

Product Development from Banana Blossom Powder and Indian Gooseberry Powder for Anaemic Adolescent Girls

Shuchita Anand¹, Mahak Sharma²

¹Student, Department of Nutrition and Dietetics, Faculty of Applied Sciences, Manav Rachna International Institute of Research and Studies, Faridabad, Haryana.

²Associate Professor, Department of Nutrition and Dietetics, Faculty of Applied Sciences, Manav Rachna International Institute of Research and Studies, Faridabad, Haryana

Corresponding Author: Shuchita Anand

ABSTRACT

Blossom of the banana plant though very rich in micronutrients majorly iron and fibre, They are lesser known and consumed by very less people. In view of this, an attempt was made to develop a value-added iron and fibre rich product for people suffering from micronutrient deficiency such as anaemia etc. Along with banana blossom, Indian gooseberry was also used to enhance the bioavailability and absorption of iron. The fresh collected Banana blossom were peeled, cleaned and dried in hot air oven at 50°C for 6 hours and then grinded into a powder and stored in aluminium foil to prevent exposure to moisture. Hummus Dip was developed with concentration of 18g, 20g and 25g of banana blossom powder and 2g, 3g and 5g Indian gooseberry powder per 100g of hummus. Sensory evaluation was done with the help of 9 Point Hedonic Rating Scale in reference to appearance, taste, texture and flavour by 50 subjects. The proximal analysis of the product was done. The result revealed that the Hummus Dip developed with concentration of 20g of banana blossom powder and 3g of Indian gooseberry powder was highly acceptable. The acceptable product can further be used for intervention for anaemic patients.

Key Words: Banana Blossom, anaemia,

INTRODUCTION

Adolescence marks as a period of increased nutritional needs which is necessary for growth and development. Elevated needs of iron are important to be maintained in order to supply nutrition for intensive growth and muscular development, this results in an increase in blood volume; thus, it is extremely important for the adolescents to meet the iron requirements. Diet, therefore, must offer enough iron and, moreover, nutrients to favour element utilization in order to produce adequate iron bioavailability and thus be sufficient for needs at this stage of life.^[1]

Banana blossom (*Musa acuminata* Colla), is also considered as a by-product of banana cultivation, is mostly consumed as a vegetable in many Asian countries such as Sri Lanka, Malaysia, Indonesia, and the Philippines.^[2] Consumed as a curry as well as a boiled or deep fried salad with rice and wheat bread in Sri Lanka.^[3] They have tremendous nutritional value and are a good source of dietary fibre and some biologically active compounds like vitamin C, tannin.^[4-6] The banana bud or flower or blossom is a component in the inflorescence of the banana plant. The male and female flowers of the plant are both present but come out of the plant separately. The female

flowers are the first to develop into fruits. The first 5-15 basal nodes or hands produce female flowers and the upper digital nodes produce male flowers. [7] Finger shaped banana blossoms are subtended by large fleshy, reddish or purple coloured scales, which fall off as the fruit matures. [8] The banana blossom is a drop-shaped purple flower that hangs at the end of a cluster of bananas. The tough maroon petals that surround the blossoms are known as bracts which need to be removed as they are inedible.

The light yellow floret encased within the bracts can be diced and eaten raw in salads or they can be cooked in curries. The flowers of the banana blossom oxidize and turn black when they come in contact with air. Banana blossom being a fairly good source of iron, it is beneficial as a functional food and help to overcome anemia. [8]

Indian Gooseberry

Emblica officinalis Gaertn. commonly known as Indian gooseberry or Amla is one of the most important medicinal plants in Indian traditional systems of medicine (Ayurveda, Unani and Siddha). Amla fruit is widely used in the Indian system of medicine as diuretic, laxative, liver tonic, refrigerant, stomachic, and for common cold, fever; as alone or in combination with other plants. Phytochemical studies on amla disclosed major chemical constituents including tannins, alkaloids, polyphenols, vitamins and minerals. [9] It is a rich source of ascorbic acid and it helps to provide the daily requirement of vitamin C of the human body and also increases the bio-availability

of iron in the body. Vitamin C is an essential co-factor in the overall process of iron homeostasis. Ascorbic acid is a powerful enhancer of nonheme iron absorption and can reverse the inhibiting effect of such substances as tea and calcium/phosphate. [10]

Being a functional food it can be used for various other researches and interventions in the food industry.

