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Research Article

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Development of Noodle Using Banana Peels as a Functional Ingredient

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ABSTRACT

Banana (Musa paradaisica), is grown worldwide and consumed as ripe fruit or used for culinary purposes. The peel of banana represents about 40% of the total weight of fresh banana and has been underutilized. It is rich in dietary fibre, carotenoid, protein, PUFA, Calcium and potassium.The aim of the study was to incorporate banana peels powder (BPP) in the preparation of noodles, to determine the nutrient composition of BPP and noodle as well as to assess the organoleptic quality and cost. Noodles were made by incorporating BPP at three different ratios (Refined flour: BPP; 90: 10, 80: 20 and 70: 30 respectively) named as T_1, T_2 and T_3. Noodles prepared from the refined flour only served as control (T_0). The noodles were organoleptically evaluated by Nine Point Hedonic Scale. The nutritional composition of product was chemically analysed by using the AOAC (2005) methods. Appropriate statistical technique was opted for the analysis.On the basis of sensory evaluation T_1 (90:10) was most acceptable with regards to overall acceptability. There was a significant difference between the sensory attributes of different treatments at 5% significance level. The proximate compositions of dehydrated BPP were 7.76 g Protein, 9.8 g Carbohydrate, 244.68 mg calcium, and 212 mg phosphorus. The nutritional composition increased with increase in substitution level of BPP. The cost of the noodles per 100g was Rs3 on the raw basis.The nutritional compositional of banana peel indicates that if it is used as a supplement, it can provide natural calcium. It can be incorporated to develop a value added product. Hence banana peel can be exploited for their nutritional value.

Keywords: *Musaparadaisica, underutilized, banana peels powder (BPP) and Noodles.*

INTRODUCTION

Banana peels, equivalent to 40% of the total weight of fresh banana**.** At present, these peels are not being used for any other purposes and are mostly dumped as solid waste at large expense. It is thus significant and even essential to find applications for these peels as they can contribute to real environmental problems. Potential applications for banana peel depend on its chemical composition. Banana peel is rich in dietary fibre, proteins, essential amino acids, polyunsaturated fatty acids and potassium[6].

Almost 40% of wheat products in Asian countries are consumed in the form of noodles. Traditional noodle is made from simple ingredients (wheat flour, water and salt) can be a complete meal since it contains carbohydrates, protein and trace amount of saturated fatty acids. Besides, noodles are often used as a convenience food due to its simple preparation, low cost and fast cooking characteristics. However, composition of noodles appears to have limited attention and there is little data available on nutritional value of noodle products. Moreover, some reports even claimed that noodle lacks other essential nutritional composition such as dietary fibre, vitamins and minerals which were lost during wheat flour refinement[4].

Therefore a study was designed to utilize the waste i.e BPP to develop a value added noodles, to determine the nutrient composition of BPP and noodle as well as to assess the organoleptic quality and cost.

MATERIALS AND METHODS

Procurement of raw material

Basic ingredients for noodle preparation were purchased from the local market of Allahabad.

Development of banana peels powder

Bananas purchased from a local supermarket
↓
Fruit was washed and separated into pulp and peel
↓
Peels were dipped in 0.5% (w/v) citric acid solution for 10 min
(To reduce enzymatic browning)
↓
Drained and dried
(At 60°C overnight)
↓
Dried peels were grinded to obtain banana peel (BP) flour
↓
Flour was stored in airtight plastic containers

Source: Ramli *et.al.*, 2009

Development of the products

Value added product***Noodles*** were developed by using banana peels powder. The basic recipes were standardized and served control (T_0).

T_0: 100 percent wheat flour.

T_1: 90 percent wheat flour+10 percent banana peels powder.

T_2: 80 percent wheat flour+ 20 percent banana peels powder.

T_3: 70 percent wheat flour + 30 percent banana peels powder.

Organoleptic analysis of developed food products

Prepared products were freshly served to taste panel of 4(four) experienced members. Panel members were rated the product with the help of nine points hedonic scale card[5].

