STUDIES ON STANDARDIZATION AND SHELF LIFE DETERMINATION OF SOYA FORTIFIED URAD PAPAD

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ABSTRACT:

The present study was undertaken to prepare soya fortified urad papad with different levels of soya flour. Papads were made with four different levels of soya flour as 5 %, 10 %, 15 % & 20 % along with control treatment without addition. The samples were analyzed chemically & physically. The moisture, protein, fat, ash and total carbohydrate content of treatment T_2, T_3, T_4 & T_5 was found to be ranging from 11.00 - 11.85 %, 24.90 – 29.25 %, 2.9 – 6.24 %, 1.45 – 1.95 % and 58.09 – 50.71 % respectively. The protein content was found to be increasing significantly with addition of soya flour. Also the shelf life study of papads was carried out for 120 days and it was remain good and acceptable upto 90 days.

Keywords- papad, urad, soya flour, shelf life study, protein content.

1. INTRODUCTION:

Papad is a popular snack item consumed after frying or toasting. Traditionally, different types of cereals and legume flours are blended to prepare papad to suit the regional taste preferences. But in most of the blends presence of the black gram flour is primary requirement. Defatted soya flour can be used as an ingredient in the preparation of papad. The incorporation of soya flour increases the nutritional value of papad. Soybean (*Glycine max* L.) a self-pollinated crop is one of the most important oil and protein crops of the world. Oil and protein rich soybean has now been recognized all over the world as a potential supplementary source ofedible oil and nutrition [1].

This can play a vital role in balancing the protein-calorie malnutrition in Indian diet. The oil of soybean contains 85% unsaturated fatty acid and is cholesterol free. The soybean is an excellent source of major nutrients including a good source of vitamins and minerals.

Besides producing oil, the seeds of soybean are also used for producing many of the food dishes, confectioneries, babyfoods and soybean milk. Soybean seeds contain 43.2% protein, 19.5% fat, 20.9% carbohydrate and a good amount of other nutrients like calcium, phosphorus, iron and vitamins [2].

Soybean contain high amount of protein so it is also called as “Poor man’s meat.” In terms of protein production per hectare, soybean has the highest yield (800 kg) at the lowest price and compared with all other vegetable proteins, its amino acid composition are one of the best. If the beans are cleaned and dried to a moisture content of less than12%, then these can be stored for a year without any significant loss in quality [3].

The protein of soybean is called a complete protein as because it supplies sufficient amount of various kinds of amino acids required for body building and repairing the body tissues. Its food value in heart disease and diabetes is well known. Soybean oil contains a large amount oflecithin and a fair amount of fat soluble vitamins. Lecithin is an important constituent of all organs in human body and especially of the nervous tissue, the heart and lever. That is why soybean is a very complete food [4].

The numbers of attempts have been carried out to fortify papad with different ingredients such as maize four, soya flour, some other cereals etc. The sensory and nutritional evaluation of papad with defatted soy flour (10 per cent) and drumstick powder (5 per cent) was most acceptable, [5] the study carried on the chemical analysis and shele-life of papads prepared from legumes flour. The study reported that, the moisture, protein, fat, ash and total carbohydrate content in the dried papads samples were found in the range of 10.10 to 10.33%, 24.13 to 28.03%, 1.06 to 5.35%, 1.53 to 1.97% and 54.55 to 62.95%, respectively. No remarkable changes in moisture content,

texture and flavour were observed up to 120days of storage in ambient condition (27^0C to 35^0C) indicating that the products were shelf-stable up to 90days. The amount of water required for dough, increases with addition of soya flour & the addition of papadkhar to the tune of 4-5 g/ 100 g was found to be better for dough characteristics such as rolling property and frying quality such as diametrical expansion.

The effect of incorporation of soya flour on the quality characteristics of papad with black gram in different proportions to prepare the papad shows that the quantity of water needed for making satisfactory dough was increased from 42 to 58 parts as the soya fortification increased from 5 to 20 per cent. Rolling properties of papad were poor at 10 and 15 per cent soya blending. Papads prepared upto 10 per cent soya fortification were well liked by the panellists and are devoid of off flavour. Soya cereal papad on frying absorbed 15-17 per cent oil and had 12 -13 per cent expansion.

In the present experimental study urad papads were made with the fortification of different levels of soya flour. The study was undertaken with major objectives like to prepare the soya fortified urad papad, to do the chemical and physical analysis of papad, and to determine the shelf life of papad.

