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## **Let's go bananas with paintings**

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### **ABSTRACT**

**We will tell the story of the complex history and global distribution of the very popular banana and illustrate this with amazing depictions by artists and scientists. In addition, we will discuss the major changes that occurred during domestication and the risks associated with maintaining a monoculture.**

The banana is a major starchy staple food in Africa, South America, Central America and Asia, and a major cash crop worldwide. Dessert bananas (with a sweeter form of fruit) and cooking bananas (with a starchier fruit that is often cooked before eating) belong to the *Musa* genus (with more than 50 known species) within the Musaceae family (here, these are referred to as bananas throughout the text). Linnaeus made the name *Musa* official, and this name is likely derived from the Arabian word for the fruit, namely “mauz”, as it was used by the Persian polymath Ibn Sina (980 – 1037) in his *The Canon of Medicine*. Alternatively, the name comes from Antonius Musa, a Greek botanist and the Roman Emperor Augustus's physician [1].

### **The banana, a virgin fruit**

The banana plant is a gigantic perennial herbaceous monocotyledonous plant, and the “stem” is made up of the bases of huge leaf stalks, and there is an enormous diversity in wild bananas<sup>1</sup>. Botanically, the banana fruit is a berry, and the fruits of the wild ancestors are filled with hard seeds and a small amount of fleshy pith. Banana was domesticated from *Musa acuminata*, but several gene pools, including *M. balbisiana* and *M. schizocarpa*, are contributed to banana cultivars [2-4]. Cultivated bananas, which are diploid, triploid or tetraploid, differ from their wild relatives by being seedless and parthenocarpic (from the Greek ‘virgin fruit’), namely the fruit develops without pollination and fertilization or seed development. The three sets of chromosomes prevent the formation of viable reproductive cells, but – while candidate genes have been identified – the underlying genetic basis that triggers seedless fruit formation is largely unknown [5]. The associated early mutations likely contributed to the potential of the banana as an important crop.

### **The banana centre of origin: South-East Asia**

The journey of the banana is complex, and – based on linguistic, archaeobotanical and gene marker evidence – there were likely multiple regions of domestication resulting in an enormous diversity (see Online Supplemental Information **Note S1**) [3]. The centre of origin of the banana lies in South-East Asia. The banana family originated and diversified during the early Eocene in northern Indo-Burma [6]. Because distinctive phytoliths (tiny, complex-shaped particles of silica laid down in plant cells) of cultivated bananas appear at Kuk valley of Papua New Guinea around 6800 years ago, this is the first known instance of banana domestication [7]. It is thus not surprising that Georg Everhard Rumphius, a German-born naturalist and merchant of the Dutch East India Company on the island of Ambon in the Moluccas (in the vicinity of Papua New Guinea), described 16 different types of banana (including a wild species containing seeds, referred to as Pissang Batu) in his *Herbarium Amboinense* (1741-1750) and he even mentioned that growers in Batavia (now Jakarta) claim to have over 80 varieties. About 1000 – 3000 years ago, (domesticated) bananas spread to Africa [8, 9] and in the 16<sup>th</sup> century banana cultivation in the Americas was rapidly expanding [10].

### **The dangers of a monoculture**

At the end of the 19<sup>th</sup> century – beginning of the 20<sup>th</sup> century, the transport and cooling revolution changed the destiny of the banana. From an exotic luxury, it became a common fruit. The Gros Michel cultivar dominated the international banana trade during the first part of the 20<sup>th</sup> century. Until, in the 1950s, an outbreak of Panama disease (*Fusarium oxysporum* f.

sp. *Cubense* race 1) almost wiped out the commercial production [11]. Because high yield Cavendish bananas were resistant to the *F. oxysporum* f. sp. *Cubense* race 1 and could stay green for several weeks after being harvested, they quickly replaced the Gros Michel. However, the Cavendish is also susceptible to several diseases, including an *F. oxysporum* strain, known as Tropical Race 4 (TR4) [12]. So, it seems that history is repeating itself, as TR4 is spreading from Asia to Africa and has also reached South America (see Online Supplemental Information **Note S2**). This is threatening worldwide banana production, and impacting people's livelihoods and the communities that rely upon it.

