

FORMULATION OF PLANTAIN FLOWER PUDDING POWDER

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ABSTRACT

A banana is an elongated, edible fruit botanically a berry produced by several kinds of large herbaceous flower ring plants in the genus *Musa*. Banana flower is rich in nutrients, including fibre, antioxidants, and numerous minerals. Emerging research indicates that it may aid digestive health, prevent prostate enlargement, support bone health, and help lower blood sugar and cholesterol levels.

The study focused on the pudding using banana flower powder. An easily perishable banana flower were sliced and put in hot and cold water about 5 minutes. after the sliced flower are drained and loaded in to hot air oven dried for 60°C for 5-6hours. then dried banana flower was powdered. The product was significant in terms of moisture, Ash and fat. The product is taken as sensory evaluation for 20 untrained panel members and the appearance, colour, texture, flavour is rated as 9 hedonic scale and it will take as overall acceptability. The product gained good overall acceptability.

INTRODUCTION

Dessert food items are a part of Western food culture and are increasingly consumed in-between the classical meal pattern of breakfast, lunch and dinner. Recently, there has been an increased interest in examining recreational (or mind less) eating and evidence suggests that snacking in between meals contributes to about 25% of children's energy intakes. However, it is not known to what extent U.S. children consume desserts at meals and in-between meals, nor how the intakes of desserts differ among children who have a dessert alongside a meal or in-between meals. (Emma F Jacquier, 2016)

BANANA FLOWER (*Musa acuminata* colla)

SCIENTIFIC CLASSIFICATION

TABLE 1:

Kingdom	Plantae
Subkingdom	Tracheobionta

Superdivision	Spermatophyte
Division	Magnoliophyta
Class	Liliopsida
Subclass	Zingiberidae
Order	Zingiberales
Family	Musacea
Genus	Musa L

(Ref: apletz,R C,et al.,l.,2007)

The flower of the banana plant is also known as blooms or banana heart. family to whom banana belongs is called musacea as banana blooms, represent a valuable source of potassium, vitamin A, vitamin c, vitamin E, minerals, fatty acid content, flavonoids,saponin, essential and non-essential aminoacids,tannins,glycoside and steroid. Banana blooms is a good antioxidant source. Banana flower has a huge nutritional value and healthy benefit(Vishal Sharma,2019)

Banana has got immense nutritional and nutraceutical value. It is rich in nutrients and more easily digestible than many other fruit crops with its good aroma, texture and easy to eat property, make it favourite among all.tge flower of banana called, banana blossom is consumed as a vegetable in some countries, mainly in India and Malaysia(Fathima zehala et al,2018).

The nectar juice obtained from flower buds has got medicinal value, for curing stomach disorders and ulcers(Mohapatra et al.,2010)

The flowers are unisexual which means individual plant contains both male and female flowers. One the banana plant, first female flowers appear. These flowers develop into “ hands” of banana flowers have fruited, the inflorescence elongates and produce cluster of male flowers whithin 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 resultin older and riper fruits being positioned downwards flowers and younger fruit being closer to the elongated rip. This happens with the male flower also, with spent flower occurring lower down, and pollen producing ones at the tip of the inflorescence. Being strigly

scented, banana blossom produce large quantities of nectar on which birds and bats feed and pollinate the flowers (ploetz,RC,et al l.,2007)

An immense wastage of this byproduct also. These are usually discarded in water bodies, leading to increased biological oxygen demand (DOB) and thus disturbing aquatic life. Blossom of the plant (*Musa acuminata* colla) is often consumed as a vegetable in many Asian countries such as Sri Lanka, Malaysia, Indonesia and the Philippines (Walker A.,1931),1997). Banana blossom is a popular dish in Sri Lankan cuisines. It is consumed as a curry as well as a boiled or deep-fried salad with rice and wheat bread. Despite the absence of data on dietary fibre content and composition of the banana blossom, it is generally valued as a fibre – rich source (Kanchana s,2005)

Finger millet or ragi is one of the ancient millets in India (2300 BC), and this review focuses on its antiquity, consumption, nutrient composition, processing, and health benefits. Of all the cereals and millets, finger millet has the highest amount of calcium (344 mg%) and potassium (408 mg%). It has higher dietary fiber, minerals, and sulfur containing amino acids compared to white rice, the current major staple in India. Despite finger millet's rich nutrient profile, recent studies indicate lower consumption of millets in general by urban Indians .

