

TRADITIONAL AND MEDICINAL EFFECT OF BANANA BLOSSOM

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Abstract: *Musa acuminata* is commonly known as banana plant. The flower of the banana plant is also known as banana blossom or banana heart. The family to whom banana belongs is called Musaceae as banana blossom, represent a valuable source of potassium, vitamin A, vitamin C, vitamin E, minerals, fatty acid content, flavonoids, saponin, essential and non-essential amino acid, tannins, glycoside and steroid. Banana blossom is a good antioxidant source. Banana blossom has a huge nutritional value and healthy benefit. In most tropical countries, bananas blossom are used for cooking. People came to the conclusion that cooking of banana flower has about the very high nutritional and calorie content than other ones. The blossom of the banana plant is used in Southeast Asian, Indian, and Bengali cooking either served raw with dips or cooked in soups, dip fried, cutlet and curries. The objective of present study was the utilization of banana blossom could provide health benefits of human being. All parts of banana have nutritional and traditional medicinal uses. Many in vitro studies other medicinal uses are in surgical dressing, pain relief, food and pharmaceuticals, nano medicine, pollution control, apoptosis and cell cycle.

Keywords: Banana blossom, Medicinal uses, Anti diabetic activity, anticancer activity, Antimicrobial activity, Dietary fiber,

Introduction

Bananas (*Musa species*) are the fourth most important food crop in developing countries, after rice, wheat, and maize, with nearly 90% of the crops being grown for small-scale consumption and local trade [1] According to FAO database, 103 million tonnes of banana were produced in the year 2004. The plantain and unripe banana are consumed cooked and mature dessert banana is eaten raw. The pseudo stem and rhizome of banana has recently been identified as potential nutraceutical, antioxidant rich food beverage. Banana blossom and pseudo stem are fibre rich potent antioxidant materials with low glycemic index value. Therefore, they may serve as a beneficial health food supplement for diabetic individuals. Banana flower is used for preparation of curries etc.

The blossom constitutes several parts such as bract, bell, tepals and stigma. Although, the whole flower has been studied for its health benefits, the individual parts are not analysed for their phytochemical constituents and their biological activities. Despite the observations that banana flower may become a health food supplement for diabetic individuals, the mechanism of its antidiabetic activity is not properly investigated. This research analyzed phytochemical constituents, in vitro antihyperglycemic, antihyperlipidemic and antioxidant potentials in 50% aqueous methanol extract of various parts of banana flower.

Our analysis showed that stigma of flowers is richest source of polyphenol, flavanoid and anthocyanins. The bract, fused tepals, stigma and bell possess potent free radicals scavenging activities and have varying degrees of advanced glycation end-products (AGEs) formation inhibitory potentials. Furthermore, the bract and bell were observed to possess intestinal α -glucosidase inhibitory activities and fused tepals contain pancreatic lipase inhibitory potentials. Our research finds that the whole edible parts of banana flower are rich source of antioxidant activities and have the potentials of inhibiting the formation of various types of AGEs. The bract and bell are rich source of antihyperglycemic potentials and fused tepals as pancreatic-lipase inhibitors.[2]

Banana flower / blossom (BF) and pseudostem (PS) are byproducts of banana cultivation and are known to have health beneficial effects. The main objective of this study was to evaluate the dietary fiber composition and antioxidant effect of BF and PS. In the present study, BF and PS were found to be rich in dietary fiber (65.6 ± 1.32 and $28.8 \pm 0.98\%$, respectively). Dietary fiber fractions were extracted and characterized in terms of sugar profile, and antioxidant activities were determined. BF and PS fractions were rich in sugars and showed wide diversity with respect to the nature of the sugars. Hemicellulose A fraction of BF showed high amounts of total polyphenols and total antioxidants, which were 121.8 ± 1.9 and 39.03 ± 0.118 $\mu\text{g}/\text{mg}$ extract, respectively. HPLC analysis showed the presence of phenolic acids in hemicellulose A and B fractions of BF. These results indicate that BF and PS are rich sources of dietary fiber associated with polyphenols, which could promote health beneficial effects.[3]

