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A review on the therapeutic potential of Banana flower

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Abstract:

Banana (*Musa paradisiaca*) flower is rich in phytochemicals and exhibit antioxidant, anti-inflammatory, anticancer properties etc. The flower extract of banana showed promising therapeutic effects due to the presence of phytochemicals and minerals.

Key words: Banana flower, polyphenol, galactopoietic effects, menorrhoea

Description:

Banana is a familiar tropical and largest herbaceous flowering plant in the genus *Musa* of the family Musaceae, cultivated in tropical and subtropical areas. Banana flower, stalk and leaves are used to treat different diseases and are of incredible medicinal value for human being [1]. It is considered to be an excellent nutritional and mineral source of high level of natural bioactive substances (e.g., phenolic compounds, flavonoids, carotenoids, or quercetin) and exhibits a great antioxidant property which is related to health benefits and disease prevention [2]. Therefore, they are beneficial health food supplement for diabetic individuals [3]. Banana flowers are a good source of nutrients with tremendous health benefits [4]. Therefore, it is of interest to document the health benefits and therapeutic potential of banana flower. Banana flowers are valued for their nutritional and health benefits. Proximate composition of banana flower is highly impressive as they contain a wide variety of minerals including phosphorous, calcium, potassium and magnesium. Potassium, an important component of cell and body fluids, supports muscles, nerves and controls heartbeat. Magnesium is a natural anti-depressant and it will help reduce mood swings and depression. It is essential for strong bone and has a cardiac protective role. Manganese is a co-factor for anti-oxidant enzyme like superoxide dismutase. Banana flower is a source of antioxidants, vitamin C, vitamin B6, functional/bioactive compounds such as phenolics, antioxidants, dietary fibers, proteins,

peptides etc. that can present several beneficial effects and it may be used in Pharmaceutical industry [5].

Table 1: As per Sheng *et al.* (2010) the nutritional information of 100 g of banana flower [4].

Total calories/100g of banana flower	51 kcal
Protein	1.6g
Carbohydrate	9.9g
Fat	0.6g
Fiber	5.7g
Calcium	56mg
Phosphorous	73.3mg
Iron	56.4mg
Copper	13mg
Potassium	553.3 mg
Magnesium	48.7mg
Vitamin E	1.07mg

Every part of banana plant is useful for mankind. Various parts of the plant is used to treat non-communicable, communicable diseases, regulating blood pressure, diabetes, hypertension, anemia, allergic reaction, microbial infections, and chronic bronchitis disorders [6-9]. Apart from the conventional uses it possesses pharmacological activities, demonstrating antioxidant, immunomodulatory, anti microbial, anticancer, anti ulcerogenic, hypo-lipidemic, hypo-glycemic, and anthelmintic properties [10]. Table 2 highlights the health benefits of banana flower.

Table-2. Health benefits of Banana flower

S. No	Health benefits	Therapeutic potential	References
1.	Antibacterial and antiparasitic activity	Banana flower retards the growth of pathogenic bacteria such as <i>Bacillus subtilis</i> , <i>Bacillus cereus</i> , and <i>E.coli</i> . Growth of the malarial parasite <i>Plasmodium falciparum</i> (<i>in vitro</i>) and prevents infection. The existence of various peptides and amino acids i.e., <u>tyrosine</u> and <u>tryptophan</u> amino acid found to have significant antibacterial potential against gram-positive and negative bacteria.	[11, 5]
2.	Diabetes	Significant reduction in blood glucose and glycosylated haemoglobin and an increase in total haemoglobin. Fructosamine and AGEs (advanced glycation end-products) formed during diabetes were inhibited in banana flower treated groups when compared with the diabetic group	[12, 13]
3.	Menorrhagia	Increases the level of progesterone in the body and thereby reduces bleeding associated with prolonged menstruation.	[11]
4.	Gastro intestinal health	Banana flowers are a good source of dietary fiber as they contain soluble and insoluble fiber. Biologically active molecules are held by dietary fiber exerts beneficial role in the prevention and management of gut related problems	[14]
5.	Hypocholesterolaemic and hypo glycaemic effect	Food components with antioxidant properties may prevent cardiovascular diseases by inhibiting the oxidative damage to LDL-cholesterol the effects of fibre and polyphenol rich banana blossom on serum cholesterol and serum glucose in rats fed a cholesterol enriched diet were examined	[15, 16]
6.	Body weight reduction	Banana blossom diet (CDB) reduced the body weight in rats compared to cholesterol enriched control diet (CD) fed group and may support the previous findings that fibrous diet help reducing body weight	[17, 18]

Banana flowers are a good source of dietary fiber in the form of soluble and insoluble fiber. Soluble fiber dissolves in water and forms a gel, which allows food to pass easily through the digestive tract. The insoluble fiber in banana flowers does not dissolve in water and it helps provide bulk to undigested waste products. Both

types of dietary fiber promote healthy digestion and absorption of food in the gastrointestinal tract. Biologically active molecules are held by dietary fiber from plantain inflorescence [14]. These biologically active molecules are always released in digestion with probiotic bacteria which helps in fermentation, all these

have advantageous effects on gastrointestinal health and decreasing the exposure of colon cancer [18-21]. It is reported that the intake of dietary fibre exerts beneficial role in the prevention and management of gut related problems, cardiovascular diseases, type 2 diabetes, certain types of cancer and obesity [7].