### **Depicting bananas**

Banana plants and fruits have always been an important element in the visual arts. In the 20<sup>th</sup> century, the banana has been the subject of Andy Warhol's cover art for the Velvet Underground's debut album in 1967. The first depictions and descriptions of the banana plant appear in the earliest Western herbals of the East Indies, written by botanists such as Garcia de Orta (*Colóquios dos simples e drogas da India*, 1563) and Jacobus Bontius (*De medicina Indorum*, 1642). The first detailed and/or colored illustrations of bananas can be found in *Hortus Malabaricus* (1678-1703) by Hendrik Adriaan van Reede tot Drakestein and especially in the *Herbarium Amboinense* (1741-1750) of G. E. Rumphius (**Figure 1A**). Another detailed drawing occurs in the book *Metamorphosis insectorum Surinamensium* (1705) by the German-born artist and entomologist Maria Sibylla Merian. In addition, we also find an illustration of the banana plant and fruit in the *Acta Eruditorum* (*Acts of the Erudite*), the first scientific journal of the German-speaking lands of Europe, in 1734 (**Figure 1B**). The banana was furthermore the sole subject of a botanical monograph written by Carolus Linnaeus that was dedicated to a single species (*Musa Cliffortiana*, 1736), accompanied by two detailed illustrations of the plant in its entirety and a close-up showing the inflorescence. In the 17<sup>th</sup> to 18<sup>th</sup> century, the banana also regularly features in still lifes or in landscape paintings. In the 17<sup>th</sup> century, the Dutch artist Albert Eckhout traveled to Brazil and painted, for example, "Bananas, guaves and other fruit" (**Figure 1C**). Another 17<sup>th</sup> century example is "A market stall in Batavia" (attributed to Andries Beeckman), where – among many other fruits – short, plump bananas hang in bunches (**Figure 1D**). The mid-17<sup>th</sup> century "Brazilian landscape with anteater" by Albert Post also includes a banana plant. The first flowering banana plant in Northern Europe grew in the greenhouse on the estate of George Clifford in The Netherlands, where Linnaeus was briefly appointed as head gardener and responsible for this horticultural breakthrough. This flowering banana plant is thus depicted on the cover of his *Hortus*

*Cliffortianus* (1738) (**Figure 1E**). There is also a beautiful illustration of the Chatsworth banana, from which the Cavendish name is derived, in Paxton's Magazine of Botany and Register of Flowering Plants from 1837<sup>ii</sup>. In addition, the late 19<sup>th</sup> century painting “The meal” by Paul Gauguin depicts cultivated bananas in Tahiti (called Fe'I bananas) (**Figure 1F**).

### **Bananas as (sexy) icons**

Around 77 AD, the Roman Plinius the Elder describes the banana as the favorite fruit of the wise in his *Historia Naturalis*. From at least the 8<sup>th</sup> century, Hindus refer to the banana as *kalpataru* or virtuous plant [13]. The banana plant was the favorite place for Indian mystics to meditate, and they saw the fruit as the incarnation of Lakshmi, the goddess of wealth and prosperity. It was believed by, for example, Linnaeus and Garcia de Orta that the forbidden fruit from the tree of knowledge in paradise was a banana, giving rise to the species names *Musa sapientum* L. and *Musa paradisiaca* L. [1]. In addition, there are many oral traditions and associated ritual practices around the Indian Ocean that show the cultural depth for bananas [14]. The banana has also been used as a more suggestive icon. A famous 20<sup>th</sup> century example is the banana dress of Josephine Baker<sup>iii</sup>. And off course, there is the launch of Miss Chiquita by United Fruit in the 1940s, together with the famous jingle by Garth Montgomery (lyrics) and Len Mackenzie (music)<sup>iv</sup>. More recently, Maurizio Cattelan used a fresh banana affixed to a wall with duct tape in his conceptual artwork *Comedian*<sup>v</sup> as a reflection on the value we give to things.

### **Concluding Remarks**

Bananas have a complex history but have embedded themselves in our daily life. Notwithstanding bananas have conquered the world, this fruit faces several threats. However, the 523-megabase genome of a *Musa acuminata* doubled-haploid genotype [15] holds, in part, the key to solving the origin and the parthenocarpy of the banana and to tackling the diseases that threaten our Cavendish bananas.

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### **Resources**

<sup>i</sup> [www.calameo.com/read/000644152a6641c6b8276](http://www.calameo.com/read/000644152a6641c6b8276)

<sup>ii</sup> [archive.org/details/paxtonsmagazineo03paxt/page/n89/mode/2up](http://archive.org/details/paxtonsmagazineo03paxt/page/n89/mode/2up)

<sup>iii</sup> [www.theministryofhistory.co.uk/historical-biographies/josephinebaker](http://www.theministryofhistory.co.uk/historical-biographies/josephinebaker)

<sup>iv</sup> [www.youtube.com/watch?v=RFDOI24RRAE](http://www.youtube.com/watch?v=RFDOI24RRAE)

<sup>v</sup> [en.wikipedia.org/wiki/Comedian\\_\(artwork\)](http://en.wikipedia.org/wiki/Comedian_(artwork))

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## FIGURE



**Figure 1.** Bananas and the visual arts. (A) Banana fruit in *Herbarium Amboinense* (1741-1750) by G. E. Rumphius (Leiden University Libraries, BPL 311, book 8, p. 7). (B) Illustration of fruit and banana plant from *Acta Eruditorum* (1734). (C) *Bananas, guavas and other fruit* (17<sup>th</sup> century) by Albert Eckhout (National Museum of Denmark). (D) *A Market Stall in Batavia* (c. 1640 - c. 1666) attributed to Andries Beeckman (Rijksmuseum, The Netherlands). (E) Cover of *Hortus Cliffortianus* (1738) by Carl Linnaeus. (F) *The meal* (1891) by Paul Gauguin (Musée d'Orsay, France).