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Nutritional quality evaluation of Rice bean flour based *Papad*

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Abstract
The present investigation was undertaken with aim to assess the development, nutritional quality evaluation and shelf life of *papad* prepared from different blending proportions of black gram and rice bean flour. The different blending proportions of black gram and rice bean flour was 100:00, 75:25, 50:50, 25:75 and 00:100. The product was analyzed for major nutritional constituents viz. moisture, protein, fat, fiber, ash, carbohydrates, mineral contents and sensory evaluation (on the basis of 9 point hedonic scale). The products were evaluated at the beginning and at interval of three and six months for chemical and sensory evaluation in order to study the storage stability of the product. The moisture content of *papad* were ranged from 3.25 to 4.63, protein content 22.55 to 17.51, fat content 1.83 to 2.55, fiber content 2.51 to 4.87 and carbohydrates content was ranged from 64.16 to 66.26 per cent, respectively. The overall acceptability of the product was ranged between liked moderately to liked very much.

Keywords: Rice bean and Black gram flours, *Papad*, development, nutritional and sensory quality evaluation.

Introduction
In India, several seed legumes have been traditional supplement [either in the form of splits (Ghadge *et al*. 2008) [4] or whole legume] to staple cereals [cooked rice, chapattis and poories] (Kachroo 1970) [5]. India is one of the major pulse producing countries in the world. Pulses and beans form as essential protein supplement for the cereal based food. These are not only rich in protein content, but also contain substantial amount of other nutrients such as starch, vitamins and minerals (Lolas and Merkakis 1975) [7]. *Vigna umbellata* (Thunb.) Ohwi and Ohashi (Rice bean) is also known as climbing mountain bean, mambi bean, oriental bean and locally as Beziamah. The crop is mainly grown in Kharif season. It is a native of South East Asia and is cultivated by the tribals in various ethnic groups in the Eastern and North-Eastern regions of India. This crop is grown in the different parts of the world mainly in the hilly areas. Rice bean is cultivated in Kangra and Chamba district of Himachal Pradesh.
Rice bean is one of a less known and underutilized pulse crop but it is a good source of high quality protein, having amino acid profile, and contains more of several minerals than most other grain pulses. That makes it an especially good source of calcium, magnesium, potassium and iron. Promotion of this crop could play an important role in improving diet and food security of people. Several food items are prepared locally from rice bean. The seeds, which are the primary products, are usually taken as a soup or as a pulse (*dhal*) with rice. The grains from young pods are used as vegetable. Black gram (*Vigna mungo*) is important pulse crop belonging to the family Fabaceae. It contains 24 per cent dietary protein.
Snack foods have long been a part of diets both in developing and developed countries. *Papad* also known as *Appalam* is a popular snack item of India. A variety of *papads* are available in India, which are produced from a great diversity of ingredients. Usually, they are made either using only cereal flour or a combination of pulse flour with salt, spices, and some additives. The present studies were undertaken to find out the nutritive quality of *Papad* prepared from different blends of black gram and rice bean flours.

Material and Methods
Procurement of raw materials
Rice bean seeds were procured from the Department of Organic Agriculture, College of Agriculture, CSKHPKV, Palampur. Dry mature seeds of rice bean were converted into flour and were kept in airtight containers at room temperature for further use. Black gram flour, chemicals and other ingredients were procured from local market.

Moisture, protein, fat, fiber, ash and minerals contents of the *papad* were determined according to standard AOAC 2000 [1] methods. Crude protein content was calculated by multiplying Kjeldahl nitrogen by a factor of 6.25. Carbohydrates content was determined by NIN 1983 [8] method.

