

Review on: All about Banana Fruit

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Abstract: Products from natural sources have been used from thousands of years. Banana is famous for its traditional, medicinal and nutritional values. India is a largest producer of banana in the world and it is grown almost all parts of India. Banana fruits are excellent food supplements. Banana processing is a boon of science and technology with multiple benefits. In India the development of commodity of consumer interest by value addition of fruits is less than 2% of the annual agricultural produce hence there is a tremendous scope for enhancing its processing. Hence in the present paper we have highlighted major products of banana. Its medicinal and traditional values.

Keywords: *Musa paradisiaca*,Anti Lipidemic, Anti Depressant, Anti Hypertensive, Anti Fungal

Introduction:

Banana is the common name used for the herbaceous plants of the genus *Musa* (family *Musaceae*). The banana fruit originated from the tropics in Southern Asia and is classified as the second largest produced fruit in the world after citrus. The fruit is cultivated in more than 100 countries throughout the tropics and subtropics with an annual world production of about 98 million tonnes, of which around a third is produced in each of the African, Asia-Pacific, Latin American, and Caribbean regions [1]. The general term “banana” describes the cultivated varieties of the genus *Musa*, made up of two subgroups, sweet bananas, and plantain. Banana is of great use both traditionally and pharmacologically and this is attributed to the presence of its diverse phyto-constituents as the pulp and peel extracts of banana are shown to have fatty acids, steryl esters, and sterols, besides oleic and linoleic acids.

Various parts of ripe and unripe forms of the banana plant have been shown to possess prominent anti-diabetic, antiulcer, and radical scavenging activities. Lately, banana has been utilized as a vector for many vaccines due to increased bioavailability and easy administration [2]. The fruit is also used as a treatment for burns and wounds. For immediate pain relief, beat a ripe banana into a paste and spread it over a burn or wound. For best results, cover the area with a cloth bandage. Even banana leaves can be used as a cool compress for burns or wounds. Other medical benefits of bananas include aiding in constipation and diarrhea relief, treatment of arthritis, and treatment of anemia [3].



Figure 1. Ripe banana and Unripe banana. (Source: Internet Wikipedia)

Description:

A banana is an elongated, edible fruit – botanically a berry – produced by several kinds of large herbaceous flowering plants in the genus *Musa*. In some countries, bananas used for cooking may be called "plantains", distinguishing them from dessert bananas. The fruit is variable in size, color, and firmness, but is usually elongated and curved, with soft flesh rich in starch covered with a rind, which may be green, yellow, red, purple, or brown when ripe. The fruits grow upward in clusters near the top of the plant [4].

Table 1.Taxonomy

Kingdom	PLANTAE
Order	ZINGIBERALES
Family	MUSACEAE
Genus	MUSA

**Figure 2. Banana inflorescence to fruit developmental stage**

The fruit bunches are either asymmetrical if borne sub-horizontal or compact if borne vertical, and fruits exhibit marked geotropic curvature. The individual fruits (length 8- 13 cm, diameter 1.5- 3.0 cm) are subcylindrical, and the young, angled fruit becomes almost straight at ripening. Fruits are narrowed at the base into a pedicel of about 1 cm, and apex into a prominent acumen of 0.6- 1.5 cm in length. The pericarp is about 2 mm thick with bright yellow color at full ripeness, and the pulp is of white or cream yellow to yellow color. Seeds are dull black, smooth, or minutely tuberculate, irregularly angulate, and measure 6- 7 mm in length and are about 3 mm in height (Cheesman [5]).

