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Original Research Article

Development of Anti-Diabetic Composite Flour by Incorporating Banana Blossom and Sprouted Feenugreek Seeds

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Abstract

Diabetes mellitus (DM) is a progressive metabolic disease characterized by persistent elevated blood sugar levels which occur due to change in action or secretion of hormone insulin. The primary goal for the management of diabetes is dietary regulation of glucose which can be achieved by consuming low glycemic index food along with physical activity. Low glycemic index foods contain carbohydrate that digest and absorb gradually. Banana blossom has low glycemic index value as well as it is rich in fiber. On the other hand, fenugreek seeds are also rich source of fiber which is again beneficial for the diabetic people. In this present study an effort has been made to develop anti-diabetic composite flour by incorporating banana blossom and sprouted fenugreek seeds by replacing wheat flour. Various variations have been developed of the composite flour (FB 101, FB 102 and FB 103) and the sensory evaluation reflect the selection of the variation FB102. Result revealed that the composite flour FB102 which comprises of 15% banana blossom and 5 % sprouted fenugreek seeds has high amount of ash (3.2±0.005), protein (11.94±0.72) and fiber (47.21±0.9) than the control wheat flour ash (1.25±0.23), protein (10.67±0.51) and fiber (6.31±0.51). Physiochemical and functional properties of the developed composite flour was estimated and significant difference was observed.

Keywords: Diabetes mellitus, Banana blossom, Fenugreek seeds, Composite flour, anti-diabetic, low glycemic index.

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Introduction

Diabetes mellitus (DM), is a metabolic illness characterized by persistently elevated blood sugar levels which causes changes in action and secretion of insulin.[1] Insulin insufficiency, leads to hyperglycemia, glucose intolerance, and excess sugar in the blood and urine, as well as weakness.[2] Pharmacologically speaking, diabetes is brought on by cellular and hormonal disturbances, which cause the body's blood glucose levels to rise above 120 mg/dl.[3] The development and maintenance of type 2 diabetes mellitus are attributed to sedentary lifestyle, unhealthy diet and psychological stress.[4]

People with diabetes have to control the blood sugar level by taking a balanced diet consisting of low glycemic index food and do enough physical activity. Low glycemic index foods are those foods which release glucose slowly in the blood after consumption, so they are considered as ideal food for the people having DM. The glycemic index (GI), which Jenkins and colleagues first proposed in the early 1980s, is a concept for evaluating carbohydrate items according to how they affect post-prandial glycemia.[5] The term "high GI" refers to carbohydrates that digested swiftly and released glucose into the blood quickly. Low GI carbohydrates disintegrate gently, releasing glucose into the blood gradually. Foods with a high GI are quickly broken down and absorbed, which causes a noticeable variation in blood sugar levels. As a result, foods with high glycemic indices are suggested as a dietary element that encourages the development of chronic disease.[6] On the other side, low GI foods have been shown to have positive health effects since they cause a gradual rise in blood sugar and insulin levels. [7]

Banana blossom is an offshoot of banana cultivation and it is mostly consumed as a vegetable in Asian countries such as Sri Lanka, Malaysia, Indonesia and the Philippines.[8] The blossoms are big, pointed, mostly scarlet color and occasionally pink also.[9]

Despite being a crop production waste, blossoms have a strong nutritional profile.[10] It has tremendous nutritional value and is a good source of dietary fiber and some biologically active compounds.[11]

Fig 1. Banana blossom

Banana blossom has low glycemic index value of 0.3±0.13. Banana blossom (65.6%) had a higher percentage of nutritional fibre than other parts. Banana blossom had higher polyphenol content than other parts.[12] The blooms' have high fibre and iron content which lowers blood sugar levels and increases hemoglobin levels in the blood respectively. Along with assisting breastfeeding moms' milk production, it also lowers menstruation bleeding and muscle cramps.[13]

Trigonella foenum-graecum(fenugreek) is an annual plant belongs to the Fabaceae family. It is a medicinal plant which is used to treat diabetes. In both diabetic and non-diabetic individuals, the fenugreek plant lowers lipids, lowers blood sugar, and possesses antioxidant and antibacterial properties. It is beneficial against obesity and reduces body fat.[14]

