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RESEARCH PAPER

Nutritional composition of products developed from banana blossom

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SUMMARY :

The banana blossom of three varieties *viz.*, Nendran, Rasakadali and Palayankodan were selected for the study. Freshly harvested blossoms were collected, washed, bracts removed, a chopped finely and pre-treated using citric acid solution. Three products *viz.*, dried slices, flour and RTC product were developed using pre-treated banana blossom. The nutrients including energy, protein, sodium, potassium, calcium and iron were analysed and found that banana blossom has high nutritional significance.

KEY WORDS : Nendran, Nutritional quality, Product development

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The selection of foods best suited for promoting good health has been found out by trial and error by continued use (Swaminthan, 1998). Non- availability of adequate nutritious food for the fast growing population is a challenging problem. Development of processed product such as instant products and mix adds convenience, save time and labour and provide hygienic products of standard and uniform quality with enhanced shelf-life. Sufficient vegetable consumption helps in managing body weight because most vegetables are high in water, fibre and low in fat (He and Nowson, 2009). Banana flower is the male sterile flower of banana plant. It is long pointed, deep crimson yellow or pink coloured and consists of tightly packed leaves or bracts that wrap around rows of thin stemmed male flowers. Easy availability of banana blossom throughout the year, high nutritive value and low market price has made it unique commodity. Despite of its valuable economic and medicinal importance, present investigation on the Nutritional composition of products developed from banana blossom was undertaken with the objectives to evaluate the nutritional qualities of selected varieties of banana blossom.

EXPERIMENTAL METHODS

Banana blossom of three varieties *viz.,* Nendran (Musa AAB), Rasakadali (Musa AA) and Palayankodan (AAB) were selected for the study. Freshly harvested banana blossoms were washed under running water after removing 3-4 outer most fibrous bracts. Fresh weight of each banana blossom was recorded in order to determine the final yield of the processed product after dehydration. The blossoms were sliced into 1mm thick size and directly put into 2 per cent citric acid solution. Three hundred gram of sliced banana blossom was immersed in citric acid solution. The immersion time required for retaining maximum sensory quality characteristics were determined.

After immersion the slices were drained. The drained slices were divided into three portions for further study. One portion was dried to get dehydrated slices; second portion was dried and powdered to get banana blossom powder. The

third portion of pre-treated slices were standardised to get ready to cook product.

As a next step, the drained slices were spread out uniformly in trays and dried in hot air oven. The drying time and temperature was assessed. Dehydrated slices, flour and RTC product was packed in aluminium foil pouches and kept for shelf-life study at room temperature.

Nutritional quality assessments:

Banana blossom is a good reservoir of vitamin E and flavanoids. Banana flower is a good source of dietary fibre, vitamin A, vitamin C, iron. Nutritional composition of the products were determined using standard techniques.

Components	Reference methods
Energy (Kcal)	Gopalan *et al* (2009)
Protein (g)	Bradford (1976)
Sodium (mg)	Thimmiah(1999)
Potassium (mg)	Thimmiah(1999)
Calcium (mg)	Jackson (1973)
Iron (mg)	Jackson (1973)

EXPERIMENTAL FINDINGS AND ANALYSIS

The results of the present study as well as relevant discussions have been presented under following sub heads:

Energy:

Energy is essential for rest, activity, growth and maintenance of sound health. Sheng *et al.* (2010) reported that energy value of fresh banana blossom observed to be 51 kcal/100g.

The energy content of the products developed from three varieties of banana blossom *viz.*, Nendran, Rasakadali and Palayankodan is elicited in Table 1.

Table 1: Calorific value of developed products of banana blossom (Kcal/100g)

Variety	Dried slices	Flour	RTC product
Nendran	253	248	288
Rasakadali	240	219	282
Palayankodan	207	183	251

The energy content was found to be maximum for Nendran RTC product (288kcal/100g) and minimum for Palayankodan flour (183kcal/100g). Gopalan *et al.* (2009) reported that fresh plantain flower contain 34Kcal/100g. A similar study reported that the soup mix developed with moringa pulp alone using drying-blending process found to have highest energy value 429Kcal/100g (Saranya, 2012).

