

Development of Gluten Free Papad Using Buckwheat (*Fagopyrum Esculentum*) and Guar Gum (*Cyamopsis Tetragonolobus*)

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ABSTRACT

Buckwheat, potato and Guar gum were used for the preparation of papad. The Buckwheat has many medicinal properties. It reduces Gastro-intestinal disorder and it also helps to reduce diabetes. Since, buckwheat is Gluten-less, it does not have binding property, so guar gum was used as a binding agent. Rock salt and Black pepper were added for enhancing of flavor and taste. Different concentrations of chief ingredients were prepared to achieve the standard sample. The sample was sun-dried in order to attain the desired characteristics and to increase the shelf-life. The shrinkage & weight loss were calculated before the optimization of standards. The product was either fried or roasted, and then it was served to several panelist members for the sensory evaluation according to 9-point hedonic test. Different Physico-chemical tests were undertaken in order to calculate the proximate value by AOAC (1995, 2005) and Ranganna (1986) method.

Keywords: Buckwheat, Guar gum, Standardization, Sensory evaluation, Papad preparation.

1. INTRODUCTION

Papad is one of the popular snack items and it is very tasty so, used in every Indian diet since older days. It is consumed either as such often frying or roasting or as adjunct along with vegetable soups and curries. It is usually made from a blend of cereal flour, edible starch and pulse flour with common salt, spices, edible oil, and mucilaginous additives (**Miaruddin et al., 2006**).

Buckwheat, *Fagopyrum esculentum* Moench, belongs to the family Polygonaceae. The main producers of buckwheat are China, Russian Federation, Ukraine and Kazakhstan (**Bonafaccia et al., 2003**). Two buckwheat species are commonly cultivated: Common buckwheat (*Fagopyrum esculentum*) and Tartary buckwheat (*F. tartaricum*) (**Krkoskova et al., 2005**). It is very rich in anti-oxidant as well as rich in vitamins (B1, B2, B6, and E) and minerals (P, K, Na, Ca, Mg, Fe etc.) (**Wijngaard & Arendt 2006**).

Guar Gum, also known as Gum cyamopsis, a naturally occurring gum, is a galactomannan. It is obtained from an annual pod bearing plant *Cyamopsis tetragonolobus*, belonging to family Leguminosae. It is a high molecular weight carbohydrate. The seed is composed of the hull (14-17 percent), the endosperm (35-42 percent), and the germ (43-47 percent), which is rich in protein. The commercial important part of the guar seed is the endosperm. Guar bean is principally grown in India, Australia with smaller crop in United State, China, Pakistan and Africa. India produces 1-1.25 million tonnes of guar annually and responsible for 80 percent of world guar production.

Potato (*Solanum tuberosum* L) is an annual, tuber crop of family Solanaceae that contains the entire essential food ingredient required for maintaining proper health. According to **FAO (2008)**, Potato is consumed by more than one billion people in the world. The average composition of the potato is about 80 percent water, 2 percent protein and 18 percent starch. Potatoes are excellent sources of both iron and folic

acid, which are essential for the production of red blood cells
(Brown C.R. *et al.*, 2007).

