returned to Spain in triumph and led further expeditions to what later became known as America. Columbus did not get to India but he had destroyed the idea that the ocean had an edge.

Stung by the Spanish achievement, the Portuguese under Vasco da Gama set out in July 1497, determined to reach India this time. It had taken Bartholomew Diaz about 150 days, sailing close to the African coastline, to reach the Cape. Freed from the fear of being swept over the edge of the ocean, Vasco da Gama navigated by compass and latitude and sailed far south into the Atlantic Ocean until he

approached the latitude of the Cape of Good Hope. Then he turned east and arrived at the Cape after 93 days without sight of land.

Vasco da Gama then proceeded up the east coast of Africa and found coastal communities that were engaged in trade with India. At Malindi, in what is now Kenya, Vasco da Gama managed to employ a pilot to guide him across the Indian Ocean to Calicut in India, arriving in May 1498. He returned home in triumph. Other Portuguese expeditions quickly followed and by 1511, the Portuguese were in control of a chain of trading ports including Malacca on the Malay Peninsula.

The Spanish reached Asia from the opposite direction when Magellan led an expedition past the tip of South America, crossed the Pacific Ocean, and arrived in the Philippines in 1521. For 99 days, between Chile and Guam, Magellan had no sight of land. It had taken 30 years, between Columbus (1492) and Magellan (1521) to connect the world globally for the first time.



A square banana : Pisang Abu Nipah

Plants on the move

Columbus recorded in his diaries that he took grapes, sugar cane, oranges, lemons, citrons and melons to the new land and brought back to Europe maize, chilli and pineapple. Other American plants such as the potato, tomato, cassava, sweet potato, sunflower and tobacco followed. The Portuguese moved plants between America, Africa, India and South East Asia. The Spanish moved plants between America and the Philippines and from the Philippines the plants were spread into Japan, China and South East Asia.

Botany gets organized

New plants were being described one after another but there was no system for organizing the information and no sense of direction. The way forward was provided by the Swedish naturalist Linnaeus (1707 - 1778) who believed that each species was the result of a divine act of creation, and that it was a worthy mission to name, document and classify all the species of Creation. To achieve this mission, he promoted a standard way to name and classify all species. In his *Species Plantarum*, published in 1753, he gave each species a two-word name that identified the species and simultaneously fixed its position in classification. For example, he gave the name *Musa paradisiaca* to the first banana that he had personal knowledge of, based on a plant with edible fruits that he had successfully grown in a garden in Holland. *Musa* was derived from the Arabic name for the banana as recorded in an Arabic medical encyclopedia by Avicenna (Ibn Sina), while *paradisica* alluded to a legend among Christians in the Middle East that the banana was the Forbidden Fruit of Paradise. *Musa* became the genus

name (plural: genera) for all plants that could be classified as bananas.

The grouping of species into genera was the vital first step in classification. Genera could then be grouped into families, families into orders, and so on in a hierarchical system. Linnaeus' innovative system inspired explorers to name, document and classify the plants of the world. However, for 260 years, between 1492 and 1753, massive plant transfers had already taken place between continents, with the result that many species, especially weeds, could be found in widely separated parts of the world. To understand plant distributions, it became necessary to determine what plants had been spread by and after Columbus and what were already in place before Columbus. This issue was addressed by the French-Swiss botanist Alphonse de Candolle (1806 - 1893) who investigated the origins of many cultivated plants, including the banana.

The banana in America

There had been claims, especially by the German explorer Alexander von Humboldt, that the banana had been cultivated in the American tropics before the arrival of Columbus. Humboldt had explored the Americas in 1799 - 1804, seen bananas in cultivation in what he considered to be remote places, and had been informed by the natives that their people had cultivated bananas before the arrival of the Europeans. But this was already one century after Columbus. Columbus and the early Spanish explorers were known to have been active looking out for interesting plants, especially food plants, to take back to Europe, and they had never mentioned bananas. De Candolle concluded that bananas

could not have been present in America before Columbus.

The banana in Africa

The Portuguese had met with bananas in Africa before Columbus set sail. However, no wild bananas have ever been found in Africa, hence the bananas cultivated there could not have been derived locally from wild plants. They must have been introduced from Asia, the only continent on which truly wild bananas exist. Archaeological evidence from central Africa indicates that the banana was already cultivated there 2500 years ago. The evidence is in the form of banana-specific phytoliths found in ancient rubbish pits in Cameroon. Phytoliths are microscopic hard particles of silica dioxide that some plants deposit in their tissues. Phytoliths can last for thousands of years, after all other plant remains have disintegrated. The rubbish pits and the phytoliths themselves contain carbon that can be dated by radioactive carbon dating.