2. MATERIALS AND METHODS:

The study was conducted in the Laboratories of the Department of Food Science and Technology, Shramshakti College of Food Technology, Maldad (MH). The samples of soybean & urad were collected from local market of Sangamner.

2.1 Black Gram Flour:

The samples of black gram collected from local market were cleaned, conditioned & grinded to make flour. The black gram flour waspacked in a high-density polythene bags, sealed and stored.

2.2 Soya Flour:

The soya flour was prepared by grinding the roasted soya seeds of JS-335 variety. The samples were cleaned & conditioned by soaking in water (water containing 0.25- 0.5 % sodium bicarbonate) for 12-16 hours and heated at 70 70°C for 10 minutes. The main purpose of using NaHCO3 was to remove the bitterness and anti-nutritional factors. The conditioning samples were then dehulled, roasted & grinded to prepare flour. The prepared flour was then packed in polythene bags. Sealed & stored for further use.

2.3 Other Ingredients:

The other ingredients such as black pepper, Asafoetida, edible oil, Papadkhar, Common Salt were made available from local market. The distilled water was used for the study.

2.4 Treatment Details:

Five different treatments of papads were prepared according to the composition given in

Table1. Treatment Details.

Ingredients	Treatments				
	T_1 (Control)	T_2	T_3	T_4	T_5
Black gram flour	100 g	95 g	90	85 g	80 g
Soya flour	0 g	5 g	10	15 g	20 g
Black pepper	0.5 g	0.5 g	0.5 g	0.5 g	0.5 g
Asafoetida	0.5 g	0.5 g	0.5 g	0.5 g	0.5 g
Edible oil	12.5 g	12.5 g	12.5 g	12.5 g	12.5 g
Common Salt	0.6 g	0.6 g	0.6 g	0.6 g	0.6 g
Papadkhar	4.5 g	4.5 g	4.5 g	4.5 g	5.0 g
Water	45 ml	50 ml	50 ml	55 ml	55 ml

2.5 Preparation of Papads from Soya Flour:

Papad is an important snack food item prepared from the flour. The preparation involves gelatinisation of the soyaflour with minimum quantity of water. The soya flour was mixed with requisite quantity of other ingredients as shown in Table1. All the ingredients were mixed in a mixture to make dough. After 30 min. resting the dough was divided into balls of about 2-3 cm diameter weighing 5-6 gm. These were rolled into thin circular discs of about 1mm thickness using rolling pin. The papads were dried in drier at

50^0C. The dried papads at this stage contained about 14-15% of moisture. The dried papads were then packed in polythene bags. These dried papads were consumed by deep frying in oil. The final products usually undergo 2-3 times expansion on frying. It is crisp and can be consumed as a side dish.

The preparation of soya papads is presented in Figure 1.

Mixing (All the ingredients)
↓
Kneading
↓
Making balls of uniform size
↓
Rolling
↓
Drying in the drier (50˚C-1 hr)
↓
Packaging
↓
Storage

Fig1. Flow Process chart for Papad

2.6 Chemical Analysis of Papads:

Processed papad samples were analysed for moisture content, ash, fat, protein and total carbohydrate. All the determinations were done in triplicate and the results were expressed as the average value.

2.6.1 Moisture Content:

Moisture content was determined adopting AOAC (1984) method as following.

$$\% \text{ Moisture content} = \frac{\text{Weight loss}}{\text{Weight of sample}} * 100$$

2.6.2 Ash:

Drying the sample at 100^oC and churned over an electric heater. The ash was then made in a Muffle furnace at 550^0Cfor 24 hrs. It was calculated using the following formula as,

$$\% \text{ Ash content} = \frac{AW}{IW} \times 100$$

Where,

AW = Weight of ash

IW = Initial weight of dry matter

2.6.3 Fat:

Soxhlet apparatus was used to determined crude fat content of the samples [6]. The percent of crude fat was expressed as follows:

$$\% \text{ Crude fat} = \frac{\text{Weight of dried ether soluble materisl}}{\text{Weight of sample}} * 100$$

2.6.4 Protein:

Protein content was determined using [7] method. Percentage of nitrogen and protein calculated by the following equation:

$$\% \, Nitrogen = \frac{\text{Ts} - \text{Tb x Normality of acid molecular weight } N_2}{Weight \ of \ sample \ in \ grams}$$

Protein= 6.25 x$\% \, Nitrogen$

2.6.5 Total Carbohydrate:

Total carbohydrate content of the samples were determine as total carbohydrate by difference, that is by subtracting the measured protein, fat, ash and moisture from 100 [8]

2.7 Physical Analysis of Papads:

The different physical properties were measured as given below.