2. MATERIALS AND METHODS

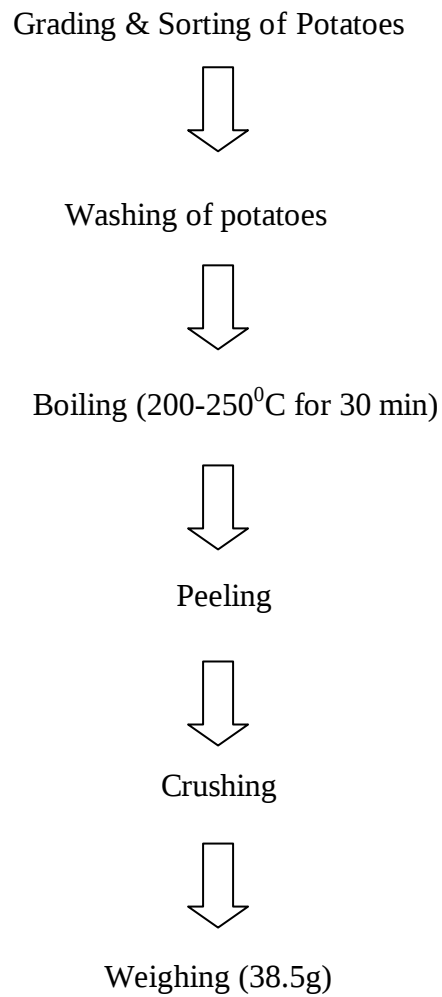
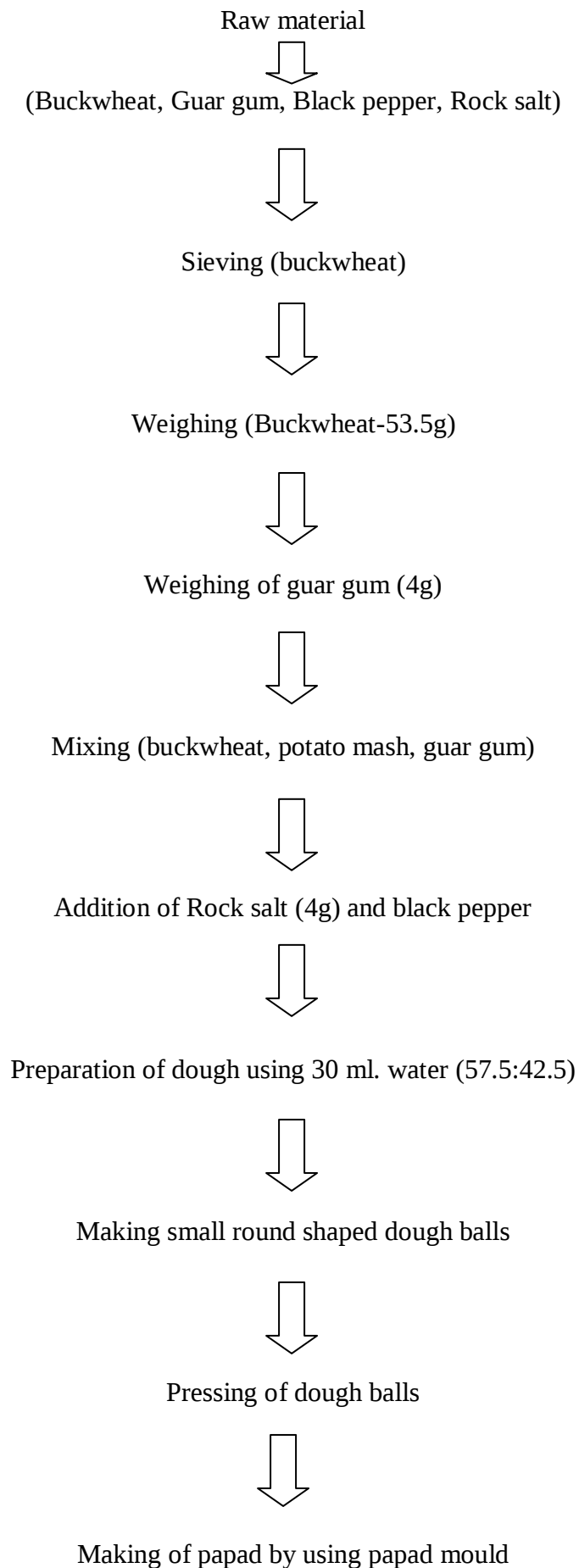


Fig.1.Flow diagram of preparation of potato mash.