Protein:

The protein content of the products like dried slices, flour and RTC product from three varieties of banana blossom are depicted in Table 2.

Table 2: Protein content of developed products of banana blossom (g/100g)

Variety	Dried slices	Flour	RTC product
Nendran	13.05	12.65	17.38
Rasakadali	13.58	13.50	17.40
Palayankodan	13.34	13.58	18.12
Mean	13.32	13.58	17.63
C.D.(0.05)			
V.M.- 4.41			

The protein content was found to be maximum for Palayankodan RTC product (18.12g/100g) and minimum protein content was noted for Nendran flour (12.65g/100g). The mean value elicited that there was significant difference in the protein *viz.*, dried slices (13.32g/100g), flour (13.58g/100g) and RTC product (17.63g/100g). Banana flower contains high quality protein because of its well balanced essential amino acid content (Sheng *et al.*, 2010).

Calcium:

The calcium content of the developed products *viz.*, dried slices, flour and RTC products from three varieries *viz.*, Nendran, Rasakadali and Palayankodan were depicted in Table 3.

Table 3: Calcium content (mg/100g) of the developed products

Variety	Dried slices	Flour	RTC product
Nendran	121.67	158.33	171.00
Rasakadali	199.33	206.33	223.33
Palayankodan	121.00	134.56	136.50
Mean	147.33	166.41	176.94
C.D. (0.05)			
V- 17.71			
M- 17.71			
VM -30.67			

From Table 3 it was noted that the calcium content varies on varietal as well as product basis. There was significant difference in calcium content of three products *viz.*, dried slices, flour and RTC products.

Statistical analysis of data showed that calcium content was highest for Rasakadali RTC product (223.33mg/100g) and lowest for Palayankodan dried slices (121.00mg/100g). The mean calcium content of dried slices (147.33mg/100g), flour (166.41mg/100g) and RTC product (176.94mg/100g) elicit significant difference. Kanchana *et al.* (2010) reported that the

calcium content of dehydrated banana blossom ranged between 262.00mg/100g to 282.19mg/100g.

Magnesium:

The magnesium content of the developed products *viz.*, dried slices; flour and RTC product from three varieties are recorded in Table 4.

Table 4: Magnesium content (mg/100g) of the products developed

Variety	Dried slices	Flour	RTC product
Nendran	14.52	21.70	21.81
Rasakadali	23.63	25.96	29.89
Palayankodan	20.43	25.01	23.00
Mean	19.53	24.23	24.90
C.D. (0.05)			
V- 4.16			
M- 4.16			
VM- 7.21			

Statistical analysis of data revealed that the magnesium content was maximum for Rasakadali RTC product (29.89mg/100g) and minimum was noted for Nendran dried slices (14.52mg/100g).

The mean value revealed that there was significant difference between the magnesium content of dried slices (19.53mg/100g) and flour (24.23mg/100g). Also there was significant difference between magnesium content of dried slices (19.53mg/100g) and RTC (24.90mg/100g) product. But there was no significant difference between magnesium content of flour (24.23mg/100g) and RTC product (24.90mg/100g).

Sodium:

The sodium content of the developed products *viz.*, dried slices, flour and RTC product from three varieties *viz.*, Nendran, Rasakadali and Palayankodan are recorded in the Table 5.

Table 5: Sodium content (mg/100g) of the developed products

Variety	Dried slices	Flour	RTC product
Nendran	226.00	286.67	267.33
Rasakadali	116.33	161.55	146.66
Palayankodan	122.68	177.33	146.33
Mean	155.01	208.52	186.78
C.D. (0.05)			
V- 9.92			
M- 9.92			
VM-17.18			

From the table it is noted that the sodium content varies on varietal as well as product basis. The maximum sodium content was noted for Nendran flour (286.67mg/100g) and minimum was recorded for Rasakadali dried slices (116.33mg/100g).The mean value elicited significant difference between the sodium content of dried slices (155.01mg/100g), flour (208.52mg/100g) and RTC product (186.78mg/100g). Gopalan *et al.* (2009) reported that fresh banana blossom contain 20.1mg/100g of sodium.

