



ISSN: 0975-833X

RESEARCH ARTICLE

BANANA BLOSSOM-AN UNDERSTATED FOOD WITH HIGH FUNCTIONAL BENEFITS

*Shilpi Singh

Department of Food Science and Technology, Punjab Agricultural University, Ludhiana, Punjab, India

ARTICLE INFO

Article History:

Received 19th October, 2016
Received in revised form
23rd November, 2016
Accepted 11th December, 2016
Published online 31st January, 2017

Key words:

Functional food, Menstrual bleeding,
Antioxidants, Fibre, Anxiety.

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Citation: Shilpi Singh, 2017. "Banana blossom-an understated food with high functional benefits", *International Journal of Current Research*, 9, (01), 44516-44519.

ABSTRACT

Banana plant, considered as a nature's gift to mankind is widely known for its fruit part due to its enormous nutritional and health benefits but banana blossom (widely known as flower or heart), also has potential to be regarded as a functional food or superfood due to its high nutrient content (excellent source of fibre, good source of protein, vitamin A,C and E, minerals like phosphorus, potassium, calcium, iron, magnesium and antioxidants) and great therapeutic value (lowers menstrual bleeding, facilitates lactation, helps in overcoming diabetes, anaemia and ulcer, reduces anxiety, helpful in weight loss and good for gastrointestinal health). Despite of being such a wonder food it is still underrated in most part of the world (except south-east Asian countries). Therefore, it is the demand of present time to increase the awareness about banana blossom as it will not only reduce the banana waste but will also help people all over the world, reap its health benefits.

INTRODUCTION

Bananas are the one of the most widely consumed fruits in the world because of its taste, nutritional value and potential health benefits. It is ranked fourth among the world's food crops in monetary value. Americans consume more bananas than apples and oranges combined (<http://www.medicalnewstoday.com/articles/271157.php>). In developing countries bananas are the fourth most important crops after rice, wheat, and maize, with nearly 90% of the crops grown for local trade and small scale consumption (Sharrock, Frison, 1998). Banana evolved in the humid tropical regions of South East Asia, India being one of its centre of origin. At present it is cultivated throughout the world with warm tropical regions between 30 degrees north and 30 degrees south of the equator (Banana - National Horticultural Board). It is grown in about 120 countries of the world with the total world production being estimated as 86 million tonnes of fruits. With the annual output of about 29.8 million tonnes, India leads the banana production in the world followed by other leading producers like China (11.64), Uganda (11.23), Phillipines (9.45), Equador (8.24), Brazil (7.65), Indonesia (6.34) (<http://worldknowing.com/top-10-banana-producers-in-the-world/>).

Banana plant -a nature's gift

Banana plant finds a special place when compared with other food plant, as it is one of the very few plants in the world

*Corresponding author: Shilpi Singh,

Department of Food Science and Technology, Punjab Agricultural University, Ludhiana, Punjab, India.

whose all the parts can serve some purpose, either food or non-food purposes. Fruits being the most common form of consumption, is eaten both in raw as well as ripe form. Apart from being delicious, the fruits are very nutritious also. They are very good source of potassium and fibre along with being a good source of magnesium, vitamin C, B6 and antioxidants. Banana leaves are used for various purposes in different countries like in India, fresh leaves are used as plates to serve food in marriages and sacred thread ceremonies, whereas in China fresh banana leaves are used to wrap meat and heat them at relatively low temperatures as they believe it adds more taste and flavour to the food (The multiple benefits of the banana plant and its parts). In Puerto Rico pasteles are made primarily with fresh banana dough stuffed with pork, and then wrapped in banana leaves which have been softened at the fire (Banana leaf - Wikipedia Retrieved from https://en.wikipedia.org/wiki/Banana_leaf). In Phillipines, the specific dishes that uses banana leaves include suman and bibingka (<http://manilastandardtoday.com/lifestyle/166300/Christmas-it-s-really-more-fun-in-the-Phillipines.html>; <http://panlasangpinoy.com/2010/12/27/suman-sa-lihiya/>). Banana pseudo stem (so called because it has an appearance of tree trunk) can be utilized for its fibre content which can be used as natural threads. The pulp can be used to manufacture rope, paper, place mats and other goods (http://www.ehow.com/info_8649558_banana-tree-its-uses.html). Along with that banana pseudo stem is edible also. Inner tender stem is eaten as vegetable (<http://www.curejoy.com/content/banana-tree-natures-gift-for-your-health/>). It is a good source of potassium, calcium, magnesium, phosphorus and iron. It also contains vitamin A,C