Papad

Ingredients

Black gram : Rice bean	Blends (Quantity for 1 Kg flour)				
	100:00	75:25	50:50	25:75	00:100
Ajwan (gm)	7	7	7	7	7
Cumin seeds (gm)	7	7	7	7	7
Sodium bicarbonate (gm)	3	3	3	3	3
Oil (ml)	40	40	40	40	40
Chilly powder (gm)	7	7	7	7	7
Salt (gm)	27	27	27	27	27
Water (ml)	575	550	500	550	525

Method

Sieve flour in the utensil and add all the ingredients except oil. Bind together to form very hard dough by adding water. After that, cover the dough with wet muslin cloth and keep aside for 2 hours at least. Apply little oil; knead the dough by hammering with a heavy pestle to make the dough softer. Make equal size of balls from dough. Roll out each ball on a rolling board in a circular movement. Apply oil if *papad* tends to stick on rolling board. Repeat with remaining balls. Dry in hot air drier at 60^0 C till constant weight is achieved. Pack the dried samples of *papad* in polythene and deep fried before serving. Figure 3.6 indicates the steps involved in preparation of *Papad*.

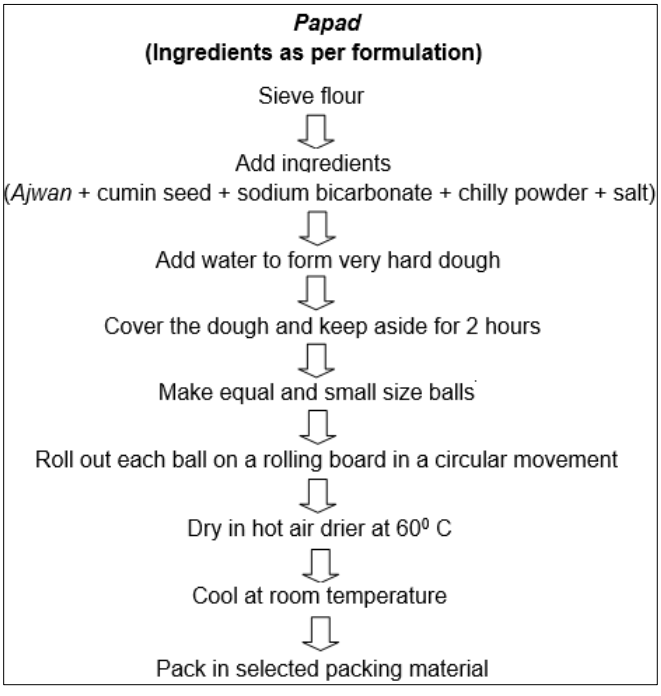

Fig 1: Steps involved in the preparation of *Papad*

Result and discussion

Table 1 depicts the effect of different blending proportions of black gram and rice bean flours and storage intervals on the proximate composition of *papad*. The moisture content of the pure black gram *papad* was 3.25 per cent which increased significantly to 3.54, 3.96, 4.22 and 4.63 per cent in *papad* prepared from 75:25, 50:50, 25:75 and 00:100 blending proportions of black gram and rice bean flours, respectively. With the storage interval, the mean moisture content of *papad* ranged between 2.93 to 5.26 per cent. Deepa *et al*. (1992) [2] while studied on 'Effect of addition of soy flour on the quality characteristics of black gram (*Phaseolus mungo* L.) *Papad*' reported that the moisture content of *papad* prepared from black gram flour was 2.50 per cent while Garg and Dahiya (2003) [3] observed that 9.12 per cent moisture content in *papad* prepared from mung flour. The values are in close agreement with the present results. The variation of moisture content of product could be directly related to the water vapour transmission rate of packaging material.

The data pertaining to the protein content of the *papad* blended with black gram and rice bean flours are presented in Table 1. With blending, the mean protein content decreased significantly from 22.55 to 17.51 per cent with increased the proportion of rice bean flour in *papad*. The initial mean value of protein content of rice bean based *papad* was 20.18 per cent which significantly decreased to 19.96 per cent after 3 months and further 19.79 per cent after 6 months of storage intervals, respectively. Deepa *et al*. (1992) [2] found that the value of protein content of *papad* prepared from black gram flour was recorded as 25.71 per cent while Garg and Dahiya (2003) [3] reported that the protein content of *papad* prepared from mung flour was 18.81 per cent. The value is in close agreement with the present results. The decreased in protein content of the product during storage might be due to accelerate the proteolytic activity as similar results have been reported by Leelavathi *et al*. (1984) [6].