Fig.2. Potato mash

Preparation of Buckwheat Papad



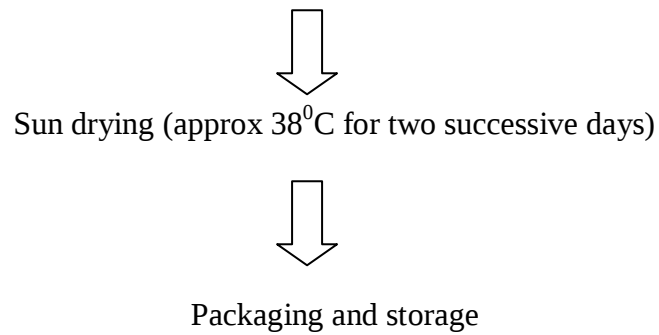


Fig.3. Flow diagram of preparation of Buckwheat Papad



Fig.4.Guar gum



Fig.5.Dry papad



Fig.6.Roasted papad



Fig.7.Deep-fried papad

The Raw materials (Buckwheat, Potato, Guar gum, Rock salt and Black pepper) were procured from the local market of Dehradun. The Buckwheat was sieved for removing bran particle. The potatoes were washed for removing dirt and then

boiled in the cooking casserole at 200-250⁰C for 30 minutes on gas. The potatoes were boiled and cooled down, then peeled and mashed. The mash was mixed with the buckwheat and guar gum, Rock salt was added in the ratio 53.5:38.5:4g

and black pepper was also added to impart the taste and mixed gently. The clean water was used for making dough. After this the hands were greased with oil and small balls were made from the dough. Then the dough balls were pressed manually and the shape was given by papad mould. Then two polythene sheets were taken. Placing the papad on one sheet and covering it with another sheet to protect the papad from dirt. The papad was allowed to dry in the sun at approximately 38°C for two successive days, by which all the moisture was

removed from papad. And then papad was either deep-fried or roasted according to preference and it was served to 10-untrained panelist members for the sensory evaluation according to 9- point hedonic test. We can either deep-fry or roast the buckwheat papad. The papad was sealed in polythene with the help of polythene thermal sealer and stored at room temperature.

3. RESULT AND DISCUSSION

Proximate Composition of Ingredients: The proximate composition of Raw Buckwheat, Guar gum, Potato and Buckwheat papad are presented in Table 1, 2, 3 and 4.

Chemical composition of Raw Buckwheat:

Table 1. Composition of buckwheat (per 100 g)

Name of food grain	Food energy (cal.)	Moisture (percent)	Protein (percent)	Fat (percent)	Total carbohydrate (g)	Calcium (Mg)	Iron (Mg)	Phosphorus (Mg)
Buckwheat	355	11.0	12.0	7.4	72.9	114	13.2	282

Source: USDA Composition of Food Agricultural Handbook

Chemical composition of Raw Guar gum:

Table 2. Composition of guar gum (percent dry matter basis)

parameter	Moisture (percent)	Ash (percent)	Fat (percent)	Fiber (percent)	Protein (percent)	Carbohydrate (percent)
	13.45	0.70	3.06	0.09	0.99	81.32

Chemical composition of Potato:**Table 3. Proximate Composition of potato**

Parameter	Moisture (percent)	Ash (mg/g)	Fat (mg/g)	Protein (mg/g)	Crude fiber (mg/g)	Carbohydrate (mg/g)
	65.31	16.02	0.025	5.25	28.96	21.41

Proximate Analysis of Buckwheat Papad:

In the study, sample of papad containing 57.5 gm Buckwheat, 42.5 gm Potato, 4 gm. Guar gum, 4 gm Rock salt, Black

pepper. the sample of papad were analysed for moisture, fat, ash, protein and total carbohydrate by AOAC (1995,2005) and Ranganna method (1986).

