ISSN : 2319-2607 (Print); 2583-0856 (Online) IISUniv.J.Sc.Tech. Vol.11(1), 60-63 (2022)
RESEARCH ARTICLE

Quality Assessment of Banana Blossom and Development of Sugarcane Based RTS Beverage

Damini Soni*, Gargi Saxena
Department of Home Science (Foods & Nutrition)
IIS (deemed to be University), Jaipur

Abstract

Utilizing agricultural by-products as a source of functional ingredient has regained popularity. Although bananas are a widely-used food crop, their blossoms are sometimes undervalued. Whole flowers are been utilized as an additive for different purposes since ancient times. Banana blossom is a by-product of banana cultivation which is usually discarded, but still it is consumed in many Asian countries like Philippines, Sri Lanka, Malaysia, Indonesia and Thailand. It is a rich source of phytochemicals, vitamins, minerals and dietary fiber, hence it exhibits health benefits such as to cure dysentery, diabetes, ulcers, menstrual problems, bronchitis and so on. So, it is desirable that these flowers should get maximum utilization and incorporation in the food products for value addition. Hence, the present study aimed to assess the nutritional value of the flower and its utilization in the development of ready-to-serve (RTS) beverage by incorporating sugarcane juice for all age groups.

Keywords: Antioxidants, Banana flower, Ready-to-serve beverage, Sugarcane juice, waste utilization

Introduction

Bananas are most produced and consumed fruit globally. Highest quantities of bananas are produced by the Asian countries while Latin America and Caribbean countries are the world's largest exporters of bananas (Lau *et al*., 2020). Worldwide production of banana has reached 116 million tonnes in 2017-2019 (FAO, 2020). Production of Banana in India during the fiscal year 2021 accounted for around 33 million metric tons (Statista, 2022).

The way bananas are harvested, a lot of waste is generated reaching 80% of the total biomass contributing to environmental problems, and therefore interest in banana by- products has recently increased due to their abundance in various bioactive compounds (Ramirez-Bolaños *et al*.,2021).

One of the residues which can also be named as by-product of banana plant is banana blossom, a dark purple colored edible flower bud. In many parts of the world where the banana cultivation is more, the utilization of the flower is good else it is a underutilized and undervalued residue product with good nutritional profile (Panyayong, 2022).

The flower is widely used in Indian cuisine, particularly South Indian and Bengali dishes, and is consumed in large quantities as a vegetable in many other nations, including Sri Lanka, Malaysia, Indonesia, and the Philippines. Traditional Assamese households use the bloom, also known as *koldil* in Assam, to make a variety of non-vegetarian recipes (Sarma, 2020).

It has been found that the flower has curative properties both scientifically and traditionally as it is rich in vitamins, fiber and phytochemicals like flavonoids. Several recent studies have shown that the banana flower possess many therapeutic benefits. It helps to cure stomach ulcers, throat ulcers, and redness of eyes, boosts immunity, treat nervous debilities (Liyanage *et al*.,2016). The antioxidants present in banana blossom helps in reducing the risk of chronic diseases like cardiovascular disorders and diabetes, also due to the presence of other nutrients, it can be helpful in treating obesity, hypercholesterolemia, anemia, menstrual problems, heart pain, asthma, diarrhea and possess anticancer properties as well (Singh, 2017).

The present study aims to focus on the quality assessment of banana blossom and its utilization to prepare an anti-oxidant rich ready-to-serve (RTS) beverage, so as to retain its bioactive compounds to its maximum.

Material and Methods

Procurement of the Material

Musa acuminate was the species of banana plant of which

*Corresponding Author Email : daminisoni1013@gmail.com

the flowers were selected for the present study. The flower was procured from the local Bengali market of Jaipur city situated at C scheme area.

Preparation of the sample

After the procurement of the flower, the bunch was washed properly weighed using digital weighing balance. The outer bracts of the flower were weighed and discarded as they are theinedible part of the flower. The inner bracts were weighed and to prevent darkening they were immersed in various concentrations of citric acid solution and salt solution for varied period of time. The pre-treated bracts were dried for 4 hours at 60 degrees and then were grounded into fine powder for further proximate estimation (Singh, 2017). Fig. 1 shows the real picture of banana blossom.

Fig. 1. Banana blossom/flower

Analysis of Proximate composition and Mineral content

Various macronutrients (moisture, ash, protein, fat, fiber and carbohydrate) and Micronutrients (iron, phosphorous and vitamin C) estimations were carried out in triplicates using standard techniques and chemicals of analytical grade in the Food and Research lab of IIS(deemed to be University), Jaipur. Table 1 represents the standard methods used for the estimation of various proximate nutrients.

Analysis of antioxidant activity and phytochemicals

According to a few studies, the flower is reportedly rich in phytochemicals, hence it was used to assess the antioxidant activity and phytochemicals through proposed standard methods presented in table 2.

Standardization and formulation of sugarcane based ready to serve beverage

A pilot study was conducted where sugarcane juice and banana flower extract were mixed in different proportions to find out the best acceptable formulation. Later, the best acceptable combination was identified through organoleptic evaluation and the recipe was standardized for the further development of the variations.