Chemical Compositions**Table 2: Composition for Banana fruit (Nutritional value pre 100 gm)**

Energy	371 kJ (89 kcal)
Carbohydrate	22.84 g
Sugars	12.23 g
Dietary fiber	2.6 g
Fat	0.33 g
Protein	1.09 g
Thiamine (B ₁)	(3%) – 0.031 mg
Riboflavin (B ₂)	(6%) – 0.073 mg
Niacin (B ₃)	(4%) – 0.665 mg
Pantothenic acid (B ₅)	(7%) – 0.334 mg
Vitamin (B ₆)	(31%) – 0.4 mg
Folate (B ₉)	(5%) – 20 µg
Choline	(2%) – 9.8 mg
Vitamin C	(10%) – 8.7 mg
Iron	(2%) – 0.26 mg
Magnesium	(8%) – 27 mg
Manganese	(13%) – 0.27 mg
Phosphorus	(3%) – 22 mg
Potassium	(8%) – 358 mg
Sodium	1 mg
Zinc	(2%) - 0.15 mg
Flouride	2.2 µg

Source: USDA Nutrient Database, Units: µg - micrograms; mg - milligrams; IU – International units [6]

Table No -3 Active Constituents

Carbohydrates	Sugar, Starch, Fiber, Cellulose [7]
Proteins and Amino acids	Starch phosphorylase, Malate dehydrogenase, Pectate lyase, Dopamine, Catecholamines, Linoleic acid, Putrescine, Serotonin, Spermidine, Norepinephrine [7]
Vitamins	vitamin B1 (thiamine), vitamin B2 (riboflavin), vitamin B3 (niacin), vitamin B6 (pyridoxine), vitamin B7 (biotin), vitamin B9 (folic acid or folate), vitamin B12 (cobalamins), vitamin C (ascorbic acid), vitamin D (calciferol), vitamin E (tocopherols and tocotrienols), vitamin K (phylloquinone and menaquinones) [7]
Minerals	Calcium, Copper, Zinc, Magnesium, Potassium, Manganese, Phosphorus, Sodium [7]
Phenolic Acid	Hydroxyphenylpropanoic acids, Hydroxycinnamic acids, Ferulic acid, Caffeic acid, p-Coumaroyl glycolic acid, Hydroxyphenylacetic acids [8]
Phenolic compound	Gallic acid, catechin, epicatechin, tannins and anthocyanins, gallicatechin, epigallocatechin, quercetin, myricetin, kaempferol, ferulic, sinapic, salicylic, gallic, p-hydroxybenzoic, vanillic, syringic, gentisic and p-coumaric acids [9]
Carotenoids	Lutein, β-carotene, α-carotene, violaxanthin, auroxanthin, neoxanthin, solution, β-cryptoxanthin, and α-cryptoxanthin [9]
Flavonoids	[8]
1. Anthocyanins	Delphinidin (3-O-(6"-acetyl-galactoside)), Pelargonidin (3-O-(6"-succinyl-glucoside)), Malvidin (3-O-(6"-acetyl-glucoside))
2. Isoflavonoids	2'-Hydroxyformononetin
3. Flavonols	Isorhamnetin3-O-glucoside 7-O-rhamnoside Myricetin3-O-rutinoside Patuletin3-O-glucosyl-(1->6)-[apiosyl(1->2)]-glucosid Quercetin3-O-xylosyl-glucuronid

4. Flavanols	(+)-Gallocatechin 3-O-gallate
5. Flavones	Apigenin 7-O-apiosyl-glucoside Chrysoeriol 7-O-glucoside
6. Flavanones	Neoeriocitrin
7. Other Polyphenols Hydroxycoumarins	Scopoletin, Urolithin A, Umbelliferone

Pharmacological Activities

Banana has various pharmacological effects. All parts of the bananas have nutritional and traditional medicinal use. Many clinical and animal model studies (Invitro) suggest that various parts of banana act as medicines for the treatment of diseases like Diarrhea, Ulcers, Cancer, Diabetes, and infections.

The prominent ones of more relevance to healthcare are discussed in the below sections.