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Fig 2. Sprouted Feenugreek Seeds

A chemical that exists in plants naturally is referred to as a phytochemical. Phytochemicals in plants give host plants a natural defensive mechanism and in addition provides color, flavor, and aroma.[15] In comparison to dried fenugreek seeds, the action of soaking (sprouting) fenugreek seeds increases insulin resistance, nutritional value and increases the quantity of their dietary constituents.[16] Sprouted fenugreek seeds are high in protein (32%), lysine (5.7g/16g of nitrogen), soluble (20%) and insoluble (28%) dietary fibre, L-tryptophan, and are also a good source of calcium, iron, and beta-carotene. The primary chemical components of fenugreek seeds are steroidal sapogenins, galactomannans and isoleucine, all of which have potential medical use.[16]

Objectives

To develop anti-diabetic composite flour by using Banana blossom and sprouted Fenugreek seeds in different proportion.

To carry out the nutritional analysis of the developed composite flour.

To assess the shelf life of the developed composite flour.

To analyze the cost of the developed composite flour.

Research Methodology

Study area: IIS deemed to be University

Study Type: Experimental Nutrition

The methodology is divided into six phases as follow:

Phase I: Preparation of ingredients

Procurement of raw ingredients: Banana blossom, fenugreek seeds and wheat flour were purchased from the local market of Jaipur city.

Processing of banana blossom: The banana blossom was washed thoroughly under running water and then the outer fibrous bracts were removed and inner white florets were separated. Prepared florets were immersed in 0.2% citric acid solution for 30 minutes. After 30 minutes the citric acid solution was drained out. Then, the florets were dried in oven at 50-55 °C. A fine powder was prepared by grinding the dried banana blossom and the powder was stored in an airtight container [17].

Processing of fenugreek seeds: The procured seeds were washed carefully with water and were steeped in distilled water at a 1:5 (w/v) ratio for 12 hours. After 12 hours the seeds were allowed to germinate for 24 hours at 27°C±2°C in the dark. After germination, the seeds were dried in an oven at 40 °C for 6 hours. The dried fenugreek seed was ground into a fine powder and kept in an airtight container [18].

Phase II: Development of the composite flour

Composite flour was developed by addition of 15% of banana blossom powder in all the variation i.e., FB 102, FB 103 and FB 104 by replacing the wheat flour. Further sprouted fenugreek seeds powder was added at 5%, 10% and 15% in FB 102, FB 103 and FB 104 by replacing the wheat flour.

Variation	Wheat Flour	Banana Blossom	Feenugreek Seed
C 101	100g	-	-
FB102 (20%)	80g	15g (15%)	5g (5%)
FB103 (25%)	75g	15g (15%)	10g (10%)
FB104 (30%)	70g	15g (15%)	15g (15%)

Table 1. Different variation of the composite flour

Phase III: Sensory evaluation

The sensory evaluation of developed composite flour was done using sensitivity threshold test by the panel of 18 semi trained judges, comprised of faculty members from IIS (deemed to be University), Jaipur. It is used to select and train panel members for evaluating the quality of food products.
The sensory evaluation was carried out by preparing composite flour chapattis from each variation which is FB 102 (20%), FB 103 (25%) and FB 104 (30%) and a comparison was made with control recipes.

The evaluation was performed by panel members, using hedonic scale (where '1' = dislike extremely and '9'= like extremely). Evaluation was carried out on sensory characteristics namely, appearance, color, texture, taste, after taste and overall acceptability [19]. The best selected composition was chosen for further estimations.

Phase IV: Nutrient content estimation of the developed composite flour

The proximate analysis, functional properties and physiochemical properties of the most acceptable (FB 102) composite flour and control wheat flour was done by using standard methods. The estimation was carried out in the Research Laboratory, Department of Home Science, IIS (deemed to be university), Jaipur.