Table 1: Nutritional quality of *Papad* as affected by addition of Rice bean flour and storage intervals

Parameters/Blending Bengal gram : Rice bean	Storage Intervals			Mean
	Fresh	3 Months	6 Months	
Moisture				
100 : 00	2.28	2.96	4.50	3.25
75 : 25	2.53	3.12	4.98	3.54
50 : 50	2.95	3.61	5.31	3.96
25 : 75	3.28	3.85	5.52	4.22
00 : 100	3.61	4.32	5.97	4.63
Mean	2.93	3.57	5.26	3.92
Protein				
100 : 00	22.97	22.53	22.14	22.55
75 : 25	21.83	21.65	21.82	21.77
50 : 50	20.12	19.93	19.16	19.74
25 : 75	18.44	18.20	18.32	18.32
00 : 100	17.55	17.49	17.49	17.51
Mean	20.18	19.96	19.79	19.98
Fat				
100 : 00	2.13	1.90	1.46	1.83
75 : 25	2.31	2.12	1.52	1.98
50 : 50	2.48	2.21	1.86	2.18
25 : 75	2.68	2.37	2.01	2.35
00 : 100	2.82	2.53	2.29	2.55
Mean	2.48	2.23	1.83	2.18
Fiber				
100 : 00	2.65	2.50	2.37	2.51
75 : 25	2.89	2.79	2.72	2.80
50 : 50	3.57	3.47	3.34	3.46
25 : 75	4.29	4.23	4.10	4.21
00 : 100	4.92	4.90	4.80	4.87
Mean	3.66	3.58	3.47	3.57
CD (P ≤ 0.05)	**Moisture**	**Protein**	**Fat**	**Fiber**
Blends (A)	0.02	0.15	0.02	0.02
Storage intervals (B)	0.01	0.11	0.02	0.02
AXB	0.03	0.25	0.03	0.04

The mean values of the fat content of *papad* prepared from different blending proportions of black gram and rice bean flour. With blending, the maximum fat content was observed in pure rice bean flour *papad* was (2.55%) followed by 2.35, 2.18, 1.98 and 1.83 per cent in 25, 50, 75 and 100 parts of black gram flour in *papad*, respectively. The mean fat content of *papad* was 2.48 per cent which decreased significantly to 2.23 and 1.83 per cent after 3 and 6 months of storage intervals, respectively. The results are in conformity with the results reported by Deepa *et al*. (1992) [2], as they observed that the fat content of *papad* prepared from black gram flour was 4.80 per cent. Garg and Dahiya (2003) [3] found that the value of fat content of *papad* prepared from mung flour was 2.13 per cent. The main reason of decreasing fat content was due to oxidation of fat into free fatty acids simultaneously with the time of storage. As reported by Shukla *et al*. (2013) [9].

Table 1 represents the fiber content of *papad* prepared from different blending proportions of black gram and rice bean flours and stored for 6 months of storage intervals. The maximum fiber content (4.87%) was recorded as in *papad* prepared with 100 per cent rice bean flour whereas minimum content (2.51%) was observed in pure black gram flour based *papad*. The mean fiber content of *papad* was 3.66 per cent which decreased significantly to 3.58 and 3.47 per cent with increased 3 and 6 months of storage intervals, respectively. The results of the study are in conformity with the results reported by Garg and Dahiya (2003) [3]. As Garg and Dahiya (2003) [3] reported that the value of fiber content of *papad* prepared by mung flour was recorded as 1.91 per cent.

The data pertaining to the ash content of *papad* prepared with blends of black gram and rice bean flour are presented in Table 2. With blending, the mean ash content decreased significantly from 8.96 to 8.81 per cent with increased the proportion of rice bean flour in black gram flour proportions of *papad*. The initial mean value of ash content of *papad* was 8.91 per cent which significantly decreased to 8.88 per cent after 6 months of storage interval. The results obtained are in close agreement with Deepa *et al*. (1992) [2] as they observed that the ash content of *papad* prepared by black gram flour was recorded as 8.50 per cent while Garg and Dahiya (2003) [3] reported the ash content of the *papad* prepared from mung flour was 10.78 per cent.

