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Studies on Standardization and Physic-chemical Characteristics of Elephant Foot Yam (*Amorphophallus paeoniifolius)* Papad

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A B S T R A C T

The present study was undertaken to develop protocol for preparation of elephant foot yam papad, to assess the nutritional composition, physical characteristics and organoleptic evaluation of elephant foot yam papad. The papads were made with five different levels of elephant foot yam flour as 10, 20, 30, 40 and 50% along with control samples. The protein content in papad ranged from 16.20 to 22.50g, carbohydrate 55.60 to 58.96g, fat 4.21 to 4.50g, fibre 3.22 to 3.53g, calcium 140 to 158 mg/100g, iron 5.50 to 6.29 mg/100g. The overall acceptability score of control sample and supplemented with 30% elephant foot yam flour was highest (8.50 like extremely). The thickness (cm) and diameter (cm) of papad of control sample was highest and respective values were 0.60cm and 14.95cm (after frying). The thickness (cm) and diameter (cm) of papad supplemented with 30% (T3) and 10% (T1) were least i.e., 0.56cm and 13.72cm respectively. The expansion (%) of papad supplemented with 30% (T3) elephant foot yam flour was highest i.e.16.50% and least for treatment T1 (10% supplemented with elephant foot yam flour).

Introduction

Elephant foot yam (*Amorphophallus paeoniifolius)* is a tropical tuber crop belongs to family *Areceae*. The important *Amorphophallus* species i.e. *Amorphophallus Peaoniifolius* is basically a crop of south East Asian origin. In India, it is commonly known as "Suran" or "Jimikand". Elephant foot yam is a good source of energy, sugar, starch, proteins, fiber as well as minerals (Singh and Wadhwa, 2012). It is majorly used as a vegetable in various Indian, Chinese and Japanese cuisines. It is not only used as vegetable but different value added products like pickles, dried cubes, chips, flour, thickening agent etc are also made and they are gaining popularity

Elephant foot yam a tuberous root crop is grown as a cash crop due to its high production potential, and popularly as a vegetable in many Asian and African countries (Misra *et al.,* 2002). Tubers also serve as tonic, stomachic and appetizer. It has several medicinal properties like gastro protective ability, antioxidative, antidiarrhoeal and anti-inflammatory activity (Singh, 2015).

Papad is a popular snack item consumed after frying or roasting. Traditionally, different types of cereals and legumes flours are blended to prepare papad to suit the regional preferences. It is commonly made with the blackgram flour and it is largest selling papad in the local and national market (Suradkar *et al.,* 2014)

Elephant foot yam is not exploited for industrial uses, are cultivated in small pockets and used only as vegetables. To make them important component in our food security system of this tubers, it is necessary to develop value added products such as flours or starches (Moorthy, 2002) of this tubers to enhance their potential uses within the food industry. The present experimental study was done to standardize and asses the physic-chemical characteristics of papad made with the different levels of elephant foot yam flour.

Materials and Methods

Procurement of materials

Good quality tubers of elephant foot yam variety *Gajendra* was collected from ICAR-CTCRI, Regional centre campus. Other materials required for product development were procured from local market of Bhubaneswar.

Standardization of papad

Papad was standardized using elephant foot yam flour at different incorporations of 10,20,30,40 and 50 percent respectively. The details of processing are given in Table 1.

Table.1 Standardization of Jimikand papad

Supplementation level (%)	Black gram flour (BGF) (g)	Elephant Foot yam flour (EFYF) (g)	Common Salt (g)	Water (ml)	Papadkhar (g)	Edible Oil (g)	Asafoetida (g)
Control	100	---	1	50	4.5	7	0.5
BGF:EFYF							
90:10 (T_1)	90	10	1	50	4.5	7	0.5
80:20 (T_2)	80	20	1	50	4.5	7	0.5
70:30 (T_3)	70	30	1	50	4.5	7	0.5
60:40 (T_4)	60	40	1	50	4.5	7	0.5
50:50 (T_5)	50	50	1	50	4.5	7	0.5

Preparation of elephant foot yam flour

The tubers were washed in tap water and cut into slices (1-2 mm). The slices were blanched for 5 min. After blanching, the slices were spread on the trays and were dried in the cabinet drier at 60 ^{0}C for 6 hrs. The dried slices were subjected to milling process by

using pulverizer to obtain the fine flour that was sieved by using the sieve (SSS No.80). The detailed flow chart is mentioned in Figure 1.

Physico-chemical characteristics of papad

Thickness of papad, diameter of papad before and after frying, expansion of papad parameters were measured using standard method of AOAC (2000).

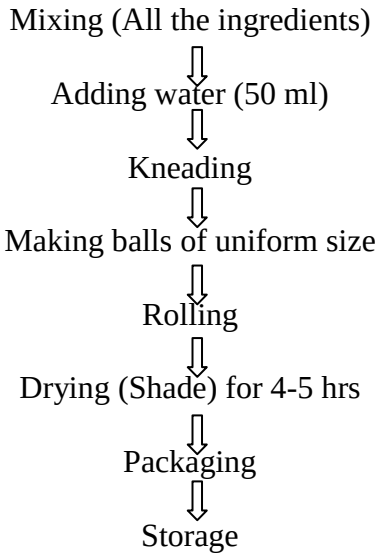
Oraganoleptic evaluation of papad

To ensure the acceptability of the modified recipe used for papad, it was subjected to organoleptic evaluation by using hedonic scale on a scale of 1 to 9. The scale range defines dislike extremely to like extremely.

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.