Table 4. Proximate analysis of Buckwheat Papad

Parameter	Moisture (percent)	Ash (percent)	Fat (percent)	Protein (percent)	Carbohydrate (g)
	5.14	6.8	4.5	4.2	81.3

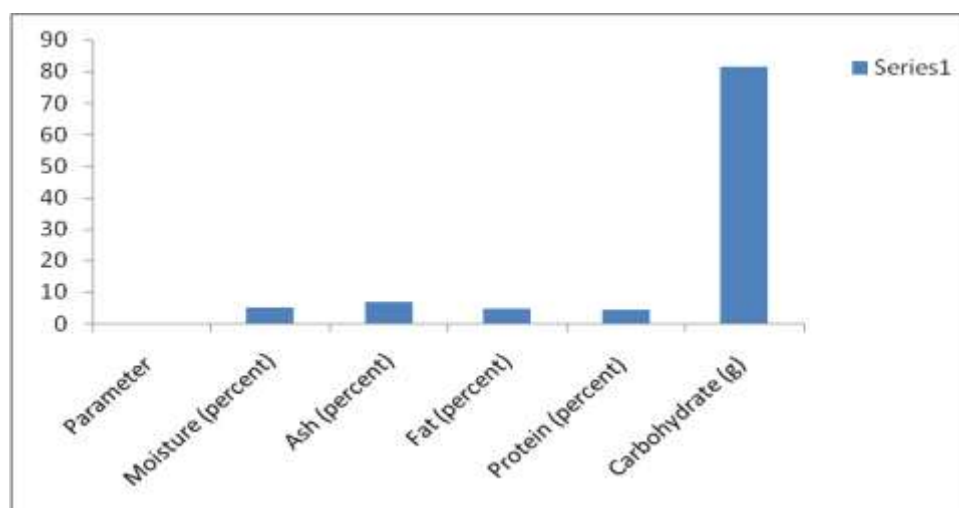
Moisture content: The moisture content of papad was 5.14 percent (Table 4).

Ash content: The Buckwheat papad contained high percentage of ash i.e. 6.8 (Table 4).

Fat content: The Buckwheat papad contained fat in percentage of 4.5 (Table 4).

Protein content: The protein content of papad was 4.2 percent (Table 4).

Carbohydrate content: The Buckwheat papad contained carbohydrate in gram of 81.3 (Table 4).

**Fig.8. Proximate analysis of Buckwheat Papad**

Physico-chemical properties of Papad:

The Physico-chemical properties of the papad are given in Table 5. The diameter of papad was 7.5 cm. regarding the weight 3.98g was obtained. Regarding kneading time for Buckwheat papad, the time was 20 minutes. The diameter of

dry papad changed individually depending upon the shrinkage occurred in papad. About the time taken for frying, the maximum time was 8 seconds. The diameter of fried papad was about 6.5 cm and weight was 1.86g.

Criteria	Diameter of wet papad(cm)	Weight of wet papad(g)	Kneading time (min.)	Diameter of dry papad(g)	Weight of dry papad(g)	Cooking time(sec) of papad	Diameter of fried papad(cm)	Weight of fried papad(g)
	7.5	3.98	20	6.4	1.80	8	6.5	1.86

Table.5. Physico-chemical properties of Papad**Sensory Evaluation score of Prepared Papad:**

The Appearance, Texture, Taste, and Flavor scores varied from 7.35 to 7.8 indicating that the Buckwheat papad was acceptable. The mean acceptability of papad was 7.61 which was more than acceptability level 5. The acceptability

parameter was checked by 10-untrained sensory panelist member followed by 9-point hedonic scale. And the data were analyzed. The sensory score card obtained by sensory evaluation of buckwheat papad are in table 6.

parameter	Color	Texture	Flavor	Taste	Overall acceptability
	7.6	7.8	7.35	7.7	7.61

