

Standardization of fresh elephant foot yam based value added products

■ ANJALI YADAV AND SADHNA SINGH

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■ **ABSTRACT** : The present study was done to assess the organoleptic acceptability, nutritional composition and economics of value added products developed from corms of released variety elephant foot yam (NDA-9). Among various value added products the highest sensory mean score was obtained by veg rolls (9.0) followed by bread roll (8.98), momos (8.88), chokha (8.86), tikki (8.38), suran pakodi (8.38), suran paratha (8.00), and suran sabji (7.54). Nutritionally Veg roll contained the highest protein value (4.88g/100g), suran ki pakodi contained highest calcium value (62.40/100g) and tikki had highest iron content (4.11 mg/100g) among all the products and economically veg roll and momos (Rs. 3.50/100g) were least expensive as compared to other products and suran pakodi was the most expensive (Rs. 12.86/100g).

■ **KEY WORDS**: Elephant foot yam, Value addition, Organoleptic properties, Nutritional composition, Economics

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See end of the paper for authors' affiliations →

ANJALI YADAV

Department of Foods Science and Nutrition, N.D. University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA

The elephant foot yam (*Amorphophallus paeoniifolius*) also called Suran and Zimikand is native to India and is grown for its underground modified stem known as corm which can be stored for long periods. It has now become a very popular vegetable in certain areas of the tropical and sub-tropical regions. It is a cheap source of carbohydrates, minerals and vitamins. The corm is used as vegetable and for preparing curry and pickles. It contains crystals of calcium oxalate accounting for acidity and irritation and also used in ayurvedic preparations for the cure of piles. It is of two types; one has smooth corms and is propagated by small pieces of corms. Its acidity causes irritation that is diluted by boiling. Another type is propagated by cormels or daughter corms, is superior in quality and free from

acidity. The flesh colour ranges from white to light pink (Dey *et al.*, 2012).

Elephant foot yam is not only used as a vegetable but recently several value added products like pickles, dried cubes, chips, thickening agents etc. are also made and they are gaining popularity. Preparation of osmo-dehydrated slices from fresh corm and bread from flour of *Amorphophallus paeoniifolius* corm is a good source of both carbohydrate and protein (Singh *et al.*, 2012). Elephant foot yam is a good source of protein, starch as well as minerals. It has a great export potential since its commercial cultivation is not in other countries. The net economic return is over one lakh rupees per ha (Misra *et al.*, 2001). Tubers also serve as tonic, stomachic and appetizer (Singh and Wadhwa, 2014). *A. paeoniifolius*

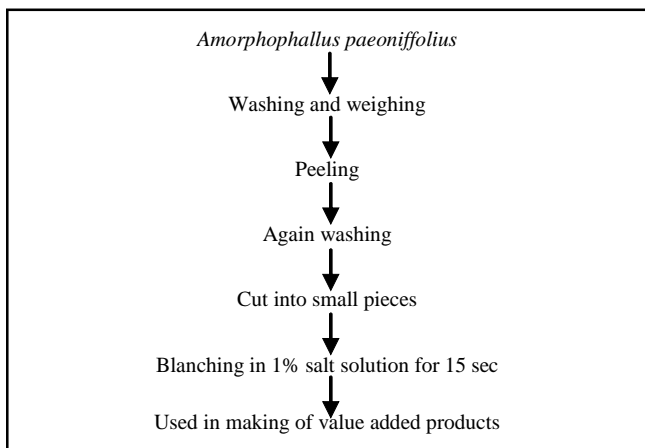
have several medicinal properties like gastro protective ability, antioxidative, antidiarrhoeal and anti-inflammatory activity (Singh *et al.*, 2015).

■ RESEARCH METHODS

Procurement of materials :

Amorphophallus paeonifolius corms of variety NDA-9 harvested during the month of April-May 2015 were procured from the Department of Vegetable Science, College of Horticulture, N.D.U.A.T. Kumarganj, Faizabad. Other ingredients required for preparation of value added products were procured from the local market of Kumarganj.

Processing of material :



Sensory evaluation:

Value added products were subjected to sensory evaluation with respect to color, appearance, aroma, texture, taste and overall acceptability by a panel of 10 semi trained judges, using 9 point hedonic scale (Appendix-I).

Nutritional evaluation of developed products:

The nutritional quality of the developed products was calculated by taking into consideration the chemical composition of the selected variety of elephant foot yam. The composition of other raw materials used in product preparation taken from the values given in the Food Composition Tables compiled by Gopalan *et al.* (2004).

Economics of the developed products:

The cost of product is an important factor for the assessment of acceptability of recipes among consumer.

The cost of the products was calculated by taking into consideration the cost of raw materials.

Statistical analysis of the data:

The data were analyzed for percentage, mean and single factor Analysis of variance (ANOVA) was applied to find the appropriate significant difference among the different foods.