Table 2: Ash and Total Carbohydrates contents of *Boondi* as affected by addition of Rice bean flour and storage intervals

Parameters/Blending Bengal gram : Rice bean	Storage Intervals			Mean
	Fresh	3 Months	6 Months	
Ash				
100 : 00	8.98	8.96	8.94	8.96
75 : 25	8.93	8.88	8.94	8.92
50 : 50	8.90	8.83	8.86	8.86
25 : 75	8.88	8.75	8.84	8.82
00 : 100	8.84	8.78	8.82	8.81
Mean	8.91	8.84	8.88	8.87
Total Carbohydrates				
100 : 00	63.26	64.11	65.09	64.16
75 : 25	64.04	64.56	65.01	64.54
50 : 50	64.93	65.56	66.78	65.76
25 : 75	65.71	66.44	66.73	66.29
00 : 100	65.87	66.30	66.60	66.26
Mean	64.76	65.40	66.04	65.40
CD (P ≤ 0.05)	**Blends (A)**	**Storage intervals (B)**	**AXB**	
Ash	0.02	0.02	0.03	
Carbohydrates	0.17	0.13	0.29	

Table 2 illustrates the value of the total carbohydrates content of *papad* prepared from different blending proportions of black gram and rice bean flours and stored for 6 months of storage interval. The maximum total carbohydrates content (66.29%) was recorded in *papad* prepared from 25 per cent parts of black gram flour and 75 per cent proportion of rice bean flour whereas minimum content (64.16%) was observed in pure black gram flour *papad*. The mean total carbohydrates content of *papad* was 64.76 per cent which increased significantly to 65.40 and 66.04 per cent after 3 and 6 months of storage intervals, respectively. Deepa *et al*. (1992) [2] found that the value of carbohydrate content of *papad* prepared from black gram flour was recorded as 57.49 per cent while Garg and Dahiya (2003) [3] reported that the carbohydrate content of *papad* prepared from mung flour was 56.23 per cent. The value is in close agreement with the present results.

Mineral contents

The data pertaining to the mineral content of the rice bean based *papad* blended with black gram and rice bean flours are presented in Table 3. The iron content of pure black gram based *papad* was 5.12 mg/100gm and 100 parts of rice bean flour based *papad* was 2.49 mg/100gm. The mean calcium and zinc content of rice bean based *papad* was recorded as 62.35 and 4.13 mg/100gm, respectively. The maximum calcium content was observed in 100 parts of black gram flour based *papad* (68.02 mg/100gm) and minimum in *papad* prepared from pure rice bean flour was 57.22 mg/100gm.

Table 3: Minerals content (mg/100g) of *Papad* as affected by addition of Rice bean flour and storage intervals

Blending Black gram :Rice bean	Minerals		
	Calcium	Iron	Zinc
100 : 00	68.02	5.12	3.50
75 : 25	65.15	4.45	3.80
50 : 50	62.27	3.80	4.13
25 : 75	59.09	3.13	4.45
00 : 100	57.22	2.49	4.76
Mean	62.35	3.80	4.13
CD (P ≤ 0.05)	3.68	0.03	0.04

The results obtained are in close agreement with Garg and Dahiya (2003) found that the value of calcium, iron and zinc content of *papad* prepared by mung flour was recorded as 68.11, 5.12 and 3.52 mg/100 gm, respectively.

Sensory quality

Table 4 represents the sensory quality of *papad* prepared from different blending proportions of black gram and rice bean flours and evaluated for organoleptic evaluation by using 9 point hedonic scale at different storage intervals. The colour scores of pure black gram flour based *papad* was 7.29 which significantly decreased to 6.81, 6.43, 5.90 and 5.70 after addition of 25, 50, 75 and 100 parts of rice bean flour in *papad*. In respect of storage interval, the mean colour score for all the blends was 6.96 which slightly decreased to 6.46 and 5.86 after 3 and 6 months of storage intervals, respectively. A perusal of the data revealed that the colour scores decreased significantly with increased storage period. The colour scores are ranged between liked slightly to liked moderately. Similar findings have been reported by Deepa *et al*. (1992) [2] and Garg and Dahiya (2003) [3].