2.7.1 Size:

The three axes of papadviz; major axis, intermediate axis and minor axis were measured with measuring scale and size was calculated by using following formula-

$\text{Size} = (a * b * c)^{1/3}$ Where,

a = Major axis

b= Intermediate axis

c = Minor axis

2.7.2 Expansion Percentage of Fried Papad:

The expansion percentage of fried papad was calculated according to -

$$\text{Expansion (\%)} = \frac{DF - DR}{DR} \text{ X } 100$$

Where,

DF = diameter of fried papad

DR = diameter of raw papad

2.7.3 Thickness of Papad:

The thickness of the papad is measured by using Vernier Caliper having a least count of 0.01 mm.

$$\text{Thickness} = a + (b \times l.c)$$

Where,

a =Vernier scale reading (mm)

b = Main scale reading in (mm)

l.c.= Least count of vernier caliper.

2.8 Storage studies of Papads:

The papads along with control sample were stored at ambient temperatures (25^0C to 30^0C) for a period of 120 days. The stored papads were analysed at an interval of 30 days. During storage studies the change in moisture content, texture and flavour wereobserved.

3. RESULTS AND DISCUSSION:

Table 2.Composition of Soya flour & Black gram flour:

Component	Soya flour	Black gram flour
Moisture (%)	12.25	10.45
Protein (%)	42.00	22.60
Fat (%)	18.45	1.3
Ash (%)	3.35	0.3
Total Carbohydrate (%)	23.95	65.35

The soya & black gram flour was analyzed for its chemical composition. The results are shown in Table 2. The protein content was found to be **42.00 %** which is in agreement with [2] & [9]. There is considerable variation in the protein content of soya and black gram as the black gram contains **22.60 %** protein. All other results are supported by the research findings of [2] & [9]

3.1 Chemical composition of Papad:

The present experiment was undertaken with five samples of papad were as T_1 (Control), T_2(5 % soya flour), T_3 (10 % Soya flour), T_4 (15 % soya flour) &T_5 (20 % soya flour) prepared & were chemically analysed. The results are reported in Table no. 3.

3.1.1 Moisture content:

The moisture content of papads made with five different treatments ranges from 10.10 % (db) to 11.85 % (db). There is slight increase in the moisture content of papad with addition of soya flour. This is due inceresed consumption of water with addition of soya flour during dough preparation.

3.1.2 Protein content:

The Table no.3 shows per cent protein content of five different samples of papad. It was found that the protein content increased considerably with addition of soya flour. The papad with 20 per cent soya flour reported 29.25 per cent protein content. The increased protein content increased the nutritional importance of papad.

3.1.3 Fat content:

The fat content of processed soya papad treatments T_1, T_2, T_3, $T_4$and T_5 were 1.20, 2.95, 3.8, 4.50 and 6.24%, respectively. From Table no.3, it is evident that the fat content of soya papad and control papad were different. Fat content was the highest (6.24%) in treatment $T_5$and the lowest (1.20 %) in treatment T_1, which was control sample. The fat content increased with the increasing percentage of soya flour in the papad samples.

3.1.4 Total carbohydrate content:

The carbohydrate content was found to be decreasing from treatment T_1 to T_5. The carbohydrate content was highest of 62.86 per cent in control & lowest of 50.71 for soya flour addition of 20 per cent. The variation in the levels of carbohydrate is due the variation in the levels of protein, ash & fat.

3.2 Physical properties of papad

3.2.1 Thickness & Size:

The thickness of five samples was found ranging from 0.65 cm for $T_1$to 1.10 cm for T_5. This determines that with addition of soya flour the thickness of papad has to increase. This is because; the papads were breaking during sheeting due to addition of soya flour. The size is correlated with thickness. The size of control samples was found maximum as 13.50 cm while that of papad with 20 per cent soya flour was limited up to 10.07

cm. This is because of limitation to sheeting action due to breakage. The results are reported in Table no. 4. However addition of Papadkhar 4.5g /100 g maintained dough characteristics (rolling properties).