Table A : Development of fresh based elephant foot yam value added products					
Sr. No.	Name of product	Type of product	Ingredients used	Method	Cooked weight
1.	<i>Bread roll</i>	Snack	Suran-100g, Refined wheat flour-100g, Garam masala-1tsp, salt-to taste, oil-2-tsp, Green Chilli-1or2	Grated suran. Heated oil in a pan and sauté green chilli and then added suran, garam masala, salt and cook. Took a bread and cut its brown side. Dip the bread in water and squeeze the water then suran mixture was stuffed and makes roll of it. Heated oil in pan and fried the rolls till golden brown in colour.	275
2.	<i>Chokha</i>	Vegetable	Suran-100g, Bengal gram flour-10g, chat masala-1tsp, salt-to taste Green Chilli-1or2 Oil-20ml	Boil suran. Mashed with potato masher and mix ginger-garlic paste, salt, green chilli and mix well. Added mustard oil and mixed well.	175
3.	<i>Momos</i>	Snack	Suran-100g Ginger-garlic paste-1tsp Green chilli-2-3 salt- to taste Mustard oil-5ml	Grated suran. Heated oil in a pan and add green chillies sauté and then added grated suran and cook. Kneaded refined wheat flour to a soft dough. Roll and make small rounds and filled the mixture in it. Rolled sides in the shape of momos. Steamed the momos for 15-20 minutes.	125
4.	<i>Tikki</i>	Snack	Suran-100g, Refined wheat flour-100g, garam masala-1tsp, salt-to taste Green Chilli-1or2	Grated suran, chat masala, salt, green chilli and mixed well. Took the mixture and make round tikkis. Heated oil in pan and fried the tikkis till golden brown colour.	250
5.	<i>Veg roll</i>	Snack	Suran-100g, bread-150g, garam masala-1tsp, salt-to taste Green Chilli-1or2 Oil-30ml	Grated suran. Heated oil in a pan and sauté green chilli and then added suran, garam masala, salt and cook. Took refined wheat flour and added little water at a time and make a lump free batter. Heated non-stick tawa and greased with about 1tsp oil and pour the ladle full batter and spread it to make a round shape. When it gets cook spread a filling on it and turn it from both sides. Repeated the process for all the veg rolls.	275
6.	Suran ki sabji	Vegetable	Suran-100g, Onion-1 small, Tomato-100g, Spices-1 tsp, salt-to taste, dry mango powder-1/2 tsp, oil- 30ml.	Suran was peeled, washed and cut into slices and boiled. Oil was heated in a pan and then onion was added and sauté till golden brown in colour. Then spices, tomatoes, dry mango powder and salt were added and mixed well and cook for a minute. After that Suran was added with water (as per required) and cooked for 20-30 minutes.	250
7.	Suran ki pakodi	Snack	Suran-100g, Bengal gram flour-50g, mustard oil-20ml, cumin seeds- a pinch, salt-to taste, asafetida-a pinch, dry mango powder-1/2 tsp, refined oil- 60ml.	Suran was peeled, washed and cut into slices. Put these slices in boiling water for two minutes. Prepared the batter of Bengal gram flour. Added cumin seeds, salt and chilli powder. Pieces of suran were dipped into batter and deep fried it in hot mustard oil till golden brown colour.	125
8.	Suran ka paratha	Snack	Suran 100g, Wheat flour-100g, cumin seeds-a pinch, red chilli powder-1/2 tsp, salt-to taste, mustard oil-50-ml	Suran was boiled and peeled. Oil was heated in a skillet and cumin seeds and asafoetida were added. Boiled mashed suran was added to it and fried for 5min. Then dry mango powder was added. Wheat flour was sieved and soft dough was prepared. Balls of equal size were made. Then suran mixture was stuffed and rolled in shape of paratha. Shallow fried it from both sides.	270

■ RESEARCH FINDINGS AND DISCUSSION

To popularize the elephant foot yam among common population several value added products were standardized using the fresh corms. The fresh corm based eight value added products were bread roll, *Chokha*, *Momos*, *Tikki*, *Veg roll*, *Suran ki sabji*, *Suran ki pakodi* and *Suran ka paratha*.

Data pertaining to sensory evaluation of fresh elephant foot yam based value added products are presented in Table 1. The products were evaluated for

colour, appearance, aroma, texture, taste and overall acceptability on 9 point Hedonic rating scale by a panel of semi trained judges.

The Table 1 shows no significant difference between products with respect to colour, appearance, aroma and texture but shows a significant difference in taste and overall acceptability score.

Among various value added products the highest mean score was obtained by veg rolls (9.0) followed by bread roll (8.98), *Momos* (8.88), *Chokha* (8.86), *Tikki*

(8.38), *Suran pakodi* (8.38), *Suran paratha* (8.00) and *Suran sabji* (7.54) i.e., all were in the range of liked extremely to liked very much.