The banana in Asia

Tropical Asia, extending from India to South China, SE Asia, tropical Australia and the islands of Polynesia, is home to about 70 species of wild bananas and hundreds of cultivated varieties. New species are still being discovered in the wild, including the ornamental *Musa lokok* that Connie Geri and I discovered in the highlands of Sarawak in 2005. In many villages where bananas are cultivated, wild species come up by themselves wherever land is left unattended. There is no doubt that tropical Asia is the ancestral home of the cultivated bananas.

The cultivated bananas are distinguished by

fully-developed fruits that have no seeds or few seeds. Such plants would, in nature, die out without reproducing. However, seedless bananas are better for eating. Bananas are easy to propagate by separation of young plants (known as offshoots or suckers) that grow out from the base of old plants. They do not need irrigation, seed handling, germination, weeding, and other demanding skills. Hence the cultivation of bananas is likely to have originated informally all over tropical Asia from the time of the early human settlements.

Many of the cultivated bananas have been found to be triploid or tetraploid instead of diploid, which means they have three or four sets of chromosomes instead of the normal two sets (one set from each parent). Chromosomal abnormalities are known to be responsible for seedlessness, but in bananas many diploid forms are also seedless, so abnormal ploidy level is not the primary cause of seedlessness.

The AB system of classification

Two wild species, *Musa acuminata* and *Musa balbisiana* are thought to be the progenitors of the cultivated bananas. *Musa acuminata* occurs all over the Malay Archipelago and one variety (*M. acuminata* var. *malaccensis*) is commonly found in the Malay Peninsula in forest clearings, e.g. in the areas cleared for power transmission lines. The distribution of *Musa balbisiana* is rather curious. It has been reported from East India to South China (but apparently not Vietnam), the Philippines, Moluccas and New Guinea. It is not known where and when hybridization occurred.

The cultivated bananas have been classified according to their presumed genetic content

e.g. AA, AAA, AAB, ABB, BBB etc., with A representing the *acuminata* genome (set of genes) and B representing the *balbisiana* genome. The ploidy level is determined by direct chromosome count but the balance of A and B is determined by a curious scheme based not on genomic analysis, but on an arithmetic formula in which 15 quantitative morphological features are scored on a scale of 1 - 5 (Valmayor *et al.* 2000). For example, a short fruit stalk is scored 1 and long fruit stalk is 5. A score of 1 favours *acuminata* while 5 favours *balbisiana*. Intermediates are scored 2, 3 or 4. The scores are added up. A score of 15 - 25 would indicate an *acuminata* genome while a score of 70 -75 would indicate a *balbisiana* genome. Hybrids would be indicated by scores of 26 - 69 points.

Pisang Mas and Pisang Lemak Manis are rated AA, Pisang Berangan is AAA, Pisang Tanduk is AAB, and Pisang Abu Nipah is BBB. Hence



Pisang Mas, Pisang Lemak Manis and Pisang Berangan, having purely A genomes should be considered as forms of *M. acuminata* and Pisang Abu Nipah having a purely B genome should be considered a form of *M. balbisiana*. Those forms with mixed genomes such as Pisang Tanduk AAB would be hybrids.

Disease, diversity and food security

The vast majority of the cultivated varieties are grown for local food consumption, but the international export trade has been dominated by two varieties, Gros Michel and Cavendish. Gros Michel, which resembles the Pisang Embun of Malaysia, was grown in Jamaica in 1835. It became the first banana of international commerce and was grown as a large scale monocrop in Central America until the mid-1950s when the Panama disease, a wilt disease caused by the fungus *Fusarium oxysporum*, wiped out the Gros Michel plantations. The disease was already known in the 1890s but the industry had managed to keep ahead of the disease by continuously expanding into land newly cleared of forests. The banana industry was saved



The wild lowland banana *Musa acuminata*, in Raub, Pahang. Left: fruiting tree. Right: fruits.

by another variety, the Cavendish, which was resistant to Panama disease. The Cavendish is a short plant, resembling the Pisang Serendah of Malaysia, but was derived from plants grown in China. It was taken from China to Mauritius in about 1826, and from Mauritius to England where it was grown by William Cavendish, the 6th Duke of Devonshire. From England it was sent to the Canary Islands where it was first grown in plantations. Cavendish plantations are now threatened by a new strain of Panama disease.

Panama disease and other diseases do not greatly threaten the local varieties of bananas

in tropical Asia because local varieties are not grown in large single-variety plantations. The banana growers change from one variety to another in response to diseases. One good crop encourages more planting of the same variety until a disease takes hold and destroys the crop. The farmer then changes to something else. The abandoned variety persists in small numbers in locations that happen to be free of disease. Such survivors then provide the foundation stock for a future comeback. If the foundation stock carries a new mutation, this mutation would be multiplied when the variety is multiplied and in this way, varieties could change through time while bearing the same names.

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