MATERIALS AND METHODS

Fresh banana blossom are procured from different areas of Delhi, NCR and dried at 50°C for 6 hours. Dried blossom are then converted into powder through the process of grinding. Value added product "Hummus" is developed with incorporation of banana blossom powder in varied concentrations of 18g, 20g and 25g and Indian gooseberry powder in varied concentrations of 2g, 3g, 5g. One standard Hummus (without banana blossom) was also developed for sensory evaluation.

Sensory evaluation of developed product for colour, texture, taste, appearance, aroma and overall acceptability was done by 50 subjects using 9-point hedonic scale. Proximal analysis was done for the highly acceptable product. The obtained data was analyzed by Chi-square test using SPSS version 21.

RESULTS AND DISCUSSION

The developed products with varied concentrations (18g, 20g, 25g) of banana blossom powder and (2g,3g,5g) of Indian gooseberry powder were analyzed for their colour, texture, taste, appearance and aroma by using 9-point hedonic scale.

Table 1 – Colour acceptability percentage of developed products

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	P - value
Like extremely(9)	23 (46)	6 (12)	8 (16)	7 (14)	0.00
Like very much (8)	14 (28)	20 (40)	22 (44)	15 (30)	
Like moderately (7)	7 (14)	11 (22)	13 (26)	15 (30)	
Like slightly (6)	4 (8)	9 (18)	7 (14)	7 (14)	
Neither like or dislike (5)	2 (4)	1 (2)	1 (2)	5 (10)	
Dislike slightly (4)	0 (0)	1 (2)	1 (2)	1 (2)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 1 depicts the percentage acceptability of colour of developed products by 9-point hedonic rating scale. The results revealed

that the highest acceptability (9 - like extremely) of product Hummus regarding colour was of standard (46%) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 44% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) high acceptable (8 - like very much) regarding colour as compared to T1 and T3, 40% and 30% respectively. The differences were statistically significant ($P < 0.01$)

Table 2 – Taste acceptability percentage of developed products :

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	P - value
Like extremely(9)	14 (28)	3 (6)	7 (14)	6 (12)	0.00
Like very much (8)	21 (42)	10 (20)	13 (26)	9 (18)	
Like moderately (7)	12 (24)	21 (42)	22 (44)	16 (32)	
Like slightly (6)	0 (0)	7 (14)	9 (18)	9 (18)	
Neither like or dislike (5)	3(6)	5 (10)	0 (0)	7 (14)	
Dislike slightly (4)	0 (0)	1 (2)	2 (4)	2 (4)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 2 depicts the percentage acceptability of taste of developed products by 9-point hedonic rating scale. The results revealed

that the highest acceptability (9 - like extremely) of product Hummus regarding taste was of standard (28%) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 26% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) highly acceptable (8 - like very much) regarding taste as compared to T1 and T3 20% and 18% respectively. The differences were statistically significant ($P < 0.01$)

Table 3 – Texture acceptability percentage of developed products :

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	P - value
Like extremely(9)	15 (30)	3 (6)	4 (8)	4 (8)	0.00
Like very much (8)	23 (46)	14 (28)	20 (40)	8 (16)	
Like moderately (7)	8 (16)	17 (34)	20 (40)	24 (48)	
Like slightly (6)	3 (6)	4 (8)	8 (16)	8 (16)	
Neither like or dislike (5)	1 (2)	3 (9)	4 (8)	3 (6)	
Dislike slightly (4)	0 (0)	2 (4)	1 (2)	3 (6)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 3 depicts the percentage acceptability of texture of developed products by 9-point hedonic rating scale. The results revealed

that the highest acceptability (9 - like extremely) of product Hummus regarding texture was of standard (30 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 40% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) highly acceptable (8 - like very much) regarding taste as compared to T1 and T3 28% and 16% respectively. The differences were statistically significant ($P < 0.00$)