and B6. Besides being high in nutrients it has got certain medicinal properties also like juice of banana pseudo stem is believed to control sugar levels and hence beneficial for diabetic patients. It has been found that it also cures stomach sores and removes urine irritation (<http://moonramkonam.com/nov/banana-stem-medicinal-qualities/>). Banana peels can be used for non-food purposes as a cattle feed or as a natural fertilizer as the peels are rich in nutrients which in turn enrich the soil and make it more fertile. Just like the other parts of banana plant there is one more part which is very nutritious and possess various health benefits, banana blossom (aka banana flower or banana heart). They are the part of many cuisines in Southeast Asian countries and especially India.

Biological description of banana blossom

Finger shaped banana blossoms are subtended by large fleshy, reddish or purple coloured scales, which fall off as the fruit matures. The flowers are unisexual which means individual plant contains both male and female flowers. On the banana plant, first female flowers appears. These flower develop into "hands" of banana wherein the ovaries develop into seedless fruit without being pollinated. After all the female flowers have fruited, the inflorescence elongates and produces cluster of male flowers within the brackets of the bud. The male flowers die quickly and the bud slowly becomes smaller. Only one inflorescence develops per plant. The flowering stalk which has been developed from underground rhizome, pushes up through the pseudo stem of the plant, to emerge at the apex. Eventually, under the weight of the developing fruit, the flowering stalk curves downwards. The elongated structure (raceme) continues to elongate during development which results in older and riper fruits being positioned downwards flowers and younger fruits being closer to the elongated tip. This happens with the male flower also, with spent flower occurring lower down, and pollen producing ones at the tip of the inflorescence. Being strongly scented, banana blossoms produce large quantities of nectar on which birds and bats feed and pollinate the flowers (<http://science.jrank.org/pages/732/Banana-Biology-bananas.html>).

Nutritional value of banana blossom

Banana blossom has tremendous nutritional value similar to banana fruits. They are excellent source of vitamins, certain minerals, good source of fibre and protein. Besides banana blossoms are also excellent source of certain phytochemicals which acts as antioxidants. As per African Journal of Biotechnology (Sheng *et al.*, 2010), the nutritional information conducted on two species of banana blossom (Baxijiao and Paradisiaca) are as follows (per 100g)-

Table 1. Nutritional facts

Calories - 51 Kcal	Phosphorus - 73.3 mg
Protein - 1.6 g	Iron - 56.4 mg
Fat - 0.6 g	Copper - 13 mg
Carbohydrates - 9.9 g	Potassium - 553.3 mg
Fibre - 57 g	Magnesium - 48.7 mg
Calcium - 56 mg	Vitamin E - 1.07 mg

Health benefits of banana blossom

Banana blossom caters lot of health benefits. Given are the few benefits provided by banana blossoms.

Helpful in diabetes

It has been found that consumption of banana blossoms regularly for about a month reduces the blood sugar level and raise the haemoglobin level in the body as it is rich in fibre and iron which assists in the production of red blood cells.

Lowers menstrual bleeding

From the olden days banana blossoms has been utilized to treat the excessive blood loss during the menstrual cycle. It is helpful to lower the muscle cramps due to the ability of blossom to regulate the progesterone hormone that can in turn reduce the painful bleeding. Besides it also contain magnesium that can reduce anxiety during that period. It is also believed to help women who are suffering from polycystic ovarian syndrome (<http://www.indiatimes.com/health/healthyliving/8-incredible-health-benefits-of-banana-flower-the-health-all-rounder-you-haven-t-heard-of-251391.html>).