Nutrients	Method	References
Moisture (g/100g)	Oven drying method	AOAC, 2020 [20]
Ash (g/100g)	Ashing method	AOAC, 2020 [20]
Crude fiber (g/100g)	Acid alkali wash method	AOAC, 2020 [20]
Protein (g/100g)	Micro Kjeldhal method	AOAC, 2020 [20]
Fat (g/100g)	Soxhlet extraction method	AOAC, 2020 [20]
Carbohydrate (g/100g)	Composite method	AOAC, 2020 [20]
Energy (Kcal/100g)	By calculation	AOAC, 2020 [20]

Table 2. Methods used for estimation of proximate nutrients present in the composite flour

Functional Properties	References
Water absorption capacity (g/g)	AOAC, 2020 [20]
Oil absorption capacity (g/g)	AOAC, 2020 [20]
Bulk density (g/cm^3)	AOAC, 2020 [20]
Swelling capacity (ml/g)	Chandra et al., 2015 [21]

Table 3: Estimation of functional properties of the composite flour

Physicochemical Properties	References
Gluten content (g/100g)	AACC, 2005 [22]

Table 4. Estimation of physiochemical properties of the composite flour

Phase V: Shelf life assessment of developed composite flour

The shelf life of the developed composite flour was assessed for a period of 45 days by using Total plate count method (TPC) and moisture content. The composite flour (FB 102) was stored in zip locks and then in air tight container.

Shelf Life	Method	References
Microbiological Analysis (CFU/g)	Total Viable Count	AOAC 2020 [20]
Moisture (%)	Hot air oven	AOAC 2020 [20]

Table 5. Methods for analysis of shelf life of developed composite flour

Phase VI: Food cost analysis and nutrient calculation of the developed flour

Food cost of the best selected composite flour (FB 102) was calculated according to the existing market price of the ingredient used at the time of the formulation of flour.

Results

Phase I Sensory evaluation: The result of sensory evaluation of the developed composite flour and the control wheat flour is presented in Table 6.

Code	Appearance	Colour	Texture	Taste	After taste	Overall Acceptability
C 101	8.44±0.7 ^{a}	8.38±0.4^{a}	8.55±0.7 ^{a}	7.94±0.7^{a}	8.33±2.1^{a}	8.5±0.7^{a}
FB102	7.88±1.07 ^{a}	7.94±0.5^{a}	8.05±0.8 ^{b}	8.27±0.6^{a}	8.1±0.6^{b}	8.1±0.5^{b}
FB103	7.61±1.2 ^{a}	7.72±0.2^{a}	7.88±1.2 ^{c}	7.61±1.2^{a}	7.5±1.2^{c}	7.72±1.2^{c}
FB104	7.61±1.1 ^{a}	7.61±0.4^{a}	7.44±1.3 ^{d}	7.22±1.2^{a}	6.94±1.4^{d}	7.38±1.5^{d}

Table 6. Mean sensory score of mix vegetable stuffed chapatti prepared using formulated diabetic flour (Mean±SD)

Mean with same superscript in a column denote no significant difference at p≤0.05 Means with different superscripts in a column denote significant difference at p≤0.05