Fig.1 Flow chart



Results and Discussion

Nutritional composition of papad

Table 2 shows nutrient content (per 100g) of papad supplemented with elephant foot yam flour with respect to moisture, protein, carbohydrate, fat, fibre, calcium and iron content. The moisture content (g) of papad made with 5 different treatments ranges from 6.50 to 6.59. There is slight increase in the moisture content of papad with addition of elephant foot yam flour. This might be due to increased absorption of water with addition of elephant foot yam flour during dough preparation. Protein content (g) in the papad ranges from 16.20 to 19.21. It was found that the protein content increased considerably with addition of elephant foot yam flour. The papad with 50% of elephant foot yam flour reported highest protein content (19.21g). The increased protein content increased the overall nutritional importance of papad. The Carbohydrate content was found to be

increasing from T_1 to T_5. The carbohydrate content was highest 58.96g in T_5 and lowest in control sample. The fat content (g) of papad ranges from 4.21 to 4.50. It was observed that the fat content of papad decreasing from T_1 to T_5. The fat content was highest (4.50g) in control sample and lowest in (4.20g) in treatment T_5. This might be due to low oil absorption capacity of elephant foot yam flour.

Fibre plays the vital role in nutritional composition of food. The fibre content (g) in the papad ranges from 3.22 to 3.53.The fibre content was found to be increasing from T_1 to T_5. The highest fibre content is 3.53g in T_5 treatment and lowest fibre content (3.22g) in control sample. The calcium and iron content ranges from 140 mg to 158 mg/100g and 5.50 mg to 6.29 mg/100g respectively. It was observed that calcium and iron content increasing from T_1 to T_5. This increased calcium and iron content is might be due to increased level of elephant foot yam flour.

Table.2 Nutritional content of *healthy papad* supplemented with Jimikand flour (JMF) per 100g

Supplementations Level of (%) of JMF	Moisture	Protein (g)	Carbohydrate (g)	Fat (g)	Fibre (g)	Calcium (mg)	Iron(mg)
Control	6.56	22.50	55.60	4.50	3.22	140	5.50
T_1	6.50	16.20	56.62	4.26	3.48	143	5.59
T_2	6.53	17.41	57.27	4.24	3.50	146	5.91
T_3	6.54	18.36	57.88	4.22	3.51	153	6.20
T_4	6.59	18.92	58.24	4.21	3.52	155	6.27
T_5	6.58	19.21	58.96	4.21	3.53	158	6.29
C.D	NS	0.946	0.957	0.097	0.118	9.023	0.098
S.E(m)	0.076	0.304	0.307	0.031	0.038	2.896	0.032
S.E(d)	0.108	0.429	0.434	0.044	0.054	4.096	0.045
C.V	2.019	2.803	0.926	1.267	1.895	3.363	0.916

Table.3 Oraganoleptic evaluation of papad supplemented with Elephant Foot Yam Flour (EFYF) per 100g

Supplementations Level of (%) of JMF	Colour	Texture	Flavour	Taste	Overall Acceptability
Control	8.50	8.40	8.50	8.50	8.50
T_1	8.50	8.30	8.30	8.20	8.20
T_2	8.50	8.30	8.20	8.10	8.20
T_3	8.50	8.40	8.30	8.40	8.40
T_4	8.00	8.10	8.00	8.00	8.00
T_5	7.90	7.90	7.80	7.70	7.80
C.D	0.208	NS	0.328	0.36	0.344
S.E(m)	0.067	0.129	0.105	0.115	0.111
S.E(d)	0.094	0.183	0.149	0.163	0.156
C.V	1.388	2.716	2.231	2.454	2.340

Table.4 Physical characteristics of healthy papad supplemented with Elephant foot yam flour (EFYF) per 100gm

Supplementations Level of (%) of JMF	Thickness of papad (cm)	Diameter of papad (cm)		Expansion (%)
		Before frying	After frying	
Control	0.60	12.91	14.95	15.80
T_1	0.58	12.20	13.72	12.45
T_2	0.58	12.20	13.75	12.70
T_3	0.56	12.00	13.98	16.50
T_4	0.57	12.20	13.95	14.34
T_5	0.57	12.50	14.20	13.60
C.D	NS	0.160	0.222	0.184
S.E(m)	0.011	0.051	0.071	0.059
S.E(d)	0.016	0.073	0.101	0.083
C.V	3.395	0.721	0.877	0.717

The similar results are found in biscuits supplemented with *amorphophallus paeoniifolius* flour (Yadav Anjali and Singh Sadhana, 2018).

Oraganoleptic evaluation of papad

Data illustrated in Table 4 shows the oragnoleptic evaluation of papad. Colour score of control sample and sample supplemented with 10, 20, 30% elephant foot yam flour were highest and same i.e. 8.50 (like extremely). Texture score of control sample and 30% elephant foot yam flour was highest i.e.8.40 (like extremely). Flavour score of control sample and 30% supplements of papad was highest compared with other samples. Overall acceptability of control sample and 30% (T_3) supplemented elephant foot yam flour was highest.

Physical characteristics of papad

Table 3 shows the effect of supplementation of elephant foot yam flour on the papad making characteristics with respect to it thickness (cm), Diameter (cm) and Expansion (%). The thicknesses of five samples were ranging from 0.560 cm (T_5) to 0.60 cm (control). The thickness of papad slightly decreased with addition of elephant foot yam flour.

The diametrical expansion of five samples ranges from 12.45 to 16.50%. The highest expansion of T_3 (30%) addition of EFY flour and lowest of T_1 (10%) of EFY flour. The expansion (%) of papad was increased from treatments T_1 to T_3 but from treatments T_4 to T_6 expansion was slightly decreased. These results are good agreement with sorghum papad had highest expansion (%) 22.2% (Chavan *et al.,* 2015).

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