Antioxidant

IC_{50} value of ethanol extract of Candi banana was 3374.13 ppm and ethyl acetate extract of Candi banana (*Musa paradisiaca*) 40318.19 ppm. Ethanol extract had higher antioxidant activity than that ethyl acetate extract. Ethanol extract contains a higher amount of phenolic, flavonoids, and tannin than that ethyl acetate extract. This research explores the type of solvent of ethanol and ethyl acetate that affects the amount of extract of the bioactive compound and antioxidant activity of Candi banana. The result shows that the antioxidant activity of ethanol extract and ethyl acetate extract was 3374.13 ± 123.46 and 40318.19 ± 1014.90 respectively. Therefore, the antioxidant activity of ethanol extract is higher than that of ethyl acetate extract [10].

Antidepressant Activity

Parle and Malik explore that *Musa paradisiaca* fruit paste showed antidepressant potential at different concentrations of 05-20% W/W once daily for 15 successive days. The antidepressant activity was measured by using Tali Suspension Test (TST) and the Forced swim test (FST). *Musa paradisiaca* paste inhibits the Monoamine oxidase (MAO) and malondialdehyde (MDA) levels thus, the banana fruit appears to be a promising antidepressant because of its antioxidant, proserotonergic, pro-adrenergic, and monoamine oxidase inhibitory activities by the *Musa paradisiaca* [11].

Darji and Galani studied the antidepressant activity of *Musa paradisiaca* fruit was carried by using various experimental models. 14 days of treatment of hydroalcoholic extract of *Musa paradisiaca* fruit (MPFE) (250 and 500mg/kg,p.o) for locomotor activity. The 14 days treatment of MPFE (250 and 500mg/kg,p.o) in forced swim test and tail suspension test. The antidepressant activity of MPFE was reduced by the haloperidol 0.1mg/kg,i.p. (dopamine antagonist), and the antidepressant activity of MPFE was increased by the bromocriptine Mesylate 2mg/kg,i.p (dopamine agonist). The neurochemical estimation revealed the level of Norepinephrine, dopamine, and serotonin were increased after 14 days of MPFE treatment. Thus, this study provides scientific evidence that the antidepressant action of *Musa paradisiaca* is mediated via interaction with the monoaminergic system [12].

Antilipidemic Activity

Vijay Kumar et al. Reported the oral administration of bananas. (*Musa paradisiaca*) flavonoids have health benefits. Flavonoids extracted from fruit *Musa paradisiaca* by greatly hypolipidemic activities in male rats, the effective dosage of 1mg/100g body weight/day. The concentration of cholesterol, phospholipid, free fatty acid, triglycerides, etc. shows a significant reduction in serum, liver, kidney, and brain of experimental animals. The activity of enzymes like HMG CoA reductase, glucose-6 phosphate dehydrogenase, etc. were greatly reduced. Significant enhancement in the activities of LCAT and lipoprotein lipase. The concentration of hepatic and fecal bile acids and fecal neutral sterols were also indicating a higher rate of cholesterol degradation. The hypolipidemic activity of flavonoids showed the process of cholesterol degradation exceeds the rate of its synthesis [13].

Antihypertensive Activity

Osim et al. reported the antihypertensive effect of ripe banana pulp (50 g/rat/day) in deoxycorticosterone enantate (DOC, 25 mg/rat) induced hypertensive rats. This effect may be due to the high tryptophan and carbohydrate content of bananas which increases serotonin levels and gives a serotonin-mediated natriorexic effect. *Orie* (1997) reported the hypertension activity of aqueous extract of ripe *Musa paradisiaca* fruit shows a concentration-dependent hypotensive effect in both noradrenalin and potassium chloride-contracted aortic rings isolated from rats. This effect is observed due to non-specific interference in calcium ion availability needed for smooth muscle contraction that results in relaxation [14].

Anticancer Activity

Cancer is currently among the major world health concerns. It is characterized by abnormal cell growth. Natural products like bananas are being utilized to combat the deadly disease. Banana is found to possess an anticancer (colorectal) property by an in vitro assay of hill banana (Virupakshi). The fruit juice inhibits the human colorectal adenocarcinoma cell line (HT-29) and causes mortality at a very low concentration. It was hypothesized that CellQuest, a patented formula comprising a high level of tannic acid (TA) extracted from *Musa paradisiaca* (plantain), suppressed the tumor cell proteasome activity. This study suggested that CellQuest aims at the proteasome selectively in tumor cells, which possibly contributes to the anticancer effect. [14].