Materials and Methods

Plant materials Samples of banana blossom were collected from the banana plantation areas located. The collected samples were rinsed under running water to remove solid particles from the surface. The samples were then sliced and dehydrated at temperature between 40 - 45°C for one week using an oven. The dried samples were ground into fine powder using a grinder and then kept at 4°C for further analysis.[4]

Chemicals and reagents

α -amylase and α -glucosidase were purchased from Sigma-Aldrich company. All chemicals used in the experiments were of analytical grade.[4]

Banana blossom extract preparation

A 100 g portion of dried banana flower was placed in a 1 L conical flask and a 500 ml portion of 80% ethanol was used as the solvent system for extraction. The conical flask was then placed in a orbital shaker to enhance the extraction efficiency through shaking. After two consecutive days of extraction, the mixture was filtered through Whatman No. 1 filter paper. The residue was re-extracted with same volume of 80% ethanol for at least two more times until the filtrate became colorless. The extract was concentrated under reduced pressure using a rotary evaporator (Büchi Model R-205 rotary evaporator, Switzerland) kept at 50°C water bath. The final weight of the extract was determined and the recovery percentage was calculated based on the formula below. [4]

Nutritional Value of Banana blossom:

As per the African Journal of Biotechnology, 100g of banana flower offers the below mentioned nutrition
51 kcal

1.6g of Protein
0.6g of Fat
9.9g Carbohydrate
5.7g of Fiber
56mg of Calcium
73.3mg of Phosphorous
56.4mg of Iron
13mg of Copper
553.3 mg of Potassium
48.7mg of Magnesium
1.07mg of Vitamin E

Every part of the banana plant has medicinal properties.

Flowers:

Used to treat dysentery, ulcers, and bronchitis. Cooked, flowers are considered a good food for diabetics.

Sap:

Chemically, banana sap has astringent qualities. In traditional medicine, the sap is used to treat a wide variety of ailments, including leprosy, hysteria, fever, digestive disorders, hemorrhage, epilepsy, hemorrhoids, and insect bites.

Roots and Seeds:

Treat digestive disorders Peel and Pulp: Scientifically shown to have both antifungal and antibiotic components. These structures have also been identified as containing the neurotransmitters norepinephrine, serotonin and dopamine.

Traditional (cultural) Medicinal uses of bananas

Ranking of food items as per their consumption in the country puts banana in the fourth place after rice, wheat and milk.

Bananas help in treating some emotional and—

Bodily sicknesses. They contain tryptophan, which is an essential amino acid required in the production of serotonin, which helps a person relax, improve overall mood and feel happy.

This indirectly shows that bananas help in increasing the synthesis of serotonin thereby, curing Bananas contain high amounts of iron, which—depression. helps stimulate the production of hemoglobin in the blood. So, they can be used in cases of anemia, which is a condition caused due to lack of or low levels of iron in the body.

Food and Drug Administration (FDA) has also—

Confirmed the importance of bananas in reducing the risk of blood pressure and stroke due to its high potassium and low salt content.

Bananas also contain Vitamin B6 that helps—

Alleviate symptoms of Pre – Menstrual syndrome

Eating a banana between meals can help reduce morning sickness because it stabilizes sugar levels and provides the necessary vitamins required by the mother and the developing fetus.

Antihypertensive, Antileptic and Antioxidant activity of Bananas.

Tested the effect of banana on cold stress induced hypertension, peak expiratory flow rate and plasma ACE activity in healthy human volunteers. [11] The property of banana of decreasing blood pressure during cold stress may be utilized in clinical situations, and banana may be used with benefit as an adjuvant in hypertension therapy.[12]

Antimicrobial activity of ripened and un ripened Bananas

Antibiotic spectrum of extracts obtained from the pulp and skins of green, naturally ripened, and ethylene ripened bananas, and from banana leaves and petioles by means of solvent extracts (aqueous, methanol and petroleum-ether). Antifungal activity was exhibited by all extracts. Very little, if any, measurable antibacterial activity in either the pulp or skins of green bananas was detected, but there was appreciable antibacterial activity in the pulp and skins of ripe bananas.[13]

evaluated the fresh green and yellow banana peel of (*Musa*, cv. Cavendish) (chloroform and ethyl acetate) extracts. The ethyl acetate and water soluble fractions of green peel displayed high antimicrobial and antioxidant activity, respectively. The investigation was undertaken to evaluate the antioxidant and antibacterial power of banana fruit peel. Ethyl acetate extract of green banana peel recorded significant antimicrobial activities, while yellow peel extracts recorded low activity and no activity was recorded to chloroform and water extracts as measured by paper disk methods[14]

