

Uses

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General overview

Although throughout history bananas and plantains have provided humans with medicine, clothing, tools, shelter, furniture, paper, and crafts, their most important role is in human nutrition. Bananas and plantains are foods of great nutritional importance and play a significant role in food security in the DR Congo. They are mainly grown by farmers for their own consumption and for the local market.

The socio-cultural and ethnological dimensions of the genetic resources of bananas and plantains in the DRC are of paramount importance, as these aspects explain the ubiquity of bananas and plantains around huts, not only in rural areas but also in urban areas.

Fruits are rich in carbohydrates, which are necessary for energy production in the human body. They are a rich source of carbohydrates, which account for 22% and 32% of the weight of bananas and plantains, respectively. They also contain vitamins C and B6 (Table 1) and are particularly rich in potassium, magnesium, phosphorus and calcium. Plantains are a very important source of vitamin A.

Taking potassium as an example, an adult's daily requirement can be met by consuming 5 dessert bananas or 4.5 plantains. In addition, 100 g of bananas provide more energy (92-122 kcal) than potatoes (79 kcal) (Table 1). High consumption of dessert bananas after a meal (400 g, or more than three bananas) reduces the oxidation of LDL cholesterol, which is involved in the development of cardiovascular disease. It should be noted that dried bananas contain more energy than fresh bananas (285 kcal per 100 g, or 1141 kilojoules) and the composition can vary widely depending on the cultivar, which shows that a good biochemical characterisation of these is necessary to promote certain cultivars for a more balanced diet (Table 1).

Table 1. Chemical composition of bananas and plantains per 100g of fresh and dried fruit

Components	Unit	Dessert banana			Plantain			Daily (adult)
		Unripe	Ripe	Flour	Unripe	Ripe	Flour	
Energy	kcal	110	89	257	91	122	340	
Water	g	69	74	28	63	65	3.0	2-3 1
Protein	g	1.4	1.1	3.0	0.8	1.3	3.9	50
Total lipids	g	0.2	0.3	1.0	0.1	0.4	1.8	65
Carbohydrate	g	28.7	21.8	63.0	24.3	32	82.1	300
Fibre	g	0.5	2.0	5.5	5.4	2.0-3.4	7.6	25
Mineral elements								
Potassium	mg	-	385.0	1150.0	-	500	1,491.0	3,500
Magnesium	mg	-	30	90.0	33	35.0	108.0	400
Phosphorus	mg	-	22	75.0	35	30.0	74.0	1000
Calcium	mg	8	8.0	20.0	7	3.0	22.0	1000
Sodium	mg	-	1.0	8.0	-	4.0	3.0	2400
Iron	mg	0.9	0.42	1.3	0.5	0.6	1.15	18
Copper	mg	-	0.11	0.4	0.16	-	0.39	2.0
Zinc	mg	-	0.18	0.5	0.1	-	0.61	15
Manganese	mg	-	0.2		15	-	0.57	2.0
Vitamins								
Provitamin A	µg	-	-	-	-	232-2000	-	-
Vitamin B6	mg	-	0.47	-	-	-	-	1.3-1.7
Vitamin C	mg	3	11.7	4.0	20	20	-	75-90
Vitamin E	mg		0.29	0.6			-	15
Thiamine	mg	0.04	0.04	0.1	0.05	0.08	0.18	1.5
Riboflavin	mg	0.02	0.07	0.18	0.05	0.04	0.24	1.7
Niacin	mg	0.6	0.61	2.0	0.7	0.6	2.8	20
Acid	mg	-	0.28	-	0.37	-	-	10
Pantothenic								
Total folate	µg	-	23.0	-	0.016	-	-	400
Biotin	µg	-	2.6	-	-	-	-	300
β-carotene	µg	48.3	68.0	150.0	0.03-1.2	390-1035	183.0	800

There are two types of starchy bananas: the first is cooked when the fruit is green and is nutritionally a basic source of starch similar to potatoes. This type of banana can be conditioned to ripen and eaten raw as a dessert banana. This type mainly includes cultivars such as Pisang Awak, Bluggoe, Cardaba (*Musa* sub-group ABB) and East African highland bananas (e.g. Bisamunyo, AAA-EAHB). The second type of cooking banana (AAB) remains starchy at maturity and should be fried or cooked before consumption, rarely they are eaten raw. These are true plantains. Beer bananas (also East African Highland bananas-AAA) are those whose pulp has a bitter taste. These bananas produce juice and alcohol after fermentation and distillation.