Cytotoxic effects:

Banana extracts were tested for their ability to suppress the growth of breast cancer cell line (MCF-7) and human colorectal carcinoma (HCT-116) tumor cell lines along with the human umbilical vein endothelial cells (HUVEC cell). The extracts showing more than 60% inhibition of cell proliferation were active. Among these, hexane extract of banana peel and pulp showed maximum toxicity against HCT-116 and MCF-7 cell lines with percentages of 62.04 and 61.21%, respectively, while the aqueous and ethanol

extracts indicated low anti-proliferative activity against HCT-116 and MCF-7. Interestingly, all the tested extracts showed virtually no cytotoxic effect against the normal cell lines.

Hugo, D -P et al studied the effect of vegetables and fruits on colorectal cancer. This study indicated that banana intake influences colorectal cancer risk. Banana consumption reduced the risk of colorectal cancer. **Sun J** et al study was designed to investigate the profiles of total phenolics, including both soluble free and bound forms in common fruits like Cranberry, apple, red grape, strawberry, pineapple, banana, peach, lemon, orange, pear, and grapefruit, by applying solvent extraction, base digestion, and solid-phase extraction methods along with measurement of Total antioxidant activity using the TOSC assay and anti-proliferation activities in vitro using HepG human liver cancer cells. This study confirmed the presence of phenols, antioxidants, and anti-proliferative action of bananas [14].

Reproductive Activity

Alabi et al studied the effect of administration of mature green fruit of *Musa paradisiaca* flour in adult male Wistar rats. 2 doses of plantain flour were prepared: 500mg/kg/day and 1000mg/kg/day. The flour dissolved in 2ml of double distilled water. A significant increase in semen parameters was observed in animals that received a low dose of plantain flour, but the animals which received the higher dose of *Musa paradisiaca* had a marked and significant reduction in sperm cell concentration and percentage of the morphologically normal sperm cell. The research concludes that the mature green fruit of *Musa paradisiaca* improves the semen parameter of Wistar rats at a moderate dose, making it a possible remedy for male reproductive dysfunctions in which sperm cells have been adversely impaired [15].

Tablet Disintegrant Activity

Singh et al., evaluated the three varieties of *Musa paradisiaca* L. in their unripe state as tablet disintegrants while formulating Orally Disintegrating Tablet (ODT) and other fast disintegrating dosage forms that showed promising results as potential tablet disintegrants for hardness, friability, in vitro disintegration time, wetting time and water absorption ratio [16].

Antimicrobial activity

Fagbemi et al. Investigation of the potency of unripe banana (***Musa sapientum L.***) was carried out against pathogens. The antimicrobial activity of ***Musa sapientum L.*** was examined using different solvents and efficacy was compared. The solvents are ethanol 70% v/v and water. The ethanolic extract of unripe banana had antimicrobial activity. Under the suitable condition, all the test samples had potent inhibitory effects on the group of bacteria tested. Unripe bananas (ethanolic extract) showed high antimicrobial activity against all test organisms. For the aqueous extracts, the unripe banana had good antimicrobial activity against five organisms. Unripe bananas had more antimicrobial activity when used with two different solvents (ethanol and water) [17].