3.2.2 Diametrical Expansion:

The diametrical expansion of five treatments was found to be 5.45 per cent - 6.45 per cent. There is no considerable effect of addition on soya flour on the expansion ratio of papad. The maximum diametrical expansion of 6.45 per cent in T_5 was due to 20 per cent soya flour and 5.0 g of papadkhar.

3.3 STORAGE STUDY:

3.3.1 Effect of storage period on properties of papad.

The results of storage study reveals that, the soya fortified urad papad can be stored safely at normal conditions 25^0C–30^0C for a period 90 days without considerable changes in the quality attributes. However papad lose their crispiness after a period of three months. The moisture content was found to be increasing slightly as storage period advances. [5] reported the papads packed in the polythene bags can be stored safely for a period of 90days at temperature of 27^0C–35^0C. The results are reported in Table no. 5.

4. CONCLUSION:-

From obtained result we can conclude that soya fortified urad papad have high nutritional significance in terms of protein, carbohydrate and mineral content. The 120 days storage study shows that papad are remains good and palatable up to 90days. Hence we can successfully utilize the soybean for fortification of urad papad.

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Table 3. Chemical composition of papad

Chemical Properties	Treatments				
	T_1 (Control)	T_2 (5 % soya flour)	T_3 (10 % soya flour)	T_4 (15 % soya flour)	T_5 (20 % soya flour)
Moisture (%)	10.10	11.00	11.20	11.65	11.85
Protein (%)	22.50	24.90	26.15	27.50	29.25
Fat (%)	1.20	2.95	3.80	4.50	6.24
Ash (%)	1.34	1.45	1.56	1.76	1.95
Carbohydrate (%)	62.86	58.09	56.89	54.89	50.71

Table 4. Physical properties of papad

Physical property	Treatments				
	T_1 (Control)	T_2 (5 % soya flour)	T_3 (10 % soya flour)	T_4 (15 % soya flour)	T_5 (20 % soya flour)
Thickness (cm)	0.65	0.70	0.85	0.90	1.10
Size (cm)	13.50	12.20	12.00	11.20	10.07
Expansion (%)	5.45	5.49	5.25	5.73	6.45

Table 5. Storage study of papad

Storage Period (Days)	Treatment	Crispiness	Colour	Flavour	Moisture content	Overall Acceptability
0	T_1	Crispy	Fresh- yellow	Acceptable	10.10	Good
	T_2	Crispy	Fresh- yellow	Acceptable	11.00	Good
	T_3	Crispy	Fresh- yellow	Acceptable	11.20	Good
	T_4	Crispy	Fresh- yellow	Acceptable	11.65	Good
	T_5	Crispy	Fresh- yellow	Acceptable	11.85	Good
30	T_1	Crispy	Fresh- yellow	Acceptable	10.12	Good
	T_2	Crispy	Fresh- yellow	Acceptable	11.13	Good
	T_3	Crispy	Fresh- yellow	Acceptable	11.25	Good
	T_4	Crispy	Fresh- yellow	Acceptable	11.65	Good
	T_5	Crispy	Fresh- yellow	Acceptable	11.87	Good
60	T_1	Crispy	Fresh- yellow	Acceptable	10.15	Good
	T_2	Crispy	Fresh- yellow	Acceptable	11.13	Good
	T_3	Crispy	Fresh- yellow	Acceptable	11.28	Good
	T_4	Crispy	Fresh- yellow	Acceptable	11.67	Good
	T_5	Crispy	Fresh- yellow	Acceptable	11.88	Good
90	T_1	Crispy	Fresh- yellow	Acceptable	10.20	Good
	T_2	Crispy	Fresh- yellow	Acceptable	11.17	Good
	T_3	Crispy	Fresh- yellow	Acceptable	11.45	Good
	T_4	Crispy	Fresh- yellow	Acceptable	11.67	Good
	T_5	Crispy	Fresh- yellow	Acceptable	11.90	Good
120	T_1	Less Crispy	Slightly dark	Less Acceptable	10.55	Moderate
	T_2	Less Crispy	Slightly dark	Less Acceptable	11.43	Moderate
	T_3	Less Crispy	Slightly dark	Less Acceptable	11.61	Moderate
	T_4	Less Crispy	Slightly dark	Less Acceptable	11.85	Moderate
	T_5	Less Crispy	Slightly dark	Less Acceptable	12.21	Moderate

