



## NUTRITIONAL ASPECTS OF KODO FORTIFIED PAPAD

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### ABSTRACT

The main purpose for performing this work is due to lack of standards for minor millets which have a high nutritional value. Minor millet fortified papad is a rich source of protein, fibers, minerals and highly energetic snacks consumed and liked by everyone. Therefore the present study was made on Nutritional attributes like moisture, proteins carbohydrate, ash values and fiber. The quality of papad made from blends containing kodo, soya bean, sago, green gram and rice was as good as prepared from soya fortified millet papad. However the quality deteriorates slightly in papad prepared from blends up to limit of more than 20 percent.

Keywords- Papad, Proximate analysis, Excipients, Kodo, Sago.

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Evolutions in food during changing times have amply reflected the culture and social economics situation of different periods. Diversity has been the hallmark of Indian food. India has a wealth of traditional food created over a millennium by over five hundred culture.

Papad is a one of the popular tasty food item in the Indian diet. Since many centuries combination of pulses cereals vegetables salad and food used of preparation of papad varies from one region to another depending of the preferences of the local people

Market for papad is steadily growing across the country there are a couple of national brand available but market is predominantly control by the local brands papad prepared from black gram is very famous. India exported this brand of worth Rs 64 million but there is a great scope for manufacturing of papad fortified with kodo supplemented of rice green gram sago and soybean .This paper discusses the nutritional quality of papad prepared from various blends from rice green gram sago and soybean.

### Material and Method

Grains of Kodo, rice, green gram, soybean and sago were taken as the materials for conducting various experiments in this investigation. The methods used for preparation of full fat soy flour from soybean, kodo flour from kodo, rice flour from rice and green gram flour from green gram. Different combination of preparation of kodo millet based papad in different combination of rice flour green gram flour sago flour and full fat soya flour were tested. There are following treatment-

Kodo: Rice (100:00, 80:20, 60:40, 40:60, 20:80, 0:100)

Kodo: Sago (100:00, 80:20, 60:40, 40:60, 20:80, 0:100)

Kodo: green gram (100:00, 95:5, 90:10, 85:15, 80:20, 0:100)

Kodo: full fat soya (100:00, 95:5, 90:10, 85:15, 80:20, 0:100)

Kodo, green gram, rice, soya bean and sago were purchased from the local market then after cleaning the grains manually for milling purpose then sieving from various meshes. Weighing the flour blends and addition of excipients (like salt, cumin) and water. Mixing the material then cooked till gelatinization. Spread the material on oil smeared polyethylene sheet finally sun dried till 10-13% moisture content.

The packaging materials namely Low density polyethylene (LDPE), air tight plastic boxes and air tight steel container were purchased from the local market. Three replication of each sample were packed sealed and exposed to the ambient conditions at the room temperature for subsequent evolution during investigation.

**Table 1. Proximate analysis Kodo based papad**

S. No.	Treatments	Combinations	Proximate parameters (%)						
			MC	Protein	Fat	Ash	Carbohydrate	Fiber	EV (Kcal)
Kodo based papad	KR <sub>3</sub>	40 : 60	11.45	8.7	1.87	<b>1.16</b>	70.33	3.80	333.02
	KS <sub>2</sub>	60 : 40	<b>12.2</b>	9.13	1.9	1.78	71.37	4.46	339.38
	KG <sub>3</sub>	85 : 15	<b>11.12</b>	10.06	1.4	1.76	63.39	7.3	<b>306.36</b>
	KSO <sub>2</sub>	90 : 10	11.5	<b>11.98</b>	3.03	<b>3.05</b>	<b>59.87</b>	3.7	315.53
	SEm±	-	0.195	NS	0.12 7	0.046	0.177	0.095	0.151
CD at 5%	-	0.56	0.14	0.36 9	0.133	0.513	0.275	0.437	
KSO <sub>2</sub> = Kodo + Soybean (90:10)			KG <sub>2</sub> = Kodo + Green gram (90:10)						
KS <sub>3</sub> = Kodo + Sago (40:60)			KR <sub>3</sub> = Kodo + Rice (40:60)						

**Table 2. Sensory attributes of rice fortified papad**

Treatments	Appearance & color	Aroma	Texture	Taste	Overall acceptability
KR <sub>0</sub>	6.5	7.0	<b>6.0</b>	6.5	6.5
KR <sub>1</sub>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>
KR <sub>2</sub>	7.5	<b>6.0</b>	8.0	7.0	7.2
KR <sub>3</sub>	<b>8.5</b>	<b>8.0</b>	<b>9.0</b>	8.0	<b>8.4</b>
KR <sub>4</sub>	8.0	7.5	8.0	<b>8.0</b>	7.9
KR <sub>5</sub>	7.0	<b>6.0</b>	6.5	7.0	6.7
KR <sub>0</sub> = Kodo control (100:0)			KR <sub>1</sub> = Kodo + Rice (80:20)		
KR <sub>2</sub> = Kodo + Rice (60:40)			KR <sub>3</sub> = Kodo + Rice (40:60)		
KR <sub>4</sub> = Kodo + Rice (20:80)			KR <sub>5</sub> = Kodo + Rice (0:100)		