Graph:1

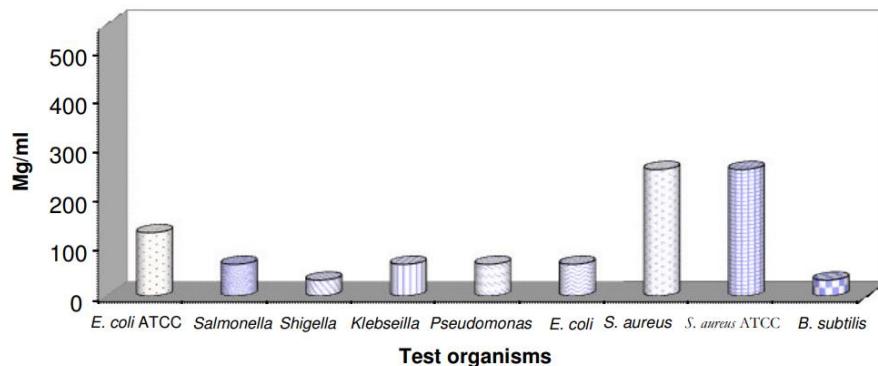


Figure 3: Minimum inhibitory concentration (MIC) of isolates to unripe banana (ethanolic extract).

Graph:2

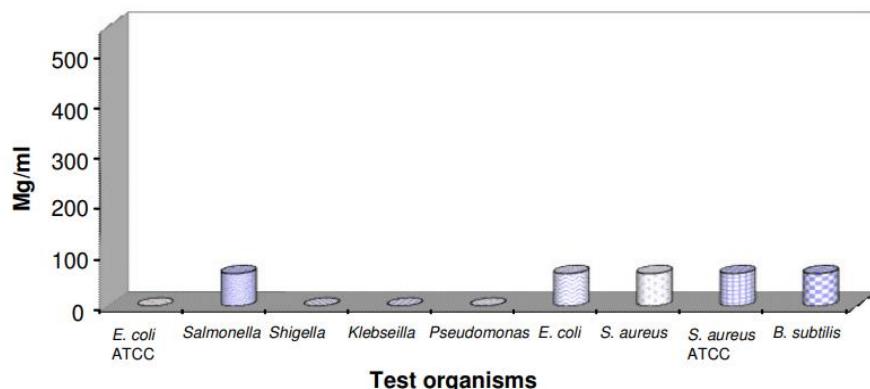


Figure 4: Minimum inhibitory concentration (MIC) of isolates to unripe banana (aqueous extract).

Graph:3

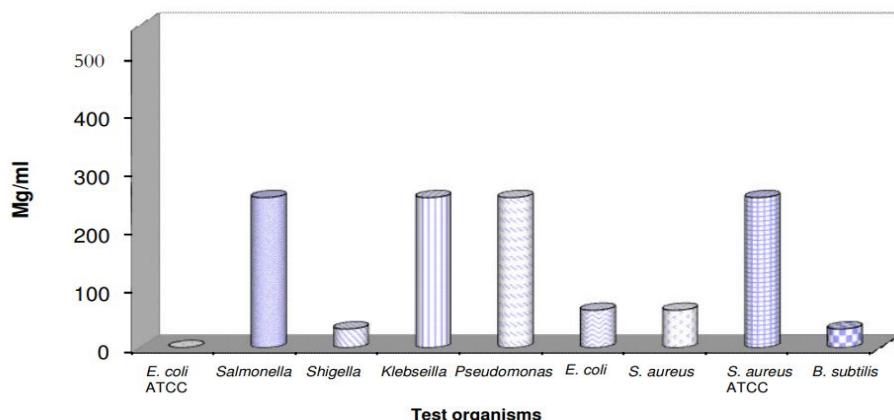


Figure 5: Minimum bactericidal concentration (MBC) of isolates to unripe banana (ethanolic extract).

Antiviral Activity

Swanson MD et al - BanLec is a jacalin-related lectin isolated from the fruit of bananas, *Musa acuminata*. This lectin binds to high mannose carbohydrate structures, including those found on viruses containing glycosylated envelope proteins such as human immunodeficiency virus type-1 (HIV-1). Based on the results, BanLec is a potential component of an anti-viral microbicide that could be used to prevent the sexual transmission of HIV-1 [18].

Antifungal Activity

Ho VS and Ng TB Two 30-kDa proteins with N-terminal sequence homology to chitinases have been isolated from fruits of the emperor banana. The proteins were adsorbed on Affi-gel blue gel and Mono S. They both inhibited mycelial growth (antifungal activity). The chitinase-like protein more strongly bound on Mono S was obtained with a slightly lower yield and exhibited a higher antifungal potency when compared with the less strongly bound chitinase-like protein [19].