Statistical analysis

All analysis was done by applying two way classification and analysis of variance techniques[3].

RESULTS AND DISCUSSION

Nutritive value of banana peel powder (per 100 gm.) obtained by chemical analysis was as follows- Moisture was found to be 4.5%, Ash content in banana peels powder was found to be 8.86%. Protein content in sample was 7.76 g. Carbohydrate content in the peel powder sample was found to be 9.8 g, the amount of dietary fibre was 10.93 g. Calcium content in sample peel powder was 244.68 mg, the amount of Iron was 3.33 mg and phosphorus content was found to be 212 mg.

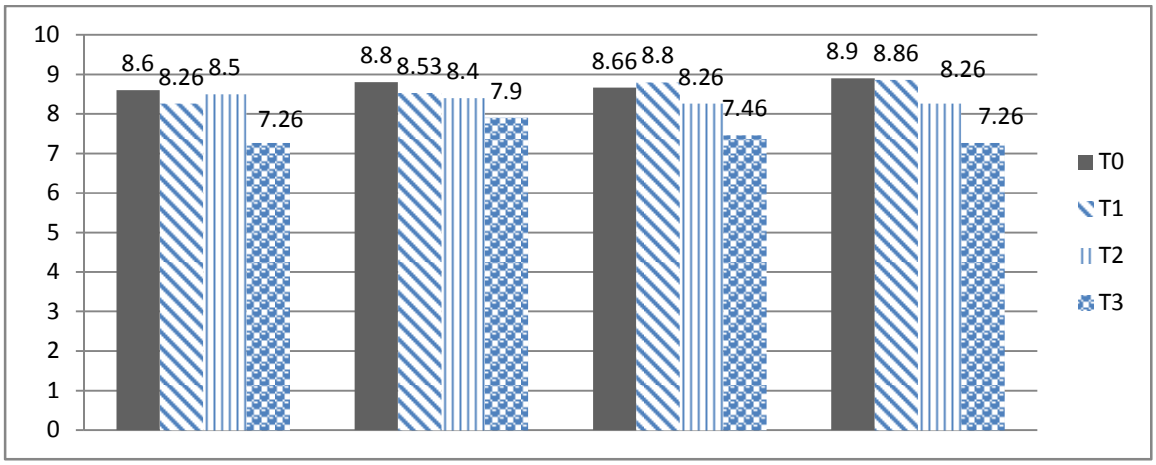
Table 1: Chemical analysis of banana peels powder per 100 gm

NUTRIENTS	CHEMICAL VALUE PER 100g
Moisture(%)	4.5
Ash(%)	8.86
Carbohydrate(g)	9.8
Protein(g)	7.76
Fibre(g)	10.93
Calcium(mg)	244.68
Iron(mg)	3.33
Phosphorus(mg)	212

Table 2: Effect of incorporation of banana peels powder on organoleptic characteristic *Noodles*

Treatments	Color & Appearance	Body & Texture	Taste & Flavor	Overall acceptability
T_0	8.6	8.6	8.66	8.9
T_1	8.26	8.53	8.8	8.86
T_2	8.5	8.4	8.26	8.26
T_3	7.26	7.9	7.46	7.26
F-test	S	S	S	NS
CD	0.428	0.46	0.53	

Fig.1: Different sensory attributesof incorporated banana peels powder developed value added *Noodles*



The data illustrated in the table 2 shows the average sensory scores for different parameters in control and treated sample of *BPP noodles,* clearly indicates that treatments T_0 (8.6) had the highest score followed by T_2 (8.5), T_1 (8.26) and T_3 (7.26) . The calculated value of F is greater than the tabulated value of F at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments regarding the color and appearance of *banana peels powder noodles*. Thus, the color and appearance acceptability increased as the amount of banana peels powder increased to maximum of 20 percent.

It was observed that there was significant difference between T_0, T_2 (0.54); T_0, T_3 (1.54); T_1, T_3 (1.34); T_2, T_3 (1.0) as their mean values were greater than the value of critical difference whereas non- significant difference were found between the remaining pairs of treatments i.e. between T_0, T_1 (0.2) and T_1, T_2 (0.34) as their mean values were less than the value of critical difference.