Finger millet is processed by milling, malting, fermentation, popping, and decortication. Noodles, vermicelli, pasta, Indian sweet (halwa) mixes, papads, soups, and bakery products from finger millet are also emerging. In vitro and in vivo (animal) studies indicated the blood glucose lowering, cholesterol lowering, antiulcerative, wound healing properties, etc., of finger millet. However, appropriate intervention or randomized clinical trials are lacking on these health effects. Glycemic index (GI) studies on finger millet preparations indicate low to high values, but most of the studies were conducted with outdated methodology. Hence, appropriate GI testing of finger millet preparations and short- and long-term human intervention trials may be helpful to establish evidence-based health benefits.(S Shobana, 2013).

Milk has been consumed since time immemorial because of its unique nutritional properties and produced almost 816 million tonnes in the year of 2016. Due to its highly perishable characteristic, milk is processed into more stable milk products such as cheese, yoghurt, and butter and milk powder. Among them, milk powder is distinctive for its longer shelf life and can be stored at ambient temperature. The other advantages of milk powder are less volume requirement during its transportation and higher selling price. Therefore, it is widely used in many food products such as ice

cream, bakery products, and sausages. According to a recent study on the statistics from Food and Agriculture Organization, world production of whole dried milk was 3,597,015 tonnes in 2014: Oceania 36.5%, Americas 36.1% and Europe 24.1% of the World production.

Milk powder production is a process that requires high energy, especially for evaporation. Recently, reducing energy use has been gaining importance by increasing energy and exergy efficiency. Conventional energy analysis is performed based on the First Law of Thermodynamics. Unlike from the First Law, the Second Law or exergy analysis (defined as useful work) has appeared in the literature, while this analysis not only assesses quantity but also quality of energy. In this study, exergy analysis of a milk powder production system, mainly includes 3 processes (pasteurization, evaporation and spray drying) which will be presented. (Nurdan Yildirim, ,2010)

REVIEW OF LITERATURE

A well-known food crop, the banana (*Musaceae* spp.) is mostly consumed as a considerable output in most developing nations. But its flowers will always become agricultural waste. These byproducts are also abundant in bioactive substances and crucial to maintaining our health. Banana bloom has comparable phytochemical concentrations, according to recent investigations. Banana blossoms are therefore a potential functional food with a variety of nutraceutical advantages.

Banana Blossom are nutritional value very good with fibre, protein, potassium, iron, magnesium, and vitamin E. Banana flower many or health benefits prevent diabetes, lower menstrual bleeding, increase the milk production for lactating women, good for gastrointestinal health, helpful in weight loss, prevent ulcer, constipation. These pretty flower can be eaten incorporate of different type of food products like-chocolate, cookies because this type of food products shelf life long lasting. (Dr Komal, 2019)

Banana blossom is a well-known medicinal flower of banana plants that is traditionally used to treat a variety of diseases in various regions of the world. Banana flower is a rich source of nutrients like proteins, dietary fiber, antioxidants, iron, calcium, potassium, phosphorus and magnesium etc. Various researchers have conducted studies and found different nutritional properties and health benefits of banana flowers. (Parismita Buzarbaruah,, 2020)

The nutritional composition of banana flowers of two cultivars [cvs. Baxijiao (AAA) and Paradisical (AAB)] grown in Hainan of China has been studied. Flower samples were collected and extracted according to methods of Association of Official Analytical

Chemists (AOAC). Results showed that Banana flowers contained abundant dietary fiber (4.96-5.74 g/100g) and proteins (1.62-2.07 g/100 g). The major amino acids are glycine, leucine, alanine, and aspartic acid. Lysine had a lowest chemical score of 64% among the essential amino acids. In both species, flowers contained a higher composition of unsaturated fatty acids (65-66%), mainly the linoleic acid, while saturated fatty acids (mainly palmitic acid) is low. The contents of vitamin E, total saponin and flavonoids were 0.87-1.07, 0.12 and 5.27-5.90Mg/100 g, respectively.(Yang Bi, Zhi-,2010).

Biological description of banana blossom Finger shaped banana blossoms is 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 appear. These flowers develop into “hands” of banana wherein the aries 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 clongated 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 lowers (Ploetz, RC, et al., 2007).