Antiviral and Antifungal Activities of Bananas

isolated BanLec, a jacalin-related lectin from the fruit of bananas, *Musa acuminata*. This lectin has the property of binding to high mannose carbohydrate structures including, those found on viruses. The tests carried out indicated that BanLec is a potential component for an anti-viral microbicide that could be used to prevent the sexual transmission of HIV-1.[15]

Anti ulcer and Anti Diarrhoeal activity of Bananas

dried and extracted the active anti-ulcerogenic ingredient from unripe plantain banana by solvent fractionation and identified it as leucocyanidin which has a protective effect against aspirin-induced erosions [16] with the premise that the drug promoting ulcer healing could have effect on wound healing. Both aqueous and methanolic extracts when studied for incision and dead space wounds parameters showed good safety profile. Plantain banana thus, favored wound healing which could be due to its antioxidant effect and on various wound healing biochemical parameters[17]

Anticancer activity of bananas

Studied the effect of vegetables and fruits on colorectal cancer.[18] This study indicated that banana intake influences colorectal cancer risk. Banana consumption reduced risk for colorectal cancer.[19] 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(2) human liver-cancer cells. This study confirmed the presence of phenols, antioxidants and anti-proliferative action of banana.[20] hypothesized that Cell Quest, a patented formula which contains high level of tannic acid (TA) obtained from a *Musa* (plantain) plant extract, inhibited the tumor cell proteasome activity. The present study suggested that Cell Quest targets and inhibits the proteasome selectively in tumor cells, which may contribute to the claimed anticancer activity.[21]

Banana in neurological diseases -He studied the effect of banana fruit extracts in protecting neuronal cells from oxidative stress induced neurotoxicity. Results of this study suggest banana reduces risk of oxidative stress induced neurodegenerative disease like Alzheimers disease.[22]

Banana use in urolithiasis -found that banana stem extract was useful in the treatment of urolithiasis and kidney stones. In hyperoxaluric induced rats banana stem extract reduced excretion of urinary oxalates.[23]

Banana in apoptosis

Cell quest a patented banana product showed induction of apoptosis in tumor cells which resulted in tumor cell growth arrest. Apoptotic changes observed in tumor cells treated with cell quest were PARP cleavage and increased caspase -3 activity[24] Banana flower extract induced apoptotic death of ovarian cancer He LA cells [25]. Activation of apoptotic enzyme caspase -9 by banana flower extract fraction caused apoptotic death of He La cells.

Banana in cell cycle

studied the effect of banana flower extract on cell cycle kinetics of He La cells *in vitro*. In presence of banana flower extract there were few He La cells in S and G2/M phase due to inhibition of cell cycle.[26]

Bananas in surgical dressing and anaesthesia

studied the usage of banana as a surgery training model to refine blade control for Mohs layer removal and skin incisions.[27] After analysis of the results, the use of banana leaf dressing for all partial thickness burn wounds in our environment was strongly recommended.[28]

Banana in Nanomedicine

Synthesized Gold nanoparticles by using banana peel extract (BPE) as a simple, non-toxic, eco-friendly 'green material'. Further studies carried out indicated efficient antimicrobial activity by the BPE mediated nanoparticles towards most of the tested fungal and bacterial cultures like *Candida albicans* BX, *C. albicans* BH, *Shigella* sp., *Enterobacter aerogenes*, *Klebsiella* sp. and *Pseudomonas aeruginosa*. [29] synthesized silver nanoparticles using banana peel extract which showed anti-microbial activity against pathogenic *B. Subtilis*, *S. Aureus*, *P. Aeruginosa*, *C. Albicanus* and *E. Coli*. organisms.

Conclusion

Globally banana plant and its various parts are consumed as part of food and used in traditional medicine for treatment of several diseases. Various parts of banana can cure many diseases and useful in other areas also. It has a rare combination of energy value, tissue-building elements, protein, vitamins and minerals. It is a good source of calories since it is rich in solids and low in water content as compared to any other fresh fruit. Bananas are a good source of Vitamin C.