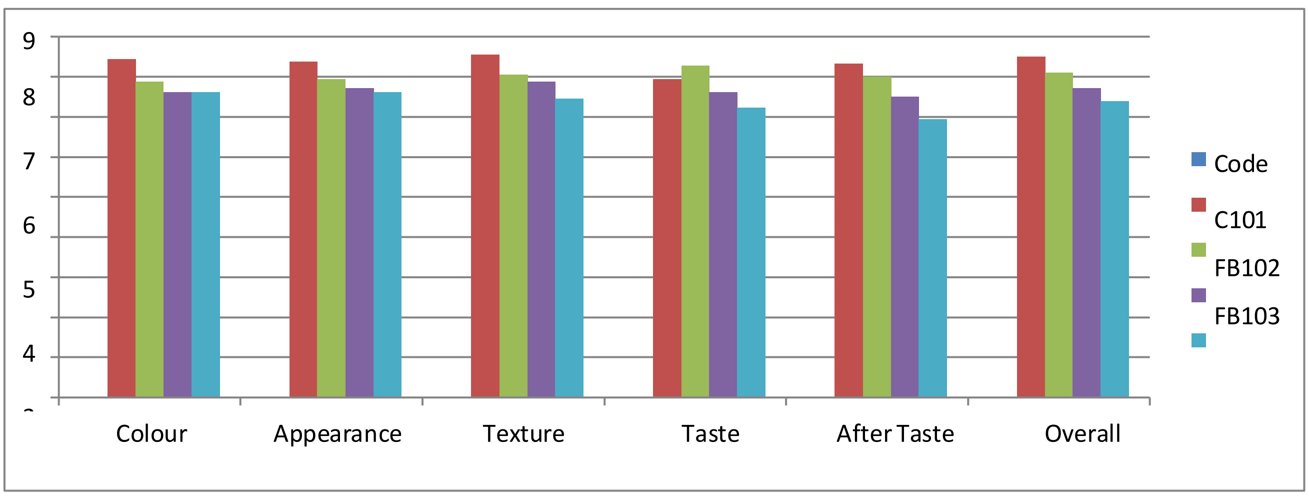

Fig 3. Graphical representation of mean sensory score of mix vegetable stuffed chapatti

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Fig 4. Various proportions of chapattis were prepared from the composite flour.

From the results it was concluded that the control what flour chapatti has the more acceptability in terms of- appearance (8.44±0.7), color (8.38±0.4), texture (8.55±0.7), taste (7.94±0.7), after taste (8.33±2.1) and overall acceptability (8.5±0.7). From the different variations the chapatti made from composite flour with 20% variation (FB 102) was most acceptable among the other variations, which have 20% incorporation of banana blossom powder and sprouted fenugreek powder. The following parameters for most acceptable variation (FB 102) were- appearance (7.88±1.07), color (7.94±0.5), texture (8.05±0.8), taste (8.27±0.6), after taste (8.1±0.6) and overall acceptability (8.1±0.5).

The selected variation (FB102) was estimated for proximate, functional properties and physiochemical properties. The selected variation (FB102) was assessed for shelf life and acceptability trial of the recipes developed from the flour by the diabetics.

Phase II Nutrient content estimation of the flour: Proximate nutrient content, physiochemical properties and functional properties of the developed composite flour (FB 102) and control wheat flour was estimated and the results are presented below.

1. Estimation of proximate composition: Various proximate nutrient contents such as moisture, ash, protein, fat, crude fiber, carbohydrate and energy were estimated and results are presented in Table 7.

Nutrients	Control	Composite Flour
Moisture (g/100g)	9.44 ± 0.11^{a}	7.89 ± 0.13^{b}
Ash (g/100g)	1.25 ± 0.23^{a}	3.2 ± 0.005^{b}
Protein (g/100g)	10.67 ± 0.51^{a}	11.94 ± 0.72^{a}
Fat (g/100g)	4.99 ± 0.02^{a}	2.94 ± 0.07^{b}
Crude fiber (g/100g)	6.31 ± 0.51^{a}	37.06 ± 0.7^{b}
Carbohydrate (g/100g)	67.35 ± 0.31^{a}	37.33 ± 0.9^{b}
Energy (Kcal/100g)	356.99 ± 0.45^{a}	223.55 ± 0.7^{b}

Table 7. Mean proximate nutrient content of the composite flour (FB 102) Mean±SD Mean with same superscript in a row denote no significant difference at p≤0.05 Mean with different superscript in a row denote significant difference at p≤0.05

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The result revealed that there is a significant difference in ash, moisture, fat, fiber, carbohydrate and energy content of control and developed composite flour. The composite flour (FB102) has higher amount of ash (3.2±0.005), protein (11.94±0.72) and fiber (47.21±0.9) than the control wheat flour ash (1.25±0.23), protein (10.67±0.51) and fiber (6.31±0.51). On the other hand, mean content of moisture (7.89±0.13), fat (2.94±0.07), carbohydrate (28.8±0.9) and energy (187.44±0.7) were lower than the control wheat flour's moisture (9.44±0.11), fat (4.99±0.02), carbohydrate (67.35±0.31) and energy (356.99±0.45).