Table 3. Sensory analysis of sago fortified kodo papad

Treatments	Appearance & colour	Aroma	Texture	Taste	Overall acceptability
KS <sub>0</sub>	6.9	6.4	6.3	6.0	6.4
KS <sub>1</sub>	6.0	7.0	7.2	6.4	6.7
KS <sub>2</sub>	7.4	7.6	7.5	8.0	7.7
KS <sub>3</sub>	6.0	5.9	6.8	7.5	6.6
KS <sub>4</sub>	7.0	7.0	6.0	6.0	6.5
KS <sub>5</sub>	6.0	6.0	6.0	6.0	6.0

KS<sub>0</sub> = Kodo control (100:0)KS<sub>1</sub> = Kodo + Sago (80:20)KS<sub>2</sub> = Kodo + Sago (60:40)KS<sub>3</sub> = Kodo + Sago (40:60)KS<sub>4</sub> = Kodo + Sago (20:80)KS<sub>5</sub> = Kodo + Sago (0:100)

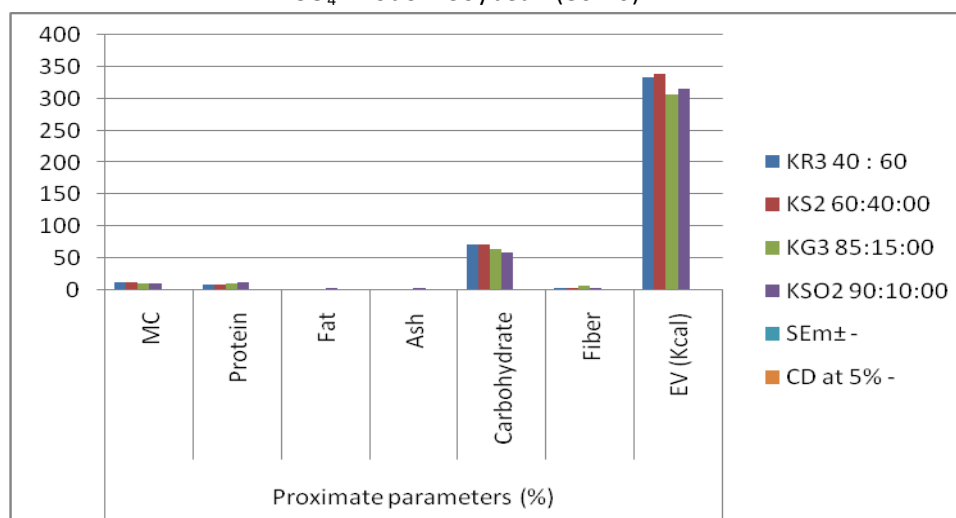
Table 4. Sensory attributes of green gram fortified kodo papad

Treatments	Appearance & colour	Aroma	Texture	Taste	Overall acceptability
KG <sub>0</sub>	6.0	6.0	7.0	6.0	6.3
KG <sub>1</sub>	6.5	6.4	6.5	6.8	6.6
KG <sub>2</sub>	7.0	7.0	6.0	6.0	6.5
KG <sub>3</sub>	7.5	7.4	8.0	7.5	7.6
KG <sub>4</sub>	6.9	6.8	6.5	7.0	6.8

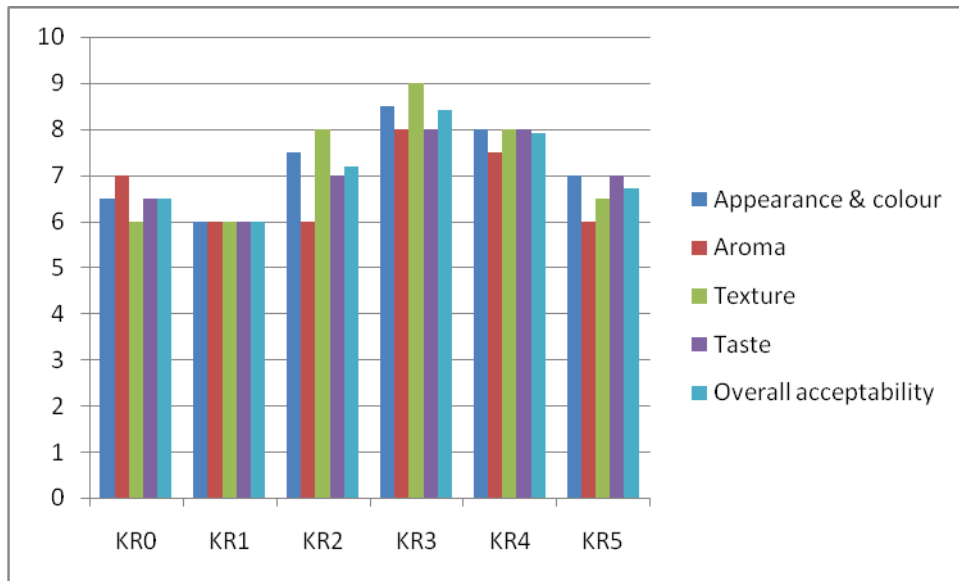
KG<sub>0</sub> = Kodo control (100:0)KG<sub>1</sub> = Kodo + Green gram (95:5)KG<sub>2</sub> = Kodo + Green gram (90:10)KG<sub>3</sub> = Kodo + Green gram (85:15)KG<sub>4</sub> = Kodo + Green gram (80:20)