Serum Lipids, Glucose, AST Level, and Antioxidant Activity

Total cholesterol (TC), HDL cholesterol (HDL-C), triglyceride (TG), Aspartate amino transferase (AST), and glucose concentrations in the serum were determined enzymatically using commercially available reagent kits (ProDia Internationals, Germany). The non-HDL-cholesterol concentration was calculated as follows: $[\text{non-HDL-C}] = [\text{TC}] - [\text{HDL-C}]$. Serum antioxidant activity was measured by Ferric Reducing Antioxidant Power (FRAP) assay [5]

Result discussion

In this way, several studies have suggested that antioxidant rich dietary fibre may have a positive effect on cardiovascular disease risk factors [6,7]. Bifidobacterium, and Lacobacilli population suggesting that dietary fibre present in banana blossoms [8,9]

Reference

- [1] S Sharrock; Frison; E. Musa production around the worlds Trends, varieties and regional importance. In INIBAP Annual Report; INIBAP: Montpellier, France, 1998; 42-47.
- [2] Banana flower as potential source of antidiabetic and antioxidant activities 6th World Congress on Biotechnology October 05-07, 2015 New Delhi, India
- [3] Banana (*Musa* sp. var. elakki bale) Flower and Pseudostem: Dietary Fiber and Associated Antioxidant Capacity Department of Biochemistry and Nutrition, Central Food Technological Research Institute (CSIR Unit), Mysore, India 570 020. *J. Agric. Food Chem.*, **2012**, *60* (1), pp 427-432
- [4] Fatiha, B., Khodir, M., Farid, D., Tiziri, R., Karima, B., Sonia, O. and Mohamed, C. 2012. Optimisation of solvent extraction of antioxidants (phenolic compounds) from Algerian mint (*Mentha spicata* L.). *Pharmacognosy Communications* 2: 72-86.
- [5] International Food Research Journal 23(5): 1988-1995 (2016) Journal homepage: <http://www.ifrj.upm.edu.my> Evaluation of banana (*Musa* sp.) flowers of selected varieties for their antioxidative and anti-hyperglycemic potentials 1,2*Marikkar, J. M. N, 1 Tan, S. J., 1 Salleh, A., 3 Azrina, A. and 1 Shukri, M. A. M. 1 Department of Biochemistry, Universiti Putra Malaysia 43400 UPM Serdang. Selangor DE, Malaysia 2 International Institute for Halal Research and Training, International Islamic University Malaysia, PO Box 10, 50728 Kuala Lumpur, Malaysia 3 Department of Nutrition and Dietetics, Universiti Putra Malaysia 43400 UPM Serdang. Selangor
- [6] Sarkar C *et al.* Effect of banana on cold stress test & peak expiratory flow rate in healthy volunteers. *Indian J Med Res.* 1999; 110:27-29.
- [7] Jo S and Megawati R. Effect of pisang ambon (*Musa Accumenta Colla*) on adult female blood pressure on cold stress test. *J. Medica Planta*, 2010; 1:21-25.
- [8] Matook Saif Mokbel and Fumio Hashinaga. Antibacterial and Antioxidant Activities of anana (*Musa*, AAA cv. Cavendish) fruits peel. *American Journal of Biochemistry and Biotechnology.* 2005; 1 (3): 125-135
- [9] C S Alisi *et al.* Inhibition of dehydrogenase activity in pathogenic bacteria isolates by aqueous extracts of *Musa paradisiaca* (Var Sapiantum). *African Journal of Biotechnology*. 2008; 7(12):1821-1825.
- [10] Ho V S and Ng T B. Chitinase-like proteins with antifungal activity from emperor banana fruits. *Protein Pept Lett.* 2007; 14(8): 828-31.
- [10] Agarwal P K *et al.* Evaluation of wound healing activity of extracts of plantain banana (*Musa sapientum* var. *paradisiaca*) in rats. *Indian J Exp Biol.* 2009; 47(1): 32-40.
- [11] Rao N M. Protease inhibitors from ripened and unripened bananas. *Biochem Int.* 1991; 24(1): 13-22.
- [12] Rabbani G H *et al.* Green banana reduces clinical severity of childhood shigellosis: a double-blind, randomized, controlled clinical trial. *Pediatr Infect Dis J.* 2009; 28(5):420-5.
- [13] Sun J *et al.* Antioxidant and antiproliferative activities of common fruits. *J Agric Food Chem.* 2002; 50(25):7449-54.
- [14] Kazi A *et al.* A natural *Musaceae* plant extract inhibits proteasome activity and induces apoptosis selectively in human tumor and transformed, but not normal and non-transformed, cells. *Int J Mol Med.* 2003; 12(6): 879-87.
- [15] Rashdkhani B P and Lindblad A W. Fruits vegetables and risk of renal cell carcinoma. A perspective study of Swedish women. *Int J Cancer.* 2005; 113:451-55.