Banana (*Musaceae* spp.) is a well-known food crop, mainly consumed as a significant yield in most developing countries. However, its blossoms will always end up as agriculture wastes. These by-products are also rich in bioactive compounds and are highly required for our health maintenance. Recent studies have reported that banana blossom contains comparable phytochemical contents. Therefore, this review aims to study the phytochemical

constituents, antioxidant properties and medicinal benefits of banana blossoms, making it a potential functional food with diverse nutraceutical values. All information

and studies used in this review were collected from various online databases, such as Web of Science, Scopus, PubMed, Science Direct and Google Scholar. From the literature studies, this review had discovered the bioactive compounds contained in this banana blossom, such as phenolics, flavonoids, dietary fibers, tannins, saponins and vitamins; and potential biological activities of this banana blossom, such as antioxidant, anti-hyperglycemic, anti-inflammatory, and antimicrobial properties. Thus, it can be concluded that banana blossoms contain appropriate quantities of beneficial secondary metabolites that are significant in maintaining good health. More research into the medicinal potential of banana blossom can be done to provide new approaches to treating and preventing a variety of medical conditions.(Nur Syahirah Muhammad Suffi.,2021)

Bananas can be used to fight intestinal disorders like ulcers. Bananas are one of the few fruits That ulcer patients can safely consume. Bananas neutralize the acidity of gastric juices. It is Used as a remedy of constipation in children. It forms the part of diets of children suffering From malnutrition. The extract of core of the stem is considered to be useful in dissolving the stones in the Kidney and urinary bladder and reducing the weight. The inflorescence mixed with coconut Oil and spices is used for flushing the urinary blocks.The fruit is believed to reduce the worm problems in the kids[7,8].

finger millet, also known as ragi, which is one of the first millets in India (2300 BC). Finger millet contains the greatest levels of calcium (344 mg%) and potassium (408 mg%) of all the grains and millets. Compared to white rice, the country's current main grain, it has more nutritional fibre, minerals, and amino acids that contain sulphur. Despite the strong nutritional profile of finger millet, current studies show decreased intake of millets overall by.

The nutrient content of finger millet makes it healthy and functional food and generally eaten as infant food, beverages, fermented foods, and bakery products. It is rich in protein, dietary fibre, amino acids, carbohydrate minerals, micro and macro nutrients etc. It can give several health and therapeutic advantages, such as diabetes prevention, anti-inflammatory, antibacterial, anti-diarrheal, and antioxidant capacity, phytochemical activity, antimicrobial, enzyme inhibitory properties due to its high dietary nutritious content. In urban areas the consumption of finger millet is limited as compare to rural areas as it is dark brown in colour which is not drool worthy so the concept of processing of this particular crop came for a save. (K Ashik Somarajan, Sonia Morya)

METHODOLOGY

Sample collection and preparation

Various ingredients used in the preparation of Banana flower pudding mix powder are

Dairy ingredients: Milk and milk powder

Non-Dairy ingredients include:sugar,Ragi extract powder were purchased from local market.musa paradisiaca colla (Banana flower) were collected in agricultural field.

Preparation of Banana Blossom powder (BBP)

Musa paradisiaca is the most popular blossoms were collected in agricultural field. The bracts were removed and cut the banana flower for 3 mm as per the previous study and washed in water and put in hot water (70°C) about 5 minutes then put into the cold water about 5 minutes. After treatment, the sliced flower are drained and loaded in to Hot air oven and dried for 60°C for 5-6 hours . Then the dried flowers were ground into fine powder and this powder was used for further incorporation.

PREPARATION OF PUDDING MIX POWDER

FLOW CHART FOR PRODUCTION OF PUDDING MIX POWDER

Weighing all the dry ingredients

Dry mixing the ingredients

Mix well

Packaging

Storage/Evaluation

Preparation of pudding from pudding mix

SELECTION OF INGREDIENT

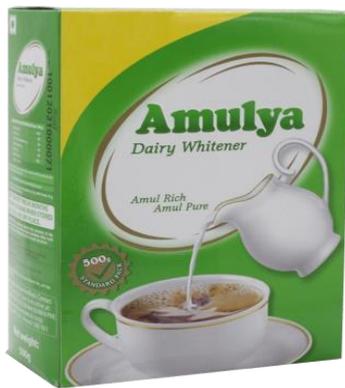
The ingredients that are used in the preparation of pudding from pudding mix, Ragi extract powder, ghee, sugar, milk and Banana flower powder. the ingredients were collected from the nearby shop. expect banana flower powder were collected in agricultural field. The main ingredient used in this product pudding mix. The mixture of milk with the ghee gives the flavor to the pudding. The selection of milk have a main role in the product because the quality of the milk is very important for the texture and taste of the pudding and the Nutritive value for the product also change it will affect the product.



Banana flower powder



Ragusa extract powder



Milk powder



Ghee

Production

The main ingredient the cow's milk were subjected to boil in a pan at 45°C and boil for 5-10 minutes with continuously stirring well till the milk to be little condensed form in that stage add a 5 ml of ghee into the ghee and stir well to mix thoroughly . Add the sweetening component sugar it is healthier than the sugar make the sugar in to little particles and add in to the milk mix thoroughly till the colour change in to a light brown and stir well.