Table.6. Sensory evaluation scores of Papad

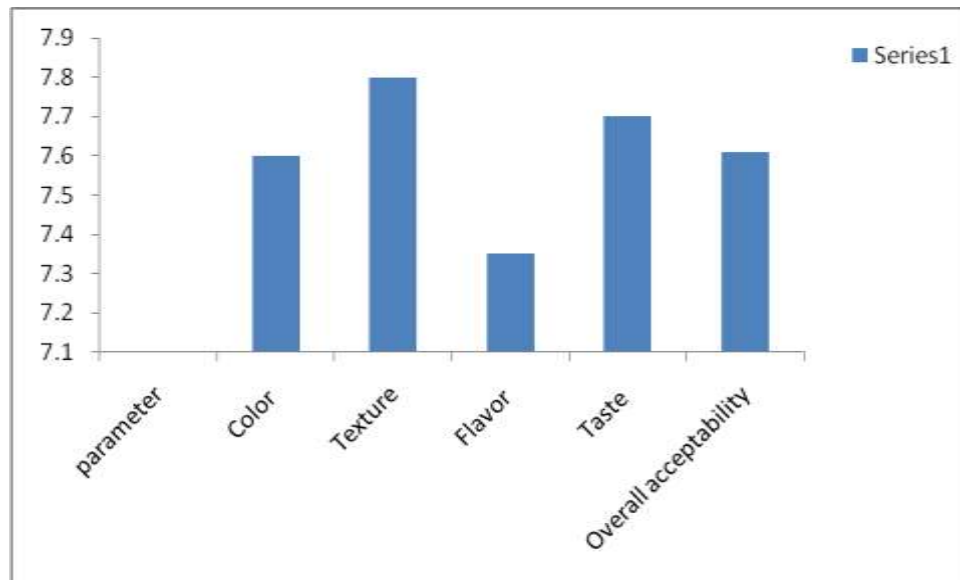


Fig.9. Sensory graph of Buckwheat Papad

Storage studies of Dried Buckwheat Papad:

The shelf of the processed papad was studied for a period of 1 month at ambient condition (room temperature). No remarkable change in moisture content, texture, and flavor

were observed up to 1 month of storage (Table 7). The papad sample was shelf –stable up to 5 months of storage at ambient conditions.

Period of storage (days)	Papad	Moisture content (percent)	Observation texture	Flavor	Remarks
0	Papad	5.14	Crisp	Good	Good
10	Papad	5.19	Crisp	Good	Good
20	Papad	5.09	Crisp	Good	Good
30	Papad	5.07	Crisp	Good	Good

Table.7. The effect of Storage time on Physico-chemical properties of Buckwheat Papad**Microbial analysis of Papad:**

The Total Plate Count (TPC) was nil at initial stage of storage. The effect of storage on the quality of papad was assessed during period of 3 months with an interval 15 days (table 3). TPC was not observed up to 3 months of storage. Yeast and Mold count in different blended papad (control) was nil at initial stage of storage not recorded up 2 months of storage, while in the completion of 3 months of storage the count of Yeast and mold were 1.0×10^1 , 1.0×10^1 cfu/g, respectively (Table 8)

	Total plate count		Yeast & Mold count	
Treatment	Plain papad (control)	Buckwheat & potato papad	Plain papad (control)	Buckwheat and potato papad
0 days	0	0	0	0
15 days	0	0	0	0
30 days	0	0	0	0
45 days	0	0	0	0
60 days	0	0	0	0
75 days	0	0	1.0×10^1	1.0×10^1
90 days	0	0	1.0×10^1	1.0×10^1

Table.8. Microbial count in Papad during storage**4. CONCLUSION**

It is concluded that all the ingredients and variables like sun drying, level of guar gum & potato, Rock salt content, black pepper content, plays a significant role in obtaining buckwheat papad with high acceptability and consistent quality. The studies revealed that a good quality buckwheat papad could be prepared using 53.5 percent buckwheat, 38.5 percent potato, 4g guar gum, 4g Rock salt, and black pepper was added to impart the taste and flavor of papad. The time of frying papad may vary according to individual however, cooking for a shorter time would prevent from over-burnt flavor.

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