2. Functional parameters: Various functional properties like- water absorption capacity, oil absorption capacity, bulk density, swelling capacity were estimated and results are presented in Table 8.

Properties	Control	Composite Flour
Water absorption capacity (g/g)	314.37±0.21 ^{a}	334.46±0.73 ^{b}
Oil absorption capacity (g/g)	316.02±0.13 ^{a}	322.49±0.02 ^{a}
Bulk density (g/cm^3)	0.83±0.31 ^{a}	0.78±0.06 ^{a}
Swelling capacity (ml/g)	11.74±0.02 ^{a}	16.88±0.5$^{\mathbf{b}}$

Table 8: Mean functional properties of the composite flour (FB 102) Mean±SD. Means with the same superscript in a row denote no significant difference at p≤0.05. Means with different superscripts in a row denote a significant difference at p≤0.05

The result revealed that there is a significant difference in between control and developed composite flour. The water absorption capacity of the composite flour (334.46±0.73) is more than the control wheat flour (314.37±0.21). Similarly, the swelling capacity of the composite flour (16.88±0.5) is more than the control wheat flour (11.74±0.02). Similarly, the oil absorption capacity of the composite flour (322.49±0.02) is more than the control wheat flour (316.02±0.13). On the other hand, the bulk density of the composite flour (0.78±0.06) is less than the control wheat flour (0.83±0.31).

3. Physiochemical parameters: Physiochemical properties like- gluten content was estimated and the results are presented in Table 9.

Properties	Control	Composite Flour
Gluten content % (on dry basis)	8.88±0.51^{a}	7.43±0.03^{b}

Table 9. Mean physiochemical properties of the composite flour (FB 102) Mean±SD. Means with same superscripts in a row denote no significant difference at p≤0.05. Means with different superscripts in a row denote significant difference at p≤0.05

The result revealed that there is a significant difference in between control and developed composite flour. The composite flour (7.43±0.03) contains less gluten% than the control wheat flour (8.88±0.51%).

Phase III Shelf life estimation of the flour: The shelf life of the developed composite flour was assessed for a period of 45 days by using Total plate count method (TPC) and moisture content.

1: Standard plate count (Standard plate technique) - Microbial analysis was done for the composite flour (FB 102) was done for about 45 days and plating was done after every 15 days. The composite flour was kept at room temperature in air tight containers in zip-locks pouches. Results of the Total Plate Count (TPC) are presented in Table 10.

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Days	Total viable count (CFU/g)	Fungal count (CFU/g)
Day 1	2.61×10^3	NA
Day 15	2.63×10^3	NA
Day 30	2.68×10^3	NA
Day 45	2.70×10^3	NA

Table 10: Mean microbial count of the composite flour (FB 102)

2. Moisture content (Oven drying method) - Moisture content of the developed composite flour (FB 102) was done for about 45 days and plating was done after every 15 days. The composite flour was kept at room temperature in air tight containers in zip-locks pouches. Results of moisture content are presented in Table 11.

Days	Moisture (per cent)
Day 1	7.89±0.14
Day 15	7.90±0.4
Day 30	7.91±0.12
Day 45	7.93±0.35

Table 11. Mean moisture content of the composite flour (FB 102)

Phase IV Cost analysis of the developed flour composite flour (FB 102): The calculation of food cost of the developed composite flour was done using the existing market rates at the time of development of product. Food cost was calculated for 100 g (Table 12). The cost of 1000 g composite flour was Rs. 45.

Ingredients	Amount (g)	Cost (Rs.)
Wheat flour	80	3.2
Banana blossom	15	1.0
Fenugreek seeds	5	0.3
TOTAL	**100**	**4.5**

Table 12. Food cost analysis of the developed composite flour (FB 102)

Phase V Calculation of nutrient content of the developed composite flour (FB102) from IFCT-2017: The nutrient content of the developed composite flour was calculated using Indian Food Composition Table, 2017.