- [16] Heo H J *et al.* Effect of banana, orange and apple on oxidative stress induced neurotoxicity in PC 12 cells. *J Food Science*. 2008; 73(2):H28-H32.
- [17] Poongzhali P K and Cheju H. The influence of banana stem extract on urinary risk factors for stones in normal and hyperoxaluric rats. *Br J Urol*. 1994; 741:23-25.
- [18] Kazi A *et al.* A natural *Musaceae* plant extract inhibits proteasome activity and induces apoptosis selectively in human tumor and transformed, but not normal and non-transformed, cells. *Int J Mol Med*. 2003; 12(6): 879-87.
- [19] Timsina B and Nadumane V K. Anti cancer potential of banana flower extract an in vitro study. *Bangladesh J Pharmacol*. 2014; 9(4):628-35.
- [20] Wanitphakdeedecha R *et al.* The banana: a surgery training model to refine blade control for Mohs layer removal and skin incisions. *Dermatol Surg*. 2008; 34(8):1088-90.
- [21] Gore M A and Akolekar D. Evaluation of banana leaf dressing for partial thickness burn wounds. *Burns*. 2003; 29(5):487-92.
- [22] Bankar A *et al.* Banana peel extract mediated synthesis of gold nanoparticles. *Colloids Surf B*
- [23] *Biointerfaces* . 2010; 80(1): 45-50.
- [24] Ibrahim M M H. Green synthesis and characterization of silver nanoparticles using banana peel extract and their anti microbial activity against representative micro organisms *J. Radiation Research and App. Sci*. 2015; 30: 1-11.
- [25] I. F. F. Benzie and J. J. Strain, "The ferric reducing ability of plasma (FRAP) as a measure of 'antioxidant power': the FRAP assay," *Analytical Biochemistry*, vol. 239, no. 1, pp. 70–76, 1996. View at Publisher · View at Google Scholar · View at Scopus
- [26] N. Martín-Carrón, I. Goñi, J. A. Larrauri, A. García-Alonso, and F. Saura-Calixto, "Reduction in serum total and LDL cholesterol concentrations by a dietary fiber and polyphenol-rich grape product in hypercholesterolemic rats," *Nutrition Research*, vol. 19, no. 9, pp. 1371–1381, 1999. View at Publisher · View at Google Scholar · View at Scopus
- [27] J. Pérez-Jiménez, J. Serrano, M. Taberero *et al.*, "Effects of grape antioxidant dietary fiber in cardiovascular disease risk factors," *Nutrition*, vol. 24, no. 7-8, pp. 646–653, 2008. View at Publisher · View at Google Scholar · [View at Scopus](#)
- [28] M. Fukushima, M. Nakano, Y. Morii, T. Ohashi, Y. Fujiwara, and K. Sonoyama, "Hepatic LDL receptor mRNA in rats is increased by dietary mushroom (*Agaricus bisporus*) fiber and sugar beet fiber," *Journal of Nutrition*, vol. 130, no. 9, pp. 2151–2156, 2000. View at Google Scholar · View at Scopus
- [29] N. Nishimura, Y. Taniguchi, and S. Kiriya, "Plasma cholesterol-lowering effect on rats of dietary fiber extracted from immature plants," *Bioscience, Biotechnology and Biochemistry*, vol. 64, no. 12, pp. 2543–2551, 2000. View at Publisher · View at Google Scholar · View at Scopus