Table 4 – Aroma acceptability percentage of developed products :

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	P - value
Like extremely(9)	8 (16)	1 (2)	5 (10)	4 (8)	0.00
Like very much (8)	21 (42)	8 (16)	12 (24)	7 (14)	
Like moderately (7)	13 (26)	21 (42)	22 (44)	20 (40)	
Like slightly (6)	4 (8)	11 (22)	8 (16)	8 (16)	
Neither like or dislike (5)	4 (8)	4 (8)	6 (12)	9 (18)	
Dislike slightly (4)	0 (0)	1 (2)	1 (2)	2 (4)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 4 depicts the percentage acceptability of aroma of developed products by 9-point hedonic rating scale. The results revealed

that the highest acceptability (9 - like extremely) of product Hummus regarding aroma was of standard (16 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 24% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) highly acceptable (8 - like very much) regarding taste as compared to T1 and T3 16% and 14% respectively The differences were statistically significant ($P < 0.01$)

Table 5 – Appearance acceptability percentage of developed products :

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	No. (%)	No. (%)	No. (%)	No. (%)	P - value
Like extremely(9)	11 (22)	3 (9)	6 (12)	4 (8)	0.00
Like very much (8)	18 (36)	13 (26)	16 (32)	10 (20)	
Like moderately (7)	16 (32)	21 (42)	17 (34)	19 (38)	
Like slightly (6)	2 (4)	7 (14)	7 (14)	9 (18)	
Neither like or dislike (5)	3 (6)	5 (10)	6 (12)	5 (10)	
Dislike slightly (4)	0 (0)	1 (2)	0 (0)	1 (2)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 5 depicts the percentage acceptability of aroma of developed products by 9-point hedonic rating scale. The results revealed

that the highest acceptability (9 - like extremely) of product Hummus regarding aroma was of standard (22 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 32% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) highly acceptable (8 - like very much) regarding taste as compared to T1 and T3 26% and 20% respectively The differences were statistically significant ($P < 0.01$)

Table 6 – Overall acceptability percentage of developed products :

S.no.	Standard	Sample T1	Sample T2	Sample T3	Chi Square
	N (%)	N (%)	N (%)	N (%)	P - value
Like extremely(9)	34 (68)	12 (24)	18 (36)	8 (16)	0.00
Like very much (8)	12 (24)	20 (40)	26 (52)	24 (48)	
Like moderately (7)	1 (2)	7 (14)	10 (20)	5 (10)	
Like slightly (6)	3 (6)	4 (8)	3 (6)	7 (14)	
Neither like or dislike (5)	0 (0)	1 (2)	1 (2)	1 (2)	
Dislike slightly (4)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike moderately (3)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike very much(2)	0 (0)	0 (0)	0 (0)	0 (0)	
Dislike extremely(1)	0 (0)	0 (0)	0 (0)	0 (0)	

Standard: Standard hummus

Sample T1: Hummus incorporated with 18g of banana blossom and 2 gm Indian gooseberry powder

Sample T2: Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder

Sample T3: Hummus incorporated with 25g of banana blossom and 5 gm Indian gooseberry powder

Table 6 depicts the percentage of overall acceptability of developed products by 9-point hedonic rating scale. The results revealed that the highest acceptability (9 - like extremely) of product Hummus regarding overall acceptability was of standard (68 %) as compared to other samples. On the other hand, the comparison between Sample T1, T2, T3 showed that 52% of subject found T2 sample (Hummus incorporated with 20g of banana blossom and 3 gm Indian gooseberry powder) highly acceptable (8 - like very much) regarding overall acceptability as compared to T1 and T3 40% and 48% respectively The

differences were statistically significant ($P < 0.01$).