Ingredients	Amount (g)	Protein (g)	Fat (g)	CHO (g)	Energy (KCal)
Wheat flour	80	8.45	1.22	41.33	225.23
Banana blossom	15	0.24	0.09	1.48	7.65
Fenugreek seeds	5	1.22	0.28	0.53	11.70
TOTAL	100	9.91	1.59	43.34	244.58

Table 13. Nutrient content of developed composite flour

Conclusion

Diabetes mellitus (DM) is a progressive metabolic disease characterized by persistent elevated blood sugar levels which occur due to change in action or secretion of hormone insulin. Global epidemiology suggests that more than 300 million people will have diabetes by the tear 2025. The primary goal for the management of diabetes is dietary regulation of glucose which can be achieved by consuming low glycemic index food along with physical activity. Banana blossom is a perfect example of low glycemic index food as it has low glycemic index value as well as it is rich in fiber. On the other hand, fenugreek seeds are also rich source of fiber and alkaloids which have hypo-glycemic effect. It is concluded that banana blossom and fenugreek seeds are very important for their medicinal as well as nutritional properties.

In this research an effort has been made to develop anti-diabetic composite flour by incorporating banana blossom and sprouted fenugreek seeds by replacing wheat flour. The composite flour was developed by addition of 15% of banana blossom powder in all the variation i.e., FB 102, FB 103 and FB 104 by replacing the wheat flour. Further sprouted fenugreek seeds powder was added at 5%, 10% and 15% in FB 102, FB 103 and FB 104 by replacing the wheat flour.

The best selected composite flour (FB102) was analyzed for various nutrient analyses. Result revealed that composite flour has high amount of ash (3.2±0.005), protein (11.94±0.72) and fiber (47.21±0.9) than the control wheat flour ash (1.25±0.23), protein (10.67±0.51) and fiber (6.31±0.51). The water absorption capacity of the composite flour (334.46±0.73) is more than the control wheat flour (314.37±0.21). Similarly, the swelling capacity of the composite flour (16.88±0.5) is more than the control wheat flour (11.74±0.02). Similarly, the oil absorption capacity of the composite flour (322.49±0.02) is more than the control wheat flour (316.02±0.13). The composite flour (7.43±0.03%) contains less gluten% than the control wheat flour (8.88±0.51%).

It was concluded that the anti-diabetic flour is rich in fiber it can fulfill the requirement of the diabetic individual with no side effects. It consists of banana blossom which has no toxic limit of consumption and fenugreek seeds are also good for health as they are rich in fiber and they both help in reducing the glycemic index of the whole wheat flour, thus beneficial for the diabetics.

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References

1. Sanzana G, Durruty P. Specific Types of Diabetes Mellitus. *Rev Med Clin Condes*. 2016;27(2):160 - 170.

2. Rahman MM. Hypoglycemic and hypolipidemic effect of fenugreek in different forms on experimental rats. *World Appl Sci J.* 2014;29(7):835–841.

3. Richard EJ, Augustine AO, Ani CO, Chime PU, Jide UU, Francis AU, Pamela OO, Chinemerem NC, Onyemaechi AB, Paul EC. Serum urea, uric acid and creatinine levels in diabetic mellitus patients attending Jos university teaching hospital, north central Nigeria. *Int J Biosci.* 2017;11 (4):68–72.

4. Violi F, Targher G, Vestry A, Carnevale R, Averna M, Farcomei A, Lenzi A, Angelico F, Cipollone F, Pastori D. Effect of aspirin on renal disease progression in patients with type 2 diabetes: A multicenter, double blind, placebo-controlled, randomized trial. The renal disease progression by aspirin in diabetic patients (LEDA) trial. Rationale and study design. *Am Heart J.* 2017;189: 120-127.