Wound healing activity

P K Agarwal et al. revealed that plantain banana (*M. sapientum* var. *paradisiaca*) has been shown to possess ulcer healing activity. Wound healing activity of *M. sapientum* was studied in terms of (i) percent wound contraction, epithelization period, and scar area; (ii) wound breaking strength, and (iii) granulation tissue antioxidant status in excision, incision, and dead space wound models. The results of this study indicate an important healing effect of both aqueous and methanolic extracts of dried pulp powder of mature unripe fruit of *Musa sapientum* var. *paradisiaca* and their effects were comparable to vitamin E on various physical and biochemical parameters of wound healing [20].

Neurological diseases

Heo H J et al studied the effect of banana fruit extracts in protecting neuronal cells from oxidative stress-induced neurotoxicity. Results of this study suggest banana reduces the risk of oxidative stress-induced neurodegenerative disease like Alzheimer's disease [21].

Anti-Diabetic Activity

A study by **Kaimal S et al** showed that ethanol extract of mature green fruits of *Musa AAA*(Chenkadali) has antioxidant and hypolipidaemic properties and may be used for treating diabetes mellitus. **Ojewole JA and Adewunmi CO** evaluated the hypoglycemic effect of methanolic extract of mature, green fruits of *Musa paradisiaca* in normal (normoglycemic) and streptozotocin-treated, diabetic (hyperglycemic) mice. The findings of this experimental study indicated that the *Musa* extract possesses hypoglycemic activity, and thus lends credence to the suggested folkloric use of the plant in the management and/or control of adult-onset, type-2 diabetes mellitus [21].

Anti-ulcer activity

U.S Mahadeva Rao et al. claimed that banana is used in herbal medicine to treat peptic ulcer disease. The use of *M. sapientum* in peptic ulcers as a component of herbal medicine has been evaluated and found effective. It was reported that pectin and phosphatidylcholine in green banana strengthens the mucousphospholipid layer that protects the gastric mucosa and reported that the gastric mucosa protective activity of the banana is due to multiple active components. The natural flavonoid from the unripe banana (*M. sapientum* var. *paradisiaca*) pulp, leucocyanidin, protects the gastric mucosa from erosions. Leucocyanidin and the synthetic analogs, hydroxyethylated leucocyanidin, and tetraallyl leucocyanidin were found to protect the gastric mucosa in aspirin-induced erosions in rats by increasing gastric mucus thickness [22].

Anti-allergic activity

U.S Mahadeva Rao et al. mentioned that the water extract of the pulp of ripe *M. sapientum* has been reported to have significant anti-allergic activity on antigen-induced degranulation in RBL-2H3 cells with an IC₅₀ value of 13.5 ± 2.4 [22].

Benefits of Banana

Almost all parts of the banana plant are used in different aspects. The whole banana plant is useful in food, feed, pharmaceutical, packaging, and many other industrial applications. The ancient Egyptians used banana leaves, fruits, and flowering sheaths as a wound dressing, often mashing the fruit and applying it as a poultice over rashes, infected scratches, grazes, and burns, covered by either the skin or the leaf which was warmed in hot water (**Robets**, 1999) [23].

In India, the banana is considered a holy fruit and is distributed as consecrated food. It is not only used as a favorite fruit but also used in treating a variety of health conditions. They act as a fine tonic as well as an instant source of energy is a favorite for athletes too. They are a boon for thin people who wish to gain weight. Banana also contains a wide array of nutrients in good amounts. Banana has a mild laxative property. Banana is a storehouse of minerals, vitamins, and carbohydrates. It contains

potassium, calcium, magnesium, iron, zinc, etc. Vitamins A, B, C, B-6, etc. are all available in plenty. The presence of iron in bananas helps to boost the production of hemoglobin. This helps persons who suffer from anemia. Banana contains plenty of potassium. This helps to balance sodium and potassium levels and reduce hypertension or high blood pressure. This fruit help to supply required vitamins and minerals to smokers who are trying to quit smoking. The craving for nicotine is reduced by the consumption of this wonderful fruit (*Suri*, 2012) [24].