These cooking bananas and plantains can be fried, grilled, boiled, steamed but also eaten raw when ripe. They can be cooked with or without the peel, wrapped in banana leaves. Ripe dessert bananas are eaten raw. However, they are also used in the preparation of cakes.

Although bananas and plantains play an important role in the diet of most of the local population in the DR Congo, they are also used in many other areas. The leaves can be used as packaging, umbrellas, plates and clothing during traditional ceremonies or rituals. They can also be used as roofing for temporary dwellings. Dried leaf sheaths are used in the manufacture of clothing, baskets, ropes, hats and handicrafts. Dried and charred peelings, especially from plantains, are used in the manufacture of potassium bicarbonate to soften certain foods and in the manufacture of soft soaps.

Uses in human nutrition

Bananas and plantains are prepared or consumed in several ways. Unripe or half-ripe plantains are eaten boiled or pounded into a popular paste called "Lituma" (Lokele tribe) (Figure 1). Among certain populations (the Boa tribe, for example), this paste is made exclusively from plantain. It may include a mixture of boiled and pounded cassava in varying proportions depending on taste or the availability of one or the other ingredient. Plantain paste is most often eaten with meat, fish or vegetables.



Figure 1. Boiled and pounded plantain (a) and lituma dish (b)

Medium-ripe plantains are used to make chips. These are made from plantains cut into strips and grilled (Figure 2).



Figure 2. Plantain chips in a supermarket in Kinshasa-Gombe

Ripe plantains are fried in oil and sold in restaurants where they are eaten with tea, corn meal porridge, omelettes, etc. Ripe (or slightly ripe) plantains are cooked with fresh crushed peanuts to make porridge. According to traditional belief, this porridge is a food for breastfeeding women and is used to stimulate abundant breast milk production. Similarly, unripe plantains are also prepared with cassava leaves, which play the same role as the former.

Plantains are also prepared as a vegetable, broth or sauce mixed with fish and other ingredients (Figure 3). Bananas and plantains are dried and processed into flour. This flour is mainly used in the preparation of porridge for infants and dough for adults, either mixed with cassava flour or on its own.



Figure 3. Plantain-based broth

Ripe dessert bananas such as Gros Michel (AAA), Grande naine (AAA), Figue Pomme (AAB) and Kamaramasenge (AAB) and Yangambi Km 5 (AAA) cultivars are commonly eaten as dessert. However, they are also used in the preparation of chips and cakes. Bisamunyo (AAA), Cardaba, Bluggoe and Pisang Awak (ABB) are eaten after cooking. Pisang Awak is also used in the preparation of local alcoholic beverages. This also applies to all other bananas and plantains when there is a surplus of fruit.

The fruits of beer bananas are used to make a local beer called Kasiki in high-altitude regions. In low-altitude regions, the Yangambi Km 5 dessert banana is used to make alcoholic beverages called Lotoko, as is the case with the Azande people in Uele.

Extracts from the ashes of plantain peels are used to soften and tenderise cassava leaves and improve the quality of food made from mushrooms and snails. In addition, these extracts play the same role as sodium bicarbonate in the preparation of cakes and are also used in the manufacture of indigenous potassium-rich salts. Ngbandi, Boa and others consume banana and plantain male buds as vegetables.