Increase the milk production in lactating mothers

Intake of banana blossom boost the milk production in lactating mothers. Therefore, it can be a blessing for new mothers who face problem nursing their new-borns

Good for gastrointestinal health

Banana blossom being a good source of both soluble and insoluble dietary fibre, is very helpful for people suffering from irritable bowel syndrome (IBS) and diarrhoea. Those people should include these blossoms in their regular diet plan. The soluble fibre dissolves in water and forms a gel, which allows food to pass easily through the digestive tract. On the other hand, the insoluble fibres in blossom does not dissolve in water and helps provide bulk to undigested waste products, therefore for people suffering from constipation are advised to increase the intake of banana blossoms. For proper digestion and absorption of food in the gastrointestinal tract both types of dietary fibres are required and banana blossoms are good source of it (<http://www.medindia.net/patients/lifestyleandwellness/health-benefits-of-banana-flower.htm>).

Helpful in ulcers

Ulcers can be described as wounds alongside the intestinal linings. Patients suffering from ulcers are encouraged to increase the consumption of vitamin C rich foods as it is believed that vitamin C plays important role in promoting tissue repair and wound healing. Since the blossoms are rich in that vitamin, it can be helpful in ulcer management as it neutralizes the gastric juices and reduce ulcer irritation (http://www.newvision.co.ug/new_vision/news/1436915/health-benefits-eating-banana-flower-empumumpu).

Helpful in infection treatment

Banana blossoms extract has been found to be very useful for treating the infection in natural way. During a research on antimicrobial activity of ananda blossom extract, it was suggested that certain bioactive compounds extracted from banana blossoms exhibited antibacterial activity against bacteria Bacillus (Mokbel and Hashinaga, 2005). The research further mentioned that the bioactive compound malic acid found in blossom exhibited a stronger antibacterial activity

against *Bacillus subtilis*, *Bacillus cereus*, and *Escherichia coli* (Jahan *et al.*, 2010). Along with that the flower extract is also useful in healing wounds especially in children and preventing the malarial parasite, *Plasmodium falciparum* from growing and developing in the body. Besides fighting against infections, the juice of banana blossom is very helpful in healing the wound and burn faster (<http://www.parentinghealthybabies.com/health-benefits-of-banana-flower-for-children>).

Rich in antioxidants and phytochemicals

Earlier researches have shown that different parts of banana plants including the blossoms have significant antibacterial and antioxidant properties (Padma *et al.*, 2012; Roobha *et al.*, 2011; China *et al.*, 2011; Bhaskar *et al.*, 2012). Since the banana blossoms are rich in phytochemicals like vitamins, flavonoids and protein. The blossoms can be used for the treatment of bronchitis, constipation and peptic ulcer (Timsina and Nadumane, 2014). It has been suggested from scientific research that banana blossom extracts can be used for various industrial application due to its high phenolic contents and flavonoids. It was found during the study that the best antioxidant activity can be obtained when the extraction is done at 60 degrees centigrade with ethanol concentration of 50 percent for the time of 30 minutes and stirring extraction without the use of ultrasound (Schmidt *et al.*, 2015). The antioxidant property of extract scavenge the free radical and control cell and tissue damage. In another study it has been reported that glucose uptake in Ehrlich ascites tumour cells was stimulated by banana (*Musa species*) flower and pseudo stem extract (Bhaskar *et al.*, 2011). Therefore, due to its high antioxidant property it is suggested to include the banana blossom in health supplements.

Keeps mood elevated and reduces anxiety

Banana blossom can boost mood in every person especially in kids who have mood swings and are anxious by nature. Banana blossoms can act as remedy for mentally imbalanced kids who suffer from bouts of anxiety as it reduces the feelings of anxiety (<http://www.parentinghealthybabies.com/health-benefits-of-banana-flower-for-children>). Anxiety reducing property of banana blossom can be attributed to the fact that it contains magnesium which acts as antidepressant without side effects.

Helpful in weight loss

Since the banana blossoms are rich in fibre, it gives a sated feeling for longer period, so it is very useful for kids and adults who are overweight or obese. Adding banana blossom in one's meal in the form of soup, salad, curry or any other form, can facilitate weight loss.