Table 1. Methods used for estimation of proximate composition and micro- nutrients of Banana flower

Nutrients	Method	References
Moisture (g/100g)	Oven drying	AOAC, 2019
Protein (g/100g)	Micro -Kjeldahl	AOAC, 2019
Ash content(g/100g)	Dry ashing	AOAC, 2019
Fat (g/100g)	Soxhlet Extraction	AOAC, 2019
Crude fiber (g/100)	Acid -alkali wash	AOAC, 2019
Carbohydrate (g/100g)	Difference method	AOAC, 2019
Vitamin C	Titration method	Titration method
Iron	Wong's method	Raghuramulu and Kalyanasundaram, 1983
Phosphorous	Colorimetric method	AOAC, 2019

Development of the product

A ready-to-serve sugarcane-based beverage was developed where banana flower juice (extracted from 200gms of banana flower by adding 150ml of water) was incorporated in fresh sugarcane juice to enhance its antioxidant and nutritional profile.

Organoleptic evaluation of the product

Selection of the panel members

10 semi trained panelists were selected through sensitivity threshold test from the IIS (deemed to be University), Jaipur for assessing the sensory characteristics of the beverage.

Evaluation of the developed product

Various organoleptic parameters such as appearance, color, taste, consistency, after taste and overall acceptability of the beverage were studied using nine points hedonic rating scale to find out the best acceptable variation.

Table 2. Methods used for estimation of phytochemicals and antioxidant activity in banana flower

Parameters	Methods	Reference
Anti -oxidant activity	DPPH	Sharma and Bhat,2009
Total phenol content	Folin -Ciocalteau method	Singleton,1999
Total flavonoid content	Aluminium chloride spectrophotometric assay	Ordonez *et al*., 2006

Results and Discussions

Proximate composition and Mineral content of Banana flower powder

The samples of banana flower powder were analyzed for its proximate composition and mineral content using standard methods published by Association of Official Analytical Chemists, (2019). The results of the estimations are presented in table 3. Mineral content of the flower was estimated where Iron and phosphorous were assessed and were found to be negligible in amount.

Anti-oxidant activity and phytochemicals

The antioxidant activity of the banana flower was estimated by DPPH method and reported to be 11.44±0.001mg/TAE/100g. The assessment of antioxidant activity showed that the flower can act as a good source of antioxidant and can help in boosting immunity, if consumed regularly. The phytochemical estimation reported that the Total Phenol present in the banana flower was 96.155±0.005mg GAE/100g and Total Flavonoid content was reported to be 137.585±0.1mg QUE/100g. Vitamin Ccontent of the flower was found to be 38±0.002mg/100g (Table 4).

Table 3. Nutritional composition of banana flower

Proximate Parameter	Amount(g/100g)
Moisture	71.516±1.007
Ash	3.58±0.531
Fiber	12.379±0.951
Fat	4.502±0.555
Protein	5.639±0.292
Carbohydrate	2.64±0.726
Iron	Negligible
Phosphorous	Negligible

Table 4. Antioxidant activity and Phytochemicals Content of Banana flower

Antioxidant activity	Amount
DPPH	11.44±0.001mg/TAE/100g
Phytochemical profile	
Total phenols	96.155±0.005mg GAE/100g
Total flavonoids	137.585±0.1mg QUE/100g
Vitamin C	38±0.002mg/100g

*TAE-Tannic acid equivalent
*GAE-Gallic acid equivalent
*QUE-Quercetin

Development of sugarcane based RTS beverage

Formulation of the variations

Sugarcane juice and banana flower extract were added in different proportions to find out the best blend, hence four different variations were developed and the sugarcane juice was taken as control as it has high acceptably and mainly provide high sugar content. The developed variations along with the control were then subjected to organoleptic evaluation by the panelists and are presented in table 5.

Organoleptic evaluation of the developed product

Sugarcane based banana flower juice was developed in different variations which were evaluated for their color, appearance, taste, consistency, and overall acceptability using a modified nine-point hedonic rating scale. The mean scores of different variations are presented in table 6.

The organoleptic evaluation of the sugarcane-based banana flower juice shows that the variation which was formulated by incorporating 50ml of sugarcane juice and 50 ml of banana flower juice was found to be highly accepted in appearance, color, consistency, taste and overall acceptability after the assessment done by panelist using nine-point hedonic rating scale. Fig. 2 depicts the graphical representation of organoleptic evaluation of the developed beverages.