Other uses

Every part of the banana and plantain plant is used for traditional purposes such as medicinal, technical and ceremonial uses. To this end, different parts are used, such as the skin of the fruit, fresh and dry leaves, pseudo stem, flowers, roots and bulbs. It should be noted that these multiple uses, which date back a long time, have resulted in the selection of cultivars with characteristics that are of interest to humans.

Medicinal uses

Medicinal use varies from one tribe to another depending on local knowledge. Bananas and plantains are used by farmers in rural areas in various forms to relieve certain illnesses not only in humans but also in some animals.

❖ Fruit skin

The product obtained by mixing the fruit peel or the burnt tip of the finger with local salt, is applied to the teeth to relieve pain. The charred peel of the fruit is used by the Ngbandi people as toothpaste to prevent tooth decay. When the human skin swells because of a mosquito bite, fresh banana or plantain peel is rubbed onto it to relieve the pain. It is also heated and applied to the problem area. After being heated on hot coal, banana and plantain peels are massaged onto a woman's pelvis after childbirth. The peel of the ripe fruit is used to treat poisoning, constipation and high blood pressure. To this end, it is dried in the sun and then burned in a fire to collect the ashes, which are then mixed with water and filtered. The liquid obtained from this mixture is heated over a fire to obtain potash crystals for treatment. Among the Mongo people, the ashes extracted from the skin or leaves are poured into the nostrils of people who have fainted and are also used to combat head lice.

❖ Fresh leaves

Fresh leaves are steeped in hot water and used as medicine after excessive sweating in direct sunlight to treat malaria, fever and flu.

❖ Dried leaves

The dry leaves collected from the plant are immersed in hot water and massaged to relieve sprains. In addition, they are boiled and the juice obtained is consumed as tea and used to relieve people suffering from heart attacks and gout due to high levels of uric acid in the blood. The smoke from burning dry leaves is inhaled to combat headaches. This practice is most common

in the lowlands of the Democratic Republic of Congo. A decoction of dry leaves is used as a purgative by the Mongo people.

❖ **Other plant parts**

The sap from the pseudostem of young plants is used by the Bangala people as a medicine for jaundice, while the sap from the corm is used as a vermifuge. Among the Mongo people, the rotten bulb is used to treat ulcers and also serves as an emetic. In addition, this people mix the male flowers of the banana and plantain plants with bath water to combat fever. In south-eastern DR Congo, banana sap collected from the pseudostem or leaf sheath is applied to wounds as first aid.

Technical uses

❖ **Fruit peel**

The ash from the green peel is used as potash in cooking or soap making. When ripe, banana or plantain peels are dried in the sun until they turn brown-black. They are then burned to collect the ash. For cooking, this ash is mixed with water and filtered, and the filtrate is added to vegetables during cooking to soften them and give a good flavour. To make indigenous soap, palm oil is mixed with bicarbonate obtained by filtering the ashes (burnt peelings) in a bath. When heated, a homogeneous mixture is obtained. After cooling, balls are made and sold as soap in local markets.

❖ **Fresh leaf**

Fresh leaves are mainly used for wrapping. They are used to wrap cassava dough called "chikwangué". The pot containing the mixture is covered with fresh leaves tied together with a rope extracted from the pseudostem to keep the steam hot in the pot or to cover the food. In addition, fresh leaves are used to wrap special meat or fish dishes called "liboke". Fresh meat is wrapped in fresh leaves and then exposed to fire to be cooked by the heat. This practice is most common in restaurants. Fresh leaves are also used when cooking bananas and plantains placed over a pot containing cassava leaves. Fresh leaves are also used as a display for drying fresh cassava, rice and other products. They serve as lids for pots when preparing food. They are also used as umbrellas. During important church ceremonies such as Easter and Christmas, fresh leaves are used for decoration.

❖ **Dry leaves**

Dry leaves are used to wrap tobacco to make cigars. They are rolled into hoops that are placed on the head to carry luggage and are used to make hats, house roofs and beds. Dry leaves are used to make special outfits for mourning ceremonies and celebrations and are also used as mattresses.