Banana blossom as part of cuisine in different parts of world

Apart from providing various therapeutic benefits, banana blossom also possess the distinctive taste and makes a place for itself in culinary area. It is mostly consumed in South East Asian countries like in Indian, Thai and Vietnamese cuisine. It finds an important place in Ayurvedic cooking. It can be eaten raw as well as cooked form. Its petal is believed to taste like artichoke leaves. As with artichoke, the heart as well as fleshy part of the bracts, both are edible. The aromatic profile is less

strong and more delicate when it is in blossom form as compared to the fruits. The flower is starchy and slightly bitter, with more vegetal flavours. In India, banana blossoms are primarily used in salads, curries or soups. In South Indian cuisine, it is mostly used in curries, soups, fritters, stir fried or fried dishes. In Thailand, it is mostly served raw on the side with pad Thai, whereas in Indonesia, it is mixed with pork and a hot sambal, cooked in a section of bamboo and served at their festivals. It can be used to make stew also, as in Philippines, it is added to kari-kari, the famous beef stew. In Laos, it is used in combination with galangal, a rhizome similar to ginger (<http://www.finedininglovers.com/blog/food-drinks/banana-blossom>). In Sri Lanka, more than 32 million banana bunches are produced annually (Department of Census and Statistics, 1998, Agricultural Statistics, Sri Lanka). It is considered as a popular ingredient in their cuisine and is considered as a very tasty ingredient to make curries, fritter or are used as salad.

How to select and clean banana blossom

When selecting the banana blossom first timers may get little confused as which one to pick from the shelf. Therefore, those blossoms should be selected which are firmer in texture with no signs of decay or blemishes, petals are tightly packed and is purple-red in colour. To clean the banana blossom, external tough layers of petals should be opened first one by one. Each petal has bunch of florets, which needs to be collected discarding the petals. Then each floret should be opened, matchstick shaped pistil (tough and bitter) should be plucked and the scale like outermost petal (calyx) should be also discarded. This process needs to be repeated with each floret.

Once all the florets are cleaned, after being chopped they should be kept in water containing lemon juice, to avoid discoloration. Once all the petals are removed, light yellow coloured heart part of blossom will be revealed. Then this tender yellowish heart of banana blossom also needs to be chopped and immersed in lemony water. Before cooking all the water needs to be drained out and squeezed well. The whole process may be little time taking and it may take around 30-45 minutes to clean a banana blossom.

Preserved forms of banana blossom

Since the cleaning of blossom is cumbersome process, therefore to cut down the preparation time in cooking preserved, blossom can also be used. In a scientific research, it has been observed that when the blossom was cut into slices and directly immersed into a 0.2 percent citric acid solution for 30 minutes followed by drying at 50 degree centigrade for 6 hours, it resulted in product which had a shelf life of more than a month when wrapped in aluminium foil laminated with high density polyethylene (Kanchana *et al.*, 2005). Along with the tedious cleaning process, another problem associated with banana blossom is its scarcity. Since fresh blossoms are not available in every part of world, nowadays canned blossoms can also be found in market especially in Asian grocery stores among the canned fruit and vegetable section. Canned in brine solution, tinned banana blossoms are inexpensive also. Colour wise they may not appear as pink as when they are fresh, but are somewhat beige in colour. Since the blossoms are mild in taste, they readily accept strong and spicy flavours. They can be combined with shrimp, meat or some vegetables to make it more palatable.

Conclusion

Banana blossoms, rather the unconventional food for most part of the world, except for Southeast Asian countries where it is well known and consumed, presents itself as a superfood, especially for women. It keeps the uterus healthy, reduces bleeding during menstrual cycle, act as lactating agent, reduce anxiety and increases good mood. It can be considered as a good example of functional food because it not only provides therapeutic value but also is loaded with lots of nutrients like fibre, protein, potassium, calcium, copper, phosphorus, iron, magnesium, vitamin E, A and C along with various antioxidants. It is recently capturing the attention of health and food industry. It can be designated as a super food due to its high nutritional values and medical benefits. It can be summarized that with some creativity, this power packed flower can be used in various cuisines all over the world. It will not only increase the use of this wonder food in food science but will also provide additional benefits in minimizing the banana waste. Finally it can be concluded that since plenty of information is available on health benefits of banana but very less has been reported about banana blossom, therefore further studies are required to document the health benefits of banana blossom and its potential to get incorporated in different cuisines worldwide and make it a part of daily healthy diet.

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