It is the stage to add the pudding mixture little by little with a spoon simultaneously need to stir well to avoid the formation bigger particles with the pudding mixture that added to the milk. Add the mixture fully little by little without stopping the mixing in the same temperature with the mixing make the mixture of milk and the pudding mixture in to a dough form. 2 minutes before the flame off add again some amount of the ghee.

Then replace into a another pudding tray from the pan and kept for 5 minutes to cool a little In a mild hot temperature and kept fridge for 15 minutes then serve



PLATE 9

SENSORY EVALUATION

Sensory analysis is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses for the purpose of evaluating consumer products. colour, texture, flavour, taste and appearance are the main criteria used for sensory evaluation (Amerine, 2014)

Sensory evaluation is a critical component to that process. historically, sensory evaluation has often been associated with product experts, and later as a more passive member of the product development team. (Dermott, 2013).

Packaging is defined as enclosing food to protect it from tampering or contamination from physical, chemical and biological sources. Packaging maintains the benefits of food processing after the process is complete, enabling foods to travel safely for long distances from their point of origin and still be wholesome at the time of consumption. The primary purpose of food packaging is to protect the food against attack from oxygen, water vapour, ultraviolet light, and both chemical and microbiological contamination. (Prasad and Kocher, 2014)

The sensory analysis was done to find out the acceptability by the same panel members showed in Figure XIX. The Score card used for sensory analysis is given in Appendix.



Sensory analysis for Banana flower pudding

RESULT AND DISCUSSION

The dairy foods of the future promise to be healthful and functional. There is going to be a great demand for nutraceutical in the future, Foods of the future will contain more of natural substances (Rasmussen, 1988). Hippocrates stated “Let food be your medicine and medicine be your food”. These words of Hippocrates hold true for dairy and food industry as well (Gherty, 1994). The study was undertaken to evaluate Banana Blossom (*Musa acuminata* colla) as a functional ingredient in pudding,, since it is well known for its medicinal and therapeutic properties. Banana blossom is an excellent source of crude fiber in the human diet. Banana is a climacteric fruit, during post-harvest handling and commercialization, huge quantities of this fruit is lost. Majority of harvested fruit is thus wasted when it reaches central collection station because of less appealing characteristics. Hence, as a solution to minimize this issue, nutrient rich product was formulated from major underutilized byproducts of banana, i.e., blossom. An attempt was also made to develop Banana Blossom Powder and its acceptability level in pudding.

The present investigation pertains to the evaluation of the suitability of various forms of banana blossom powder as a new ingredient in pudding. So far, there is no reported literature regarding of banana blossom powder in pudding. Therefore, the research has been undertaken to develop such a novel pudding.

TWO different sets of results, viz.

A) Sensory Attributes

B) Physical and chemical properties

Are discussed in the subsequent section for the banana flower powder pudding.

4.1. Sensory Evaluation

Sensory analysis is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses for the purpose of evaluating consumer products. Colour, texture, flavour, taste and appearance are the main criteria used for sensory evaluation (Amerine, 2014).

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TABLE 2:

PARAMETERS	A	B
Appearance	8.35± 1.13	8.45±1.14
Taste	8.55±0.68	8.6±0.59
Color	8.35±0.98	8.3±0.97
Texture	8.45±0.68	8.45±0.60
Flavour	6.65±0.74	8.55±0.75

4.2 CHEMICAL ANALYSIS

4.2.1 Analysis of Moisture content

The moisture content was estimated using the oven-dry method at 105°C to 110°C until the weight was consistent, which took about 16-17 hours (AOAC, 1990). The main goals of assessing moisture content in foods are to examine quality, quality assurance, quality control, and adulteration detection, as well as to analyse stability and shelf life during storage.

TABLE 3:

Sl.NO	SAMPLE NAME	MOISTURE CONTENT
1	Banana flower pudding mix	9%

4.2.2 Analysis of Ash content

To assess ash concentration, around 5 g of samples were burned for 8 hours at 550°C in a muffle furnace (Gelman, Germany). The total ash content was calculated as a percentage of dry weight (method no. 940.26, AOAC 1990).