The average sensory scores for body and texture of *BPP noodles,* shows that treatments T_0 (8.6) had the highest score followed by T_1 (8.53), T_2 (8.4) and T_3 (7.9) which indicates that an increase in the amount of banana peels powder also enhance body and texture of noodles gradually. At 10 percent and 20 percent of banana peels powder incorporation the acceptability was maximum but it decreased when the level of banana peels powder incorporation was increased to 30 percent. the calculated value of F is greater than the tabulated value of F at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments regarding the body and texture of *BPP noodles*. Thus, the body and texture acceptability increased as the amount of banana peels powder increased to maximum of 20 percent.

It was observed that there was significant difference between T_0, T_3 (0.67); T_1, T_3 (0.6); T_2, T_3 (0.47) as their mean values were greater than the value of critical difference whereas non- significant difference were found between the remaining pairs of treatments i.e. between T_0, T_1 (0.07); T_0, T_2 (0.2) and T_1, T_2 (0.13) as their mean values were less than the value of critical difference.

But in case of taste and flavor of *BPP noodles,* the average sensory scores of T_1 (8.8) had the highest score followed by T_0 (8.66), T_2 (8.26) and T_3 (7.46) which indicates that an increase in the amount of banana peels powder also enhance taste and flavor of noodles gradually.

At 10 percent and 20 percent of banana peels powder incorporation the acceptability was maximum but it decreased when the level of banana peels powder incorporation was increased to 30 percent. The calculated value of F is greater than the tabulated value at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments regarding the taste and flavor of *BPP noodles*. Thus, the taste and flavor acceptability increased as the amount of banana peels powder increased to maximum of 20 percent.

It was observed that there was significant difference between T_0, T_3 (1.26); T_1, T_2 (0.54); T_1, T_3 (1.4) and T_2, T_3 (0.8) as their mean values were greater than the value of critical difference whereas non- significant difference were found between the remaining pairs of treatments i.e. between T_0, T_1 (0.14) and T_0, T_2 (0.4) as their mean values were less than the value of critical difference.

The average sensory scores for overall acceptability of *BPP Noodles*, indicates that treatments T_0 (8.9) had the highest score followed by T_1 (8.86), T_2 (8.26) and T_3 (7.26) which indicates that an increase in the amount of banana peels powder also increase the overall acceptability of noodles gradually. At 10 percent and 20 percent of banana peels powder incorporation the acceptability was maximum but it slightly decreased when the level of banana peels powder incorporation was increased to 30 percent. The calculated value of F is less than the tabulated value at 5% probability level. Therefore, it can be concluded that the difference between treatments regarding the overall acceptability of *BPP noodles* was non- significant.

Table 3: Nutritional composition of *BPP Noodles* per 100g

NUTRIENTS	TREATMENTS			
	T_0	T_1	T_2	T_3
ENERGY(Kcal)	344.5	348.42	352.3	356.26
PROTEIN(g)	11.55	12.326	13.1	13.88
FAT(g)	1.3	2.6	3.9	5.2
CARBOHYDRATE(g)	71.65	72.63	73.61	74.59
CALCIUM(mg)	35.5	59.968	84.44	108.9
PHOSPHORUS(mg)	238	259.2	280.4	301.6
FIBRE(g)	1.1	2.19	3.28	4.37
IRON(mg)	3.8	4.13	4.46	4.79

Table 4: Comparison between nutritional composition of control and best treatment of noodles by using t-test

NUTRIENTS	T_0	T_1	$T_1 - T_0$	t (calculated)	t (tabulated) value of 5%	Result
ENERGY(Kcal)	344.5	348.42	3.92	2.05	4.303	NS
PROTEIN(g)	11.55	12.326	0.776	0.65	4.303	NS
FAT(g)	1.3	2.6	1.3	1.345	4.303	NS
CARBOHYDRATE(g)	71.65	72.63	0.98	1.087	4.303	NS
CALCIUM(mg)	35.5	59.96	24.46	22.65	4.303	S
PHOSPHORUS(mg)	238	259.2	21.2	15.80	4.303	S
FIBRE(g)	1.1	2.19	1.O9	4.3	4.303	NS
IRON(mg)	3.8	4.13	0.33	1.505	4.303	NS