1. Nutraceuticals And Food Ingredients

According to the Science Forum, nutraceuticals are defined as a “diet supplement that delivers a concentrated form of a biologically active component of food in a non-food matrix to enhance health” [25]. Table 3 highlighted the effects of banana bioactive compounds as a value-added ingredient in food processing. It is important to understand fruit maturity during the preparation of banana flour to produce desirable food products. Ripe banana can be considered for industrial processing, which could result in products that are comparable to those obtained from apple, juice, fruit drinks, fermented drinks, stewed fruit, puree, marmalade, jam, flakes, confectionery, pastry, sorbets, and ice-cream. Raw bananas can be considered a source of new food innovation and development for partial or preprocessed food products like snacks and breakfast cereals [26].

Table 4: Use of banana bioactive compounds as Nutraceuticals

Products	Maturity/cultivars	Effects on antioxidant activity	References
Pasta	Raw/Musa paradisiaca	Increased indigestible fraction and total phenolic content	26
Sponge cakes	Raw/Musa cavendish	Yielded more polyphenols and exhibit high antioxidant capacity	27
Cassava snacks	Raw/Musa Cavendish AAA	Increased antioxidant activity, including ferric-reducing power and superoxide radical scavenging capacity	28
Banana muffins	Raw	Exhibit antimicrobial activity	29

2. By-product from Banana

- Chips/Crisps:** Nendran fruits of approximately 80% maturity are harvested and demanded. The fingers are peeled, treated with 0.1% potassium metabisulphite, cut into slices of 1.2-0.8 mm thickness, and deep fried in suitable cooking oil, preferably coconut oil. Upon frying, this will yield crisp, yellow-colored chips, which are sprinkled with common salt and packed in polyethylene bags. Generally, they have a storage life of 30-35 days under ambient conditions. Packing the chips in laminates with nitrogen gas can extend its life up to 4 months. Several other varieties of banana chips like flavored, sweet, sweet and sour, tomato flavored, with pepper, etc. are also catching up in the market.
- Banana Fruit Candy/Stem Candy:** Banana fruit candy made from nendran with jaggery, and ginger is widely sold in the market in Kerala state. Banana stem (true stem) can also be made into candy through the osmotic dehydration process followed by sun drying.
- Banana Fig:** Banana figs are dried or dehydrated banana fruits with sticky consistency and a very sweet taste. Fully ripe banana fruits of variety Karpuravalli or Dwarf Cavendish are peeled, treated with 0.1% potassium metabisulphite solution, and dried either in sun or oven at 50 °C. These figs are packed in polyethylene bags or any other suitable containers. They have a shelf life of about 3-4 months under ambient conditions.
- Banana Flour:** Banana flour is prepared from mature green bananas, which have a high starch content. It can be used as a nutritious adjuvant in several food preparations like bread, cakes, biscuits, health drink, and baby food formulations. It can also be blended with other cereal flours for making chapatis and roties. It has some medicinal properties to cure ulcers. Under cool and dry conditions, it can be stored for up to one year without any adverse change in its composition.
- Banana Powder:** Banana powder is prepared from fully ripe banana fruits either through drum drying or spray drying process. The moisture content of the final product should be around 2-4%. This product has got high market value as it is extensively used in the confectionery industry, ice cream preparations, and baby food making. When suitably packed it will have a shelf life of more than 6 months.
- Banana Juice:** Since banana puree is very thick, juice cannot be directly obtained from it. Therefore, the puree is treated with a pectolytic enzyme, and clear juice is obtained through filtration or centrifugation. After pasteurization and bottling it can have a shelf life of a minimum of 6 months under ambient conditions. Fruit juices are the most common and demanding products made from more fruits. Generally, juices are extracted by simple crusher and/or grinding of fruits. However, in case of bananas, this process results in a sticky, lumpy mass with no juice. For banana juice production, any variety of bananas like *Basrai* '10 Gy' (developed by tissue culture at BARC), Haricha, l, or Cavendish can be used for extraction. A process has been developed to extract almost 60 – 70% of the total soluble materials of bananas as juice. This process has been patented (*Surendranathan* et al., 2001). Taste panel studies were conducted at Food Technology Division, FIPLY, BARC and Products evaluated included banana juice (*Nair*, 2000) [25], ripe banana powder (Jayachandran, 2000) [19], and products made from ripe banana powder such as banana biscuits, banana cake (*Cardoza*, 1999) [8] and banana baby food (*Jayachandran*, 2000).
- Banana Fruit Bar:** Banana Fruit Bar is a confectionary item prepared from ripe banana fruit of any variety. It is made by homogenizing banana pulp, sugar, citric acid, and pectin in suitable proportions and dehydrating the mass in ghee coated ray at 70° C in an oven tsetses into a sheet. It is then cut to suit sizes the size and packed in polyethylene pouches. 8.8 Banana Biscuits: Banana biscuits are made by mixing 60% banana flour and 30% maida. The dough is made a using flour mixture and suitable proportions of sugar, saturated fat, baking powder, milk powder, er, and essence. These biscuits are very tasty and highly nutritious.