Table 2 shows the nutritional composition of fresh elephant foot yam based value added products with respect to energy, protein, carbohydrate, fat, fibre, calcium and iron contents. The energy content of the products ranged from 67 to 693 kcal, protein content from 0.96 to 8.93g, carbohydrate content from 14.72 to 94.58g, fat from 4.00 to 42.28g, fibre from 0.06 to 1.12 g, calcium from 24.18 to 62.40 mg and iron from 0.48 to 4.11mg per 100g of product.

Statistical analysis of the products showed significant difference between the products with respect to nutritional composition. Veg roll contained the highest protein value (4.88g/100g), *Suran ki pakodi* contain highest calcium value (62.40mg/100g) and *Tikki* had highest iron content (4.11 mg/100g) among all products.

Table 3 shows the cost of fresh elephant foot yam based value added products. Among all products veg roll and momos (Rs. 3.50/100g) were least expensive as compared to other products and suran pakodi was most expensive (Rs. 12.86/100g).

Table 1 : Sensory evaluation* of fresh elephant foot yam based value added products						
Product name	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
Bread roll	9.00	9.00	9.00	9.00	8.90	8.98
<i>Chokha</i>	8.80	8.80	8.90	8.90	8.90	8.86
<i>Momos</i>	8.90	8.80	8.90	8.90	8.90	8.88
<i>Tikki</i>	8.50	8.30	8.60	8.40	8.10	8.38
<i>Veg roll</i>	9.00	9.00	9.00	9.00	9.00	9.00
<i>Suran sabji</i>	7.50	7.40	7.30	7.60	7.90	7.54
<i>Suran paratha</i>	7.50	7.70	8.20	8.30	8.30	8.00
<i>Suran pakodi</i>	8.50	8.40	8.60	8.30	8.10	8.38
C.D. (P=0.05)	NS	NS	NS	NS	0.47	0.39

*Nine Point Hedonic Rating Scale

NS=Non-significant

Table 2 : Nutritional composition of fresh elephant foot yam based value added products (per 100g)							
Name of product	Energy (kcal)	Protein (g)	CHO (g)	Fat (g)	Fibre (g)	Calcium (mg)	Iron (mg)
Bread roll	228	4.69	35.00	11.32	0.40	24.18	0.81
<i>Chokha</i>	67	0.96	14.72	4.08	0.06	40.00	0.48
<i>Momos</i>	188	4.43	16.78	4.00	0.13	26.54	1.20
<i>Tikki</i>	197	3.41	18.37	14.45	0.20	35.93	4.11
<i>Veg roll</i>	207	4.88	36.92	4.40	0.15	29.20	0.66
<i>Suran sabji</i>	282	1.16	41.81	12.14	0.80	39.20	0.49
<i>Suran paratha</i>	524	4.56	58.19	30.27	1.00	36.29	2.04
<i>Suran pakodi</i>	693	8.93	94.58	42.28	1.12	62.40	2.60
C.D. (P=0.05)	8.43	0.52	1.58	0.46	0.01	2.13	0.09

Table 3 : Economics of fresh elephant foot yam based value added products (per 100g)		
Sr. No.	Name of product	Cost (Rs./100g)
1.	Bread roll	7.00
2.	<i>Chokha</i>	4.00
3.	<i>Momos</i>	3.50
4.	<i>Tikki</i>	4.50
5.	<i>Veg roll</i>	3.50
6.	<i>Suran sabji</i>	6.36
7.	<i>Suran paratha</i>	3.70
8.	<i>Suran pakodi</i>	12.86

Summary :

The fresh corms of NDA-9 were used for preparation of value added products. The products based on fresh elephant foot yam included bread roll, *Chokha*, *Momos*, *Tikki*, *Veg roll*, *Suran ki sabji*, *Suran ki pakodi* and *Suran ka paratha*. Among various value added products the highest mean overall acceptability score was obtained by veg rolls (9.0) followed by bread roll (8.98), *Momos* (8.88), *Chokha* (8.86), *Tikki* (8.38), *Suran pakodi* (8.38), *Suran paratha* (8.00), and *Suran Sabji* (7.54) *i.e.*, all were in the range of liked extremely to liked very much. The fresh elephant foot yam based value added products were evaluated nutritionally with respect to energy, protein, carbohydrate, fat, fibre, calcium and iron contents. The energy content of the products ranged from 67 to 693 kcal, protein content from 0.96 to 8.93g, carbohydrate content from 14.72 to 94.58g, fat from 4.00 to 42.28g, fibre from 0.06 to 1.12 g, calcium from 24.18 to 62.40 mg and iron from 0.48 to 4.11mg per 100g of product. Statistical analysis of the products showed significant difference between the products with respect to nutritional composition. Veg roll contained the highest protein value (4.88g/100g), *Suran ki pakodi* contained highest calcium value (62.40/100g) and *Tikki* had highest iron content (4.11 mg/100g) among all the products. Among fresh elephant foot yam based value added products, veg roll and momos (Rs. 3.50/100g) were least expensive as compared to other products and suran pakodi was the most expensive (Rs.

12.86/100g).

Authors' affiliations:

SADHNA SINGH, Department of Foods Science and Nutrition, N.D. University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA

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