5. Jenkins JD, Wolever MT, Taylor HR, Barker H, Fielden H, Baldwin MJ, Bowling CA, Newman CH, Jenkins LA, Goff VD. Glycemic index of foods: a physiological basis for carbohydrate exchange. *Am J Clin Nutr*. 1981;34:362-366. doi:10.1093/ajcn/34.3.362

6. Batista MMS, Teixeira E. Food glycaemic index, satiety and chronic diseases. *Br Food J*. 2008;110(10):965-976.

7. Mulholland GH, Murray JL, Cardwell RC, Cantwell MM. Glycemic index, glycemic load, and risk of digestive tract neoplasms: A systematic review and meta-analysis. *Am J Clin Nutr*. 2009;89(2):568-576. doi:10.3945/ajcn.2008.26823

8. Sheng WZ, Ma HW, Gao HJ. Antioxidant properties of banana blossom of two cultivars in China using 2,2-diphenyl-1-picrylhydrazyl (DPPH) reducing power, 2,2'-azinobis-(3-ethylbenzthiazoline-6-sulphonate (ABTS) and inhibition of lipid peroxidation assays. *Afr J Biotechnol*. 2011;10(21): 4470–4477.

9. Ambrose DC, Sumithra V, Vijay K, Vinodhini K. Techniques to Improve the Shelf Life of Freshly Harvested Banana Blossoms. *Curr Agric Res J.* 2018; 6 (2): 141-149.

10. Preethi P, Balakrishnamurthy G. Assessment of banana cultivars for pigment extraction from bracts, its suitability and stability as food colorant. *Int J Process Post Harvest Technol*. 2011; 2(2): 98-101.

11. Zhan-Wu S, Wei-Hong M, Zhi-Qiang J. Investigation of dietary fiber, protein, vitamin E and other nutritional compounds of banana blossom of two cultivars grown in China. *Afr J Biotechnol*. 2010;9(25): 3888–3895.

12. Bhaskar J, Shobha SM, Sambalah K, Salimath V. Beneficial effects of banana blossom and pseudostem on hyperglycemia and advanced glycation end-products (AGEs) in streptozotocin-induced diabetic rats. J *Physiol and Biochem.* 2011;67(3):415-425. https://doi.org/10.1007/s13105-011-0091-5.

13. Singh JP, Mishra PK, Siddiqui MW, Ahmad MS, Aftab MA, Kumar V. Development of Nutraceuticals Ready-to-Serve Blends of Ginger and Honey. *J Postharvest Technol.* 2015; 2 (4): 188-194.

14. Akbari M, Rasouli H, Bahdor T. Physiological and pharmaceutical effect of fenugreek: a review. *J Pharm*. 2012;2 (4):49–53.

15. Biba VS, Lakshmi S, Dhanya GS. Phytochemical analysis of *Annona squamosa* seed extracts. *Intl Res J Pharm Appl Sci*. 2013; 3(4): 29–31.

16. Agrawal RS, Shirale DO, Syed HM. Physico-chemical properties of fenugreek (*Trigonella foenum-graceum L.)* seeds. *Int J Latest Technol Eng Manag Appl Sci*. 2015; 4(10): 68–70.

17. Wickramarachchi KS, Ranamukhaarachchi SL. Preservation of fiber-rich banana blossom as a dehydrated vegetable. *Sci. Asia*. 2005;31: 265-271. doi:10.2306/scienceasia1513-1874.2005.31.265

18. Saini P, Dubey N, Singh P and Singh A. Effect of processing methods on proximate composition and antioxidant activity of fenugreek (*Trigonella foenum-graecum)* seeds. Int J Agric and Food Sci. 2016; 6(2): 82-87.

19. Ranganna S. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products.* New Delhi: Tata McGraw Hill Pvt Ltd; 2010.

20. AOAC International. *Official methods of analysis of AOAC International*. 21st ed. AOAC International. Gaithersburg (MD): AOAC International; 2020.

21. Chandra S, Singh S, Kumari D. Evaluation of functional properties of composite flours and sensorial attributes of composite flour biscuits. *J Food Sci Technol*. 2015;*52*(6):3681-3688.

22. American Association of Cereal Chemists (AACC). *Approved Methods of the American Association of Cereal Chemists*. 11th ed. Arlington (USA): American Association of Cereal Chemists; 2005.