Peptic ulcer disease is one of the most common gastrointestinal disorders, which causes a high rate of morbidity. Gopinathan and Rameela reported that rats administered with banana flower juice + Aloe vera juice shows excellent antiulcer activity in all parameters studied. There was a significant reduction in the ulcer index in the rats administered with Aloe vera juice in combination with banana flower juice. This may be due to the content of flavonoids and tannins present in banana flower [22]. Flavonoids and tannins are reported to have antiulcer and anti-inflammatory activities and hence could be a wonderful remedy for ulceritis [18, 20, 23, 24].

Banana flower is used as medicine in Ayurveda. Banana inflorescence is consumed as a traditional Thai cuisine for milk lactation in maternal breastfeeding. A well-known herb in Thailand for breastfeeding is the banana flower. The extracts also showed anti-oxidant activity, which can contribute towards healthy lactation [25]. Banana flower was extracted to determine the bioactive compounds and antioxidants and develop a maternal beverage for breastfeeding. Banana flower possess galactopoietic effects or increase maternal milk lactation [26]. Michele demonstrated that the total phenolic compounds and flavonoids with antioxidant potential in banana inflorescence were found in high-polarity solvents. The antioxidant activity of banana inflorescence may be due to the total phenolic compounds and flavonoids [27]. Thus, the banana inflorescence plays a beneficial role as a health food supplement for breastfeeding mothers, including postpartum mothers and post-cesarean mothers [28].

Among many beneficial medicinal plants screened for anticancer agents, the banana is one of them. Banana flower was a good source of dietary fiber and antioxidants and is rich in micronutrients like polyphenols, gallic acid, catechol, syringic acid and ferulic acid [3]. These antioxidants and micronutrients neutralize free radicals and prevent oxidative damage. Since oxidative damage greatly increases the risk of several diseases including heart disease and cancer, antioxidants can play a vital role in preventing or even slowing down the progression of these conditions. The reduction of HT29 colon cancer cells treated with banana flower may be linked to its higher phenolic content, as reported that phenolic compounds have anticancer activity against cancer cells. Similarly, the anticancer activities of gallic acid, catechol, syringic acid and ferulic acid had also been reported on several cancer cell lines available [29, 30].

It is a metabolic disease which is characterized by high blood sugar levels for a prolonged period, and can inflict destruction on various organs in the body. The elevated sugar levels are linked to problems with insulin production or absorption. There have been several studies and animal tests in the last decade to determine the effect of banana flower on diabetes. Similarly, a test carried out on

diabetic rats showed, rats that were fed banana flower as part of their daily diet fared much better than the rats in the control group that did not receive the banana flower. The findings showed that the banana flower has anti-diabetic properties and that including it in a diabetic's diet would also reduce other diabetes symptoms such as polyuria, hyperglycemia and body weight fluctuations. Bhaskar *et al.* (2012) showed banana flower have low glycemic index and have a high content of dietary fiber and antioxidants [13]. Diabetic symptoms like hyperglycemia, polyuria, polyphagia, polydipsia, urine sugar, and body weight were ameliorated in banana flower. Increased glomerular filtration rate in the diabetic group was decreased in banana flower-fed rats. Fructosamine and AGEs (advanced glycation end-products) formed during diabetes were inhibited in treated groups when compared with the diabetic group. They suggested that banana flower have anti-diabetic and anti-AGEs properties and are beneficial as food supplements for diabetics. The whole edible parts of banana flower are proved to be a rich source of antioxidant activities and have the potentials of inhibiting the formation of various types of AGEs [31]. Significant content of Umbelliferone and Lupeol is reported to exhibit a remarkable anti hyperglycaemic effect [32].

Sitthiya *et al.* 2018 showed antibacterial effects against both gram positive and gram negative bacteria [5]. Studies have shown the antioxidant and antimicrobial capacity banana flower extract [33, 34]. Bioactive compounds such as phenolic compounds, malic acid found in blossom exhibited a stronger antibacterial activity against *Bacillus subtilis*, *Bacillus cereus*, and *Escherichia coli* [35]. The banana flower extracts have higher concentrations of phenolic and hydroxyl groups and flavonoids, which showed stronger antioxidant activities, potential scavenging abilities which in turn exhibit antimicrobial activity [36, 37].

The effects of fibre and polyphenol rich banana blossom on serum cholesterol and serum glucose in rats fed a cholesterol enriched diet were examined. Polyphenol rich dietary fibres in banana blossom are reported to modulate the lipid metabolism in rats [38]. This is supported by another study which showed a positive effect on cardiovascular disease risk factors [39]. Phenolic compounds from various sources have been reported to prevent LDL oxidation *in vitro* and show marked hypo lipidaemic activity *in vivo*, suggesting the effectiveness of polyphenols for the prevention and treatment of atherosclerosis [40]. The banana flower can be a good source of beneficial unsaturated fatty acids such as oleic, linoleic, and α -linolenic acids (accounting for more than 60% of total fatty acids) that may reduce the risk of cardiovascular diseases [38].

Banana blossoms have been utilized to treat the excessive blood loss during the menstrual cycle. Magnesium content of banana flower is reported to reduce the anxiety during that period. Consumption of one cooked banana flower with one cup of curd or yogurt is the most effective treatment for excessive bleeding during menstruation. This combination increases the level of progesterone in the body and thereby reduces bleeding associated with menorrhagia. Traditionally; banana flower is used to treat women who are suffering from polycystic ovarian syndrome [18, 20, 41].

Conclusion:

The phytochemicals and dietary fibre rich extract of banana flower is of interest for pharmacological investigations. Clinical studies in human are still not available to prove the efficacy of the flower requires more attention towards research to validate the pharmacological effects.

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