TABLE 4:

SL.NO	SAMPLE NAME	ASH CONTENT
1	Banana flower pudding mix	2.4%

4.2.3 Analysis of Fat content

Sample's fat content is generally determined quantitatively by means of extraction using a pophilic solvent. The free fat is recorded by direct extraction, without prior digestion. The most anmonly used extraction method is solid/liquid extraction. The prepared sample is extracted ng the solvent. After extraction, the solvent is evaporated and the dried residue is weighed. He free fat content is calculated from the difference between the initial sample weight and the tput weight. Complete extraction in the return flow of the distilled solvent in accordance with se classic Soxhlet method is very time-consuming and takes several hours (C. Gerbandt).

TABLE 5:

SL.NO	SAMPLE NAME	FAT CONTENT
1	Banana flower pudding mix	12%

4.2.4 Analysis of Bulk density and Tapped bulk density

Bulk density of both grains and flours were identified by the procedure suggested By Varnamkhasti et al. (2008) with slight modification. Grain or flours were loaded in a 100ml measuring cylinder and weighed. The sample in same measuring cylinder wastapped for several times, then change in the initial volume was taken to calculate tapped density. Bulk density (g/ml) was the ratio of sample weight and volume of the sample aken in measuring cylinder.

$$\text{Bulk density} = \text{Sample weight} / \text{Volume}$$

TABLE 6:

Sl no	SAMPLE NAME	Tapped Bulk DENSITY
1	Banana flower pudding mix	1.0mg/ml

TABLE 7:

SL.NO	SAMPLE NAME	Bulk DENSITY
1	Banana flower pudding mix	0.95mg/ml

4.2.5 True density.

True density (kg/ m³) of the samples were measured by the procedure followed by Karababa and Coşkuner (2013). Take 30g of sample and added into a graduate cylinder filled with distilled water. The quantity of water displaced was noted

$$P_t = \frac{30_g}{V_2 - V_1}$$

$$2 - V_1$$

Where P_t referred to as true density, V_1 is initial volume and V_2 is the final volume

3.3.4. Porosity.

Varnamkhasti et al. (2008)s formula was followed to calculate porosity (%) of the sample. It was calculated by substituting bulk density and true density values in it.

$$\epsilon = \frac{P_t - P_b}{P_t} \times 100$$

$$P_b$$

Where ϵ symbolize porosity, p_t is true density and P_b is loos bulk density

TABLE 8 :

Sl.no.	Sample name	True density
1	Banana flower pudding powdered mix	7.5

3.4.4. Water and Oil absorption capacity

Water and oil absorption capacities of the sample found out by the procedure Suggested by Sosulski, Humbert, Bui, and Jones (1976). In this method, 1g of samples Were mixed with 10ml of dis. Water or oil and then it is stored in room temperature for 30 min. Then the mixtures were centrifuged (Eppendorf centrifuge 5804) at 2000rpm for 30 min. water and oil absorption capacities are noted as a gram of absorbed oil or water Per gram of powder.

TABLE 9:

Sl.NO	Sample	Water absorption capacity
1	Banana flower pudding powdered mix	1.5g

TABLE 10:

Sl.NO	Sample	Oil absorption capacity
1	Banana flower pudding powdered mix	2.10g

Analysis of Carr's index and Hausne'r ratio

Foldability of a food powder is an important function which needs to be present In the flours to facilitate the industrial processes. The foldability of powder could be Estimated using Carr's index and Hausner's ratio. Carr's index is an indication of Compressibility of a powder and Hauser's ratio is a number related to the flowability of the powders.

TABLE 11:

Sl.no	Sample	Carr's index
1	Banana flower pudding powdered mix	5.26

TABLE 12:

Sl.no	Sample	Hausner ratio
1	Banana flower pudding powdered mix	1.05

Summary and conclusion

In recent years, change in people's lifestyle and various factors (awareness of people, explanation of health authority on nutrition, scientific development and doubt about synthetic food additives etc.) Have increased the interest for functional food sector due to the increase in demand for healthy and. Natural foods. Introducing functional ingredient in the food segment is the recent fad in the market and this continues to be one of the strategies employed by manufactures to attract consumers attention in more mature markets.

Foods like pudding can be served as a savoury entrée or as a dessert. The term "pudding" refers to the encased meats used in Medieval European puddings. It is thought that the word originated from the French bounding, which was derived from the Latin botellus, meaning "small sausage." Pudding is a widely held belief.

The present study uses banana blossom powder for the production of pudding mix powder. Results show that the sensory attributes including appearance, colour, flavour and texture were acceptable for the chemical Analysis shows that the product formulated with Banana bloosam powder .

The proximate analysis like fat, Ash and moisture. It have 90% of moisture content,12%of fat content and 24%of ash content. The satardized product is given for sensory evaluation by 20 untrained panel members and it accepted by them. The product was healthy to the body.

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