Table 4: Sensory scores (on the basis of 9.0) of *Boondi* as affected by addition of Rice bean flour and storage intervals

Parameters/Blending Bengal gram : Rice bean	Storage Intervals			Mean
	Fresh	3 Months	6 Months	
Colour				
100 : 00	8.18	7.25	6.45	7.29
75 : 25	7.25	6.80	6.38	6.81
50 : 50	6.85	6.55	5.90	6.43
25 : 75	6.28	5.90	5.53	5.90
00 : 100	6.25	5.80	5.05	5.70
Mean	6.96	6.46	5.86	6.43
Flavor				
100 : 00	7.60	6.88	5.98	6.82
75 : 25	7.48	6.50	6.05	6.68
50 : 50	6.73	5.95	5.83	6.17
25 : 75	6.70	6.33	5.43	6.15
00 : 100	6.60	6.05	5.38	6.01
Mean	7.02	6.34	5.73	6.37
Taste				
100 : 00	7.60	6.63	5.45	6.56
75 : 25	7.30	6.68	5.60	6.53
50 : 50	7.08	6.40	5.30	6.26
25 : 75	6.70	6.20	5.65	6.18
00 : 100	6.68	6.38	5.40	6.15
Mean	7.07	6.46	5.48	6.34
Texture				
100 : 00	7.50	6.58	5.40	6.49
75 : 25	6.83	5.80	5.48	6.03
50 : 50	6.48	5.90	5.18	5.85
25 : 75	6.05	5.78	5.13	5.65
00 : 100	5.93	5.35	5.13	5.47
Mean	6.56	5.88	5.26	5.90
CD (P ≤ 0.05)	**Colour**	**Flavor**	**Taste**	**Texture**
Blends (A)	0.36	0.30	0.32	0.32
Storage intervals (B)	0.28	0.24	0.25	0.25
AXB	0.62	0.53	0.55	0.56

The flavor scores for *papad* were higher in *papad* prepared from pure black gram flour was (6.82) which followed by *papad* prepared by using 75, 50 and 25 parts of black gram flour with recorded scores as 6.68, 6.17 and 6.15 (on the hedonic scale of 9.0), respectively. The least flavor scores were observed in *papad* prepared by using 100 parts of rice bean flour was (6.01). Irrespective of the blends, the mean flavor scores of freshly prepared *papad* was 7.02 which significantly decreased to 6.34 and 5.73 after 3 and 6 months of storage intervals, respectively. With storage, the flavor scores decreased with increased in storage duration. The decreased in flavor scores might be due to developed rancid flavor in *papad*. Similar observations have been reported by Deepa *et al*. (1992) [2], Garg and Dahiya (2003) [3] and Shukla *et al*. (2013) [9].

The taste scores reported highest in *papad* prepared from pure black gram flour was (6.56) whereas least scores for taste were observed in pure rice bean flour based *papad* (6.15) (Table 4). With storage, the mean taste scores was observed as 7.07 in freshly prepared *papad* which decreased to 5.48 (on the hedonic scale of 9.0) after 6 months of storage interval. Although the taste scores decreased with increased in storage duration yet this decreased might be due to developed rancid flavor in product. Deepa *et al*. (1992) [2], Garg and Dahiya (2003) [3] and Shukla *et al*. (2013) [9] reported similar findings.

The texture scores of *papad* prepared by using 100 parts of black gram flour was recorded maximum (6.49) (Table 4). The texture scores of *papad* prepared with black gram flour was 6.49 which decreased significantly to 6.03, 5.85, 5.65 and 5.47 (on the hedonic scale of 9.0) with addition of 25, 50, 75 and 100 parts of rice bean flour, respectively in *papad*. With storage, the mean texture scores of freshly analyzed *papad* decreased significantly from 6.56 to 5.26 after 6 months of storage interval. The decreased in texture scores during storage may be due to increased in moisture with increasing storage period which are ultimately responsible for decreased texture. Deepa *et al*. (1992) [2], Garg and Dahiya (2003) [3] and Shukla *et al*. (2013) [9] were also reported similar observations.