Potassium:

The potassium content of the developed products *viz.*, dried slices, flour and RTC product from three varieties *viz.*, Nendran, Rasakadali and Palayankodan are depicted in Table 6.

Table 6 : Potassium content (mg/100g) of the developed products

Variety	Dried slices	Flour	RTC product
Nendran	427.36	481.80	452.23
Rasakadali	587.63	565.33	583.66
Palayankodan	471.66	479.33	481.20
Mean	495.56	498.62	505.70
C.D. (0.05)			
V- 163.53			
M-163.53			
VM-283.23			

From Table 6 it was noted that the potassium content varies on varietal as well as product basis. There was significant difference in potassium content of three products ($F_{4,18}$=3.1698, P<0.05) *viz.*, dried slices, flour and RTC products.

The maximum potassium content was noted for Rasakadali dried slices (587.63mg/100g) and minimum was recorded for Nendran dried slices (427.36mg/100g).

The mean value shown that there was significant difference between the sodium content of dried slices (495.56mg/100g) and RTC product (505.70mg/100g). But there was no significant difference noted for dried slices (495.56mg/100g) and flour (498.62mg/100g). Potassium and phosphorus was the most abundant minerals in banana flower, followed by calcium, magnesium and sulphur (Ngamsaeng *et al*., 2006). Sheng *et al*. (2010) reported that the banana blossom contain 553mg/100g of potassium content.

Iron:

The iron content of the developed products *viz.*, dried slices, flour and RTC product from three varieties *viz.*, Nendran, Rasakadali and Palayankodan were recorded in the Table 7. From the table it was noted the iron content varies on varietal as well as product basis. There was significant difference in iron content of three products *viz.*, dried slices, flour and RTC products.

The highest iron content was noted for Palayankodan

RTC product (140.22mg/100g) and least was recorded for Nendran dried slices (81.41mg/100g).

Table 7: Iron content (mg/100g) of the developed products

Variety	Dried slices	Flour	RTC product
Nendran	81.41	117.45	131.00
Rasakadali	134.08	130.33	136.82
Palayankodan	124.67	135.67	140.22
Mean	113.39	127.82	136.01
C.D.(0.05)			
V-7.70			
M-7.70			
VM- 13.35			

The mean value elicited significant difference between the iron content of dried slices (113.39mg/100g), flour (127.82mg/100g) and RTC product (136.01mg/100g) at 5 per cent level. The fresh banana blossom contains 1.6mg/100g of iron (NIN, 2009).

Conclusion:

The banana blossom of three varieties *viz.*, Nendran, Rasakadali and Palayankodan were selected for the study. The banana blossom was weighed, washed, removed outer bracts, sliced and pre-treatment was done using citric acid. The sliced banana blossom was pre-treated in 2 per cent citric acid solution, dehydrated and developed into three products *viz.*, dried slices, flour and RTC product. Calorific value was observed to be highest for Nendran RTC product (288 Kcal/100g). Palayankodan RTC product was found to have maximum protein content (18.12g/100g) among the developed products. In case of minerals, the calcium (223.33mg/100g), magnesium (29.89mg/100g) and potassium (583.66mg/100g) was highest in Rasakadali RTC product. Sodium content was detected to be highest in Nendran RTC product (286.67mg/100g) while low sodium content was noted for Rasakadali and Palayankodan blossom products. Highest iron content was observed for Palayankodan RTC product (140.22mg/100g). Nutritional value of the developed products was found to be high. Being nutritious and low cost vegetable it can be used to attain food security.

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