h. **Banana Jam & Jelly:** Banana jam is made by cooking the fruit pulp with sugar along with pectin and citric acid in the right proportions till it gives a good set. Several varieties of bananas are suitable for making jam. This is a product, which has good commercial value and a good market. Banana semi-solid product prepared by boiling clear strained fruit extract from the pulp after addition of a required amount of sugar, citric acid, and pectin. A perfect jelly should be transparent, attractive, and sparkling in color with the strong flavor of the fruit [30].

Uses and Health benefits

Table 5. Uses and health benefits of banana

Health benefits	Reference source
Applied as medicinal agents for the treatment of burns	Siang (1983) [31]
Antioxidant and potential hepatoprotective effects	Rasool et al. (2010) [32]
Is a precursor to the sweetener aspartame by the means of enzyme-catalyzed amination to phenylalanine	Garbe (2000) [33]
Cholesterol reduction	Ikeda et al. (2003) [34]
Food colorant might reduce the risk of lung cancer	DeLorenze et al. (2010) [35]
Might contribute to feelings of well-being and happiness	Young (2007) [36]
Increases blood pressure, glucose levels, and heartbeat rate	Kuklin and Conger (1995) [37]
Potential to reduce blood cholesterol levels and benign prostatic hyperplasia (BPH)	Wilt et al. (1999) [38]
Reduces the absorption of cholesterol in the human intestines	Choudhary and Tran (2011) [39]
Antioxidant, antimicrobial, anti-inflammatory, antiallergic, anticarcinogenic, modulation of enzyme activity, antiviral and vasodilatory actions	Kumar and Pruthi (2014) [40]

Conclusion

Musa paradisiaca Linn. Is widely distributed throughout various tropical regions. Fruit part of *Musa Paradisiaca* Linn. Is a highly nutritious and the most widely consumed fruit throughout the world. The fruit appears to have a broad spectrum of pharmacological activities on several ailments. Fruit have been explored for antioxidant activity, antidepressant activity, antilipidemic activity, antihypertensive activity, reproductive activity, tablet disintegrant activity, antimicrobial activity, antiviral activity, antifungal activity, anticancer activity, wound healing activity, neurological diseases, antidiabetic activity, and many other activities. It is reported to contain carbohydrates, proteins, amino acids, vitamins, minerals, phenolic acids, phenolic compounds, carotenoids, flavonoids, etc. With the availability of primary information, further studies can be carried out such as clinical evaluation, phyto-analytical studies, and toxicity evaluation. The plant is pre-clinically evaluated to some extent; if these claims are scientifically and clinically evaluated then it can provide good remedies and help mankind with various ailments.

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