Conclusion

The present study signifies the utilization of anundervalued by-product as ready-to-serve beverage

Table 5. Variations of sugarcane based RTS beverages

Ingredients/ Variations	Control	222	333	444	555
Sugarcane juice (ml)	100	75	50	25	0
Banana flower extract (ml)	0	25	50	75	100

Table 6. Mean Organoleptic evaluation of sugarcane based RTS beverage

Parameter /sample code	Appearance	Color	Consistency	Taste	Overall acceptability
Control	8.2±0.7	8.5±0	8.3±0	8.8±0.7	8.2±0.7
222	7.3±0	7.5±0.7	7.5±0.7	7.1±0.7	7.5±0
333	8.1±0.7	8±0	8.3±0	8.1±0.7	8.06±0
444	6.8±0.4	7.3±0.4	7.2±0.7	7.1±0.1	7.1±0.4
555	6±0	6±0	5.6±0.7	5.6±0	5.8±0.7

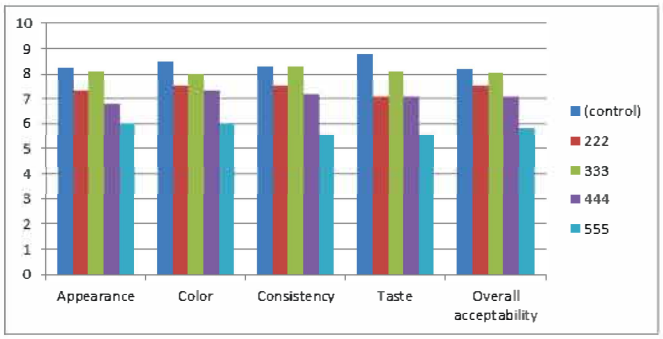

Fig. 2. Organoleptic evaluation of sugarcane based RTS beverage

which is rich in anti-oxidants and various other nutrients. The nutritional evaluation of the banana flower showed that being rich in dietary fiber, vitamin C and phytochemicals the flower can further be utilized for the development of various value-added products and hence its popularity can be increased. This study concludes that plain sugarcane juice can be supplemented with banana flower juice to improve its nutritional and antioxidant profile. The developed RTS beverage can be consumed by all age groups and also is helpful in protecting cells against free radicals which play a major role in prevention of cardiovascular diseases, cancer and other diseases. It is suggested that the sugarcane juice should be consumed as soon as it is extracted due to the reason that it is highly susceptible to the growth of mould, yeast and bacteria and also gets fermented quickly and cannot be preserved even for a few hours. Hence, the developed RTS beverage will be more beneficial if consumed within few minutes of extraction.

The blossom which is a agricultural by-product being a good source of antioxidants and exhibiting various health benefits according to the previous researches is of renewed interest of the researches and hence further interventional research can also be performed to increased its utilization as a source of functional phytochemicals in food industry.

Conflict of Interest

No conflict of Interest.

References

AOAC., 2019. Official methods of analysis (Vol. 222). Washington, DC: Association of Official Analytical Chemists.

FAO: Food and Agriculture Organization of the United Nations. 2020. Risk assessments of Salmonella in eggs and broiler chickens. *SBN*, *92*(9), p.156230.

Lau, B.F., Kong, K.W., Leong, K.H., Sun, J., He, X., Wang, Z., Mustafa, M.R., Ling, T.C. Ismail, A.,2020. Banana inflorescence: Its bio-prospects as an ingredient for functional foods. Trends Food Sci. Technol. 97, 14-28.

Liyanage, R., Gunasegaram, S., Visvanathan, R., Jayathilake, C., Weththasinghe, P., Jayawardana, B.C.and Vidanarachchi, J.K., 2016. Banana blossom (Musa acuminate Colla) incorporated experimental diets modulate serum cholesterol and serum glucose level in Wistar Rats Fed with cholesterol. Cholesterol, 2016.

Ordonez, A.A.L., Gomez, J.D., Vattuone, M.A., 2006. Antioxidant activities of Sechium edule (Jacq.) Swartz extracts. Food. chem. 97, 452-458.

Panyayong, C., Srikaeo, K., 2022. Foods from banana inflorescences and their antioxidant properties: Anexploratory case in Thailand. Int. J. Gastron. Food Sci. 28,100436.

Ramírez□Bolaños, S., Pérez□Jiménez, J., Díaz, S. and Robaina, L., 2021. A potential of banana flower and pseudo□stem as novel ingredients rich in phenolic compounds. Int. J. Food Sci & Tech 56(11):5601-5608.

Raghuramulu, N., Nair, K.M., Kalyanasundaram, S. eds., 1983. A manual of laboratory techniques. National Institute of Nutrition, ICMR, Hyderabad.

Sarma, U., Govila, V.K., Yadav, A., 2020. The traditional and therapeutic use of banana and its plant based delicacies in ethnic Assamese cuisine and religious rituals from Northeast India. J. Ethn. Foods. 7 (1), 1-7.

Sharma, O.P., Bhat, T.K., 2009. DPPH antioxidant assay revisited. Food. Chem.113 (4),1202-1205.

Singh, S., 2017. Banana blossom- an understated food with high functional benefits. Int. J. Curr. Res. 9 (01), 44516-44519.

Singleton, V.L., Orthofer, R., Lamuela-Raventós, R.M., 1999. Analysis of total phenols and otheroxidation substrates and antioxidants by means of folin-ciocalteu reagent.Methods Enzymol. 299, 152-178.

Statista Research Department, 2022. Volume of banana produced across India from financial year 2015 to 2021, with an estimate for 2022 (https://www.statista.com/statistics/1038905/india-production-of-banana/)