Table 5. Sensory attributes of soybean fortified kodo papad

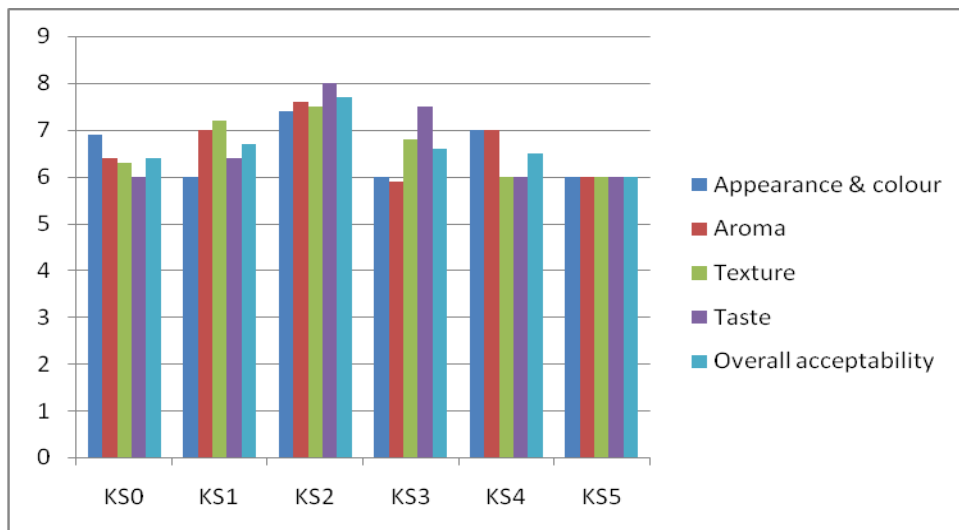
Treatments	Appearance & colour	Aroma	Texture	Taste	Overall acceptability
KSO <sub>0</sub>	7.4	7.0	7.0	7.2	7.2
KSO <sub>1</sub>	6.9	7.2	7.2	7.0	7.1
KSO <sub>2</sub>	8.0	9.0	8.9	8.5	8.6
KSO <sub>3</sub>	8.1	8.5	8.0	7.9	8.2
KSO <sub>4</sub>	7.2	7.7	7.5	7.5	7.3

KSO<sub>0</sub> = Kodo control (100:0)KSO<sub>1</sub> = Kodo + Soybean (95:5)KSO<sub>2</sub> = Kodo + Soybean (90:10)KSO<sub>3</sub> = Kodo + Soybean (85:15)KSO<sub>4</sub> = Kodo + Soybean (80:20)

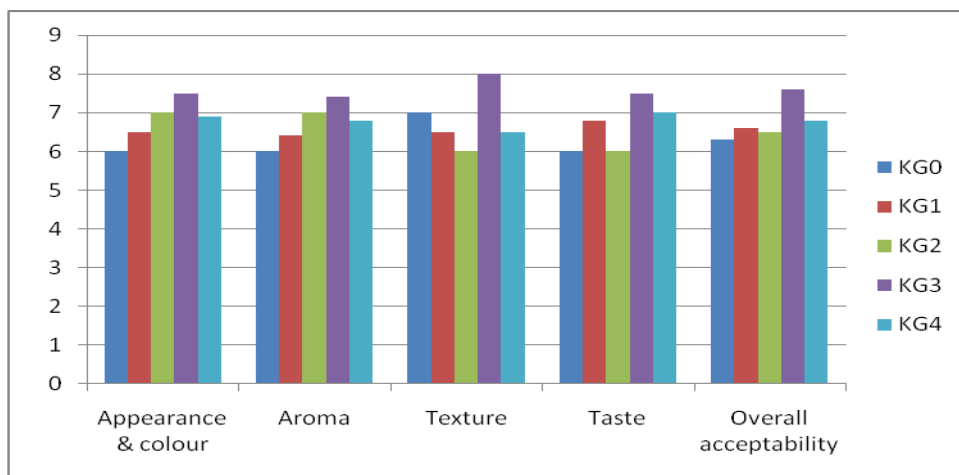
Proximate analysis Kodo based papad