The table 3 presented above shows the nutritive value of noodles of different treatments i.e. control (T_0) without incorporation of banana peels powder and with incorporation of banana peels powder at three different levels- 10%, 20% and 30% of T_1, T_2 and T_3 respectively.

Result revealed that highest energy was found at T_3 (356.26 Kcal) followed by T_2, T_1 and T_0. Protein content was highest in T_3 (13.88 g) followed by T_2 and T_1. Carbohydrate content also increased with the increase in amount of banana peels powder i.e.T_3 (74.59 g), T_2 (73.61 g) and T_1 (72.63 g). Fat content also increased with the increase in amount of banana peels powder.

Minerals like Calcium (T_3= 108.9 mg, T_2= 84.44 mg, T_1= 59.96 mg) and Phosphorus (T_3= 301.6 mg, T_2= 280.4 mg, T_1= 259.2 mg) content also showed increased as the level of incorporation of banana peels powder increase. Fiber content also highest in T_3 (4.37 g) followed by T_2 (3.28 g) and T_1 (2.19 g).

Vitamin like Iron also highest in T_3 (4.79 mg) followed by T_2 (4.46 mg) and T_1 (4.13 mg).Therefore, it can be concluded that with increase in amount of banana peels powder positively not unsurely increased the percentage of nutrients present in noodles.

The table 4presented above shows the comparison between nutrient content of control and best treatment of noodles by using t-test. Result shows that a non-significant difference between control (T_0) and best treatment (T_1) applying t- test regarding energy, protein, fat, carbohydrate, fiber and iron as the calculated value of 't' were found to be less than the tabulated value of 't' at 5 percent probability level.

There is a significant difference between control (T_0) and best treatment (T_1) regarding their calcium and phosphorus contents as the calculated value of 't' i.e. 22.65and 15.80 respectively found to be greater than the tabulated value of 't' i.e. 4.303 which indicated that the calcium and phosphorus contents of treatment (T_1) was better than treatment (T_0).

Table 5: Cost of the prepared products namely *noodles* per 100g of raw ingredients

Ingredients (g)	Actual rate/Kg (Rs)	Treatments							
		T_0		T_1		T_2		T3	
		Quantity (g)	Cost (Rs)	Quantity (g)	Cost (Rs)	Quantity (g)	Cost (Rs)	Quantity (g)	Cost (Rs)
Refined flour	30	100	3	90	2.7	80	2.4	70	2.1
Total amount (100g)			**3**		**2.7**		**2.4**		**2.1**

The table 5 presented above shows the cost calculation of banana peels powder noodles of different treatments i.e. control (T_0) without incorporation of banana peels powder and with incorporation of banana peels powder at three different levels- 10%, 20% and 30% of T_1, T_2 and T_3 respectively of noodles. Result revealed that cost of noodles at different treatments - T_0 = Rs 3, T_1 = Rs 2.7, T_2 = Rs 2.4 and T_3 = Rs 2.1. Cost of noodles slightly decreased from T_0 to T_3 but approximately overall Rs 3 i.e. because of banana peels were available in free of cost. In every households and fruits drink shop banana peels were available in free of cost because after ate or used banana, peels have been throwing in compost pit where as it is rich in nutrients and can be used as an ingredient in food product development as a functional ingredient.

CONCLUSION

It can be concluded from the present study, that developed value added product by incorporated banana peels powder are rich in dietary fiber , amino acid, calcium, phosphorus and phyto-chemicals. Therefore, it will help to improve the nutritional status of the population and decrease chances of nutrient deficiency diseases. Noodles of Banana Peel Powder (BPP) are of low cost with reasonable price.

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