Proximal Analysis of the Product

Proximal Analysis of banana blossom powder and Indian gooseberry incorporated hummus per 100g, the analysis was carried out of sample T2 that was 20 g banana blossom and 3g Indian gooseberry powder incorporated hummus, which is as follows:

Table 7: Proximal analysis of the sample incorporated with 20 g banana blossom and 3g Indian gooseberry powder in 100g of hummus are as follows:

Parameters	Values
Energy	143 Kcal
Protein	7.8g
Carbohydrates	15.2g
Fat	28 g
Dietary fibre	5.84g
Iron	8.45 mg
Vitamin C	1.15 mg

CONCLUSION

Banana blossom being a good source of iron, protein and fibre and Indian gooseberry powder being rich in Vitamin C which increases the bio-availability of iron

is beneficial for patients with anemia as this when incorporated with hummus helps to reduce risk of reduced iron levels in the body and decrease the risk of onset of diseases that occur due to anemia. The study concludes that the product developed with concentration of 20g of banana blossom and 3g Indian gooseberry powder was highly acceptable by 9-point hedonic rating scale. The content of iron per serving is 16.9 mg / 200 gm which is approximately the daily iron requirement of female. Further the study can be used for intervention of developed product for human trials.

REFERENCES

1. John L. Beard. Iron Requirements in Adolescent Females. *The Journal of Nutrition*.2000;130(2): 440S-442S
2. Z.-W. Sheng, W.-H. Ma, J.-H. Gao et al. "Antioxidant properties of banana flower 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". *African Journal of Biotechnology*. 2011;10(21): 4470–4477
3. K. S. Wickramarachchi, S. L. Ranamukhaarachchi .“Preservation of fiber-rich banana blossom as a dehydrated vegetable,” *Science Asia*. 2005;31:265–271
4. F. J. Alarcon-Aguilara, R. Roman-Ramos, S. Perez-Gutierrez, A. Aguilar-Contreras, C. Contreras-Weber, J. L. Flores-Saenz. “Study of the anti-hyperglycemic effect of plants used as antidiabetics”. *Journal of Ethnopharmacology*. 1998;61(2):101–110
5. W. Somsub, R. Kongkachuichai, P. Sungpuag, and R. Charoensiri . “Effects of three conventional cooking methods on vitamin C, tannin, myo-inositol phosphates contents in selected Thai vegetables.” *Journal of Food Composition and Analysis*. 2008;21(2):187–197
6. S. Zhan-Wu, M. Wei-Hong, J. Zhi-Qiang et al. “Investigation of dietary fiber, protein, vitamin E and other nutritional compounds of banana flower of two cultivars grown in China,” *African Journal of Biotechnology*. 2010;9(25): 3888–3895
7. Salvador, Isabel F. Consumer acceptability of banana blossom sisig. *Uneje-Proceeding*, [S.l.], p. 336-350, mar. 2018. ISSN 0000-0000.
8. Shilpi Singh. “Banana blossom-an understated food with high functional benefits” *International Journal of Current Research*. 2017; 9(01) :44516-44519
9. Dasaraju, S & Mohan Gottumukkala, K. Current trends in the research of *Emblica officinalis* (Amla): A pharmacological perspective. *International Journal of Pharmaceutical Sciences Review and Research*.2014; 24: 150-159
10. Lynch SR, Cook JD. Interaction of vitamin C and iron. *Ann N Y Acad Sci*.1980; 355:32-44

How to cite this article: Anand S, Sharma M. Product development from banana blossom powder and Indian gooseberry powder for anaemic adolescent girls. *Int J Health Sci Res*. 2019; 9(5):273-278.