Fig 2 showed the overall acceptability scores of rice bean based *papad*, the mean values for all the blends ranged from 6.79 to 5.83 for 100:00 to 00:100 proportions of black gram and rice bean flours in *papad*. However, with storage the mean overall acceptability scores of the product was recorded as 6.90 which decreased to 6.28 and 5.58 after storage intervals of 3 and 6 months, respectively. The overall acceptability scores were significantly lower when compared with fresh. Similar decrease in sensory scores during storage scores have been observed by Deepa *et al*. (1992) [2], Garg and Dahiya (2003) [3] and Shukla *et al*. (2013) [9].

Conclusion

The rice bean based *papad* prepared in the present study have improved nutritional profile and acceptable storage stability in relation to overall acceptability of the products. Storage studies revealed that *papad* can be stored safely for six months, at ambient temperature without much change in chemical and sensory characteristics. The standardized/ developed rice bean based product has great potential for household food security and add variety to diet for better nutrition. The improved/ developed formulations can be popularized for preparation of products with added advantages and meaningful utilization of rice bean in specialty products at cottage industry.

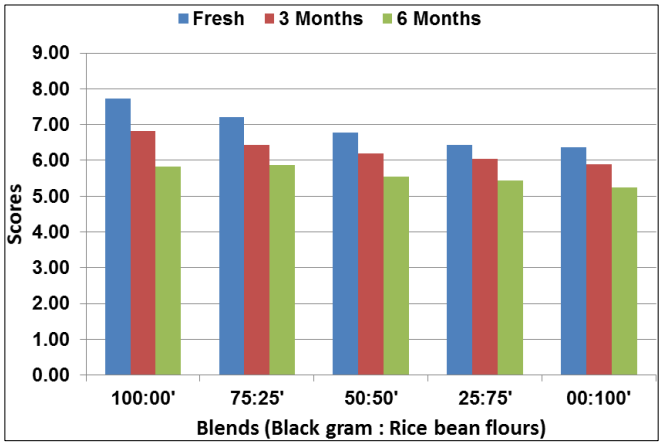

Fig 2: Effect of blending and storage on the overall acceptability scores (on the basis of 9.0) of *Papad* prepared from blends of Black gram: Rice bean flours

References

1. AOAC. Approved methods of Association of Official Analytical Chemists. 7th Edition Saint Paul, Minnesotea, U.S.A, 2000, 345p.
2. Deepa CR, Urooj A, Puttaraj S. Effect of addition of soy flour on the quality characteristics of blackgram (*Phaseolus mung L.*) *papad*. Journal of Food Science and Technology. 1992; 29(6):385-387.
3. Garg R, Dahiya S. Nutritional evaluation and shelf life studies of *Papads* prepared from Wheat-Legume composite flours. Plant Foods for Human Nutrition. 2003; 58:299-307.

4. Ghadge PN, Vairagar PR, Prasad K. Physical Properties of Chick Pea Split (*Cicerarietinum* L.). Agricultural Engineering International: the CIGR Ejournal. Manuscript FP. 2008; (10):07-039.
5. Kachroo P. Pulse Crops of India, ICAR, New Delhi, 1970.
6. Leelavathi KP, Haridas RD, Indrani, Shurpalekar SR. Physico-chemical changes in whole wheat flour (*Atta*) and resultant *atta* during storage. Journal of Food Science and Technology. 1984; 21:68-71.
7. Lolas GM, Merkasis P. Phytic acid and other phosphorous compounds of bean (*Phaseolous vulgaris* L.). Journal of Agricultural and Food Chemistry. 1975; 23(1):13-15.
8. NIN. A manual of laboratory techniques, National Institute of Nutrition, Hyderabad, 1983.
9. Shukla S, Jain J, Genitha TR Tirkey VRP. Studies on development, quality evaluation and packaging materials on the storage stability of snack food (*Sev*). International Journal of Agriculture and Food Science Technology. 2013; 4(6):515-522.