❖ **Pseudostem**

Coarse fibres are extracted from the pseudostem to make ropes, which are used to make fishing nets and hats and to build huts. The pseudostem is also used as a chair. In music, it is used to make xylophones. It is also used as a pallet on which planks are placed. It is also thrown across certain waterways to form bridges. Floating on water, the pseudostem is used by children to learn to swim (Figure 4).



Figure 4. Learning to swim using a pseudostem from a banana plant

Cultural ceremonies

Plantain is one of the gifts offered to the family of the future bride when the dowry is presented. Among the peoples of the equator, dry or fresh leaves are sewn together to make hats and belts to welcome a chief. At the birth or presentation of twins, dry leaves accompany the ceremony to welcome the newborns. Warriors lie on fresh leaves and are then covered with other fresh

leaves, which are cut with a machete removed from the fire. Victory is assured if the leaves are not damaged and the man is not injured; defeat is assured if the opposite occurs.

Among the Azande, the dowry is spread out on fresh leaves during the traditional wedding ceremony. Among the Ngombe, fresh leaves are said to cause the death of a man who protects himself with fetishes. The Mongo people make protective fetish shells from the petioles. Among the Sakata people, there is a mysterious link between the birth of twins and plantains. The umbilical cords of twin babies are buried under the plantain stump and the fruit of the plant is eaten exclusively by the eldest child in the family. Among the Ngombe, the umbilical cord and foreskin are buried under the plantain stump by the maternal grandmother, and the plantain fruit is eaten exclusively by the maternal family. In times of misfortune, the Lega people use Ensete leaves to protect themselves from evil. During traditional Azande wedding ceremonies, the dowry in cash is placed on leaves spread out on the ground before being accepted by the in-laws. Dried banana and plantain leaves are used as nesting and breeding grounds for poultry (chickens and ducks). The dried leaves are used as coffins for stillborn babies, who are buried at the door of their parents' house in the hope that they will be reborn.

The pseudostem is used to represent the corpse of a person who has died far from home. The pseudostem is thrown into the water in search of the drowned corpse. It is placed where the person drowned, and with the current of the water, the pseudostem will find the body. Among the people of northern DR Congo, the pseudostem of the Bisamunyo cultivar is displayed in the field to protect against sorcerers. The Cavendish cultivar is considered to have ritual properties by certain peoples in western and eastern DR Congo.

Semi-industrial flour production

Introduction

To reduce post-harvest losses of bananas and plantains, add value to them and facilitate the export of fruit to distant markets, there is a need to introduce processing technology that can facilitate the production of flour. Flour can be easily stored, transported and sold for use in other foods, either on its own or in combination with cassava, maize or *Treculia africana* flour (which is rich in protein for children with nutritional deficiencies). The drying of peeled bananas over the hearth in households of certain ethnic groups in the Democratic Republic of Congo exist in regions of high production, but the product obtained is of poor quality due to smoke. Figures 5-9 show the procedures for obtaining flour from bananas and plantains.



Figure 5. Peeling (a) and cutting into chips (b) of banana and plantain



Figure 6. Heating hot water (a) and soaking (b) bananas and plantains



Figure 7. Sun-drying and fire-drying on a rack



Figure 8. Dried chips and banana and plantain flour



Figure 9. Bagging or packaging

To improve quality and diversify food uses, the technique developed consists of peeling unripe bananas and plantains (even immature bunches from fallen plants), cutting them into small slices, and soaking them for 3 to 5 minutes in hot water with lemon juice added to preserve their white colour. They are then dried in the sun or on a rack placed 1.5 m above a charcoal fire until completely dry. The dried chips are crushed in a mortar and then sieved, or better still, ground in a mill to obtain a good banana or plantain flour. This can be mixed in various proportions with corn, cassava, soybean or *Treculia africana* (African breadfruit) flour. Banana and plantain flour is most popular as porridge, especially when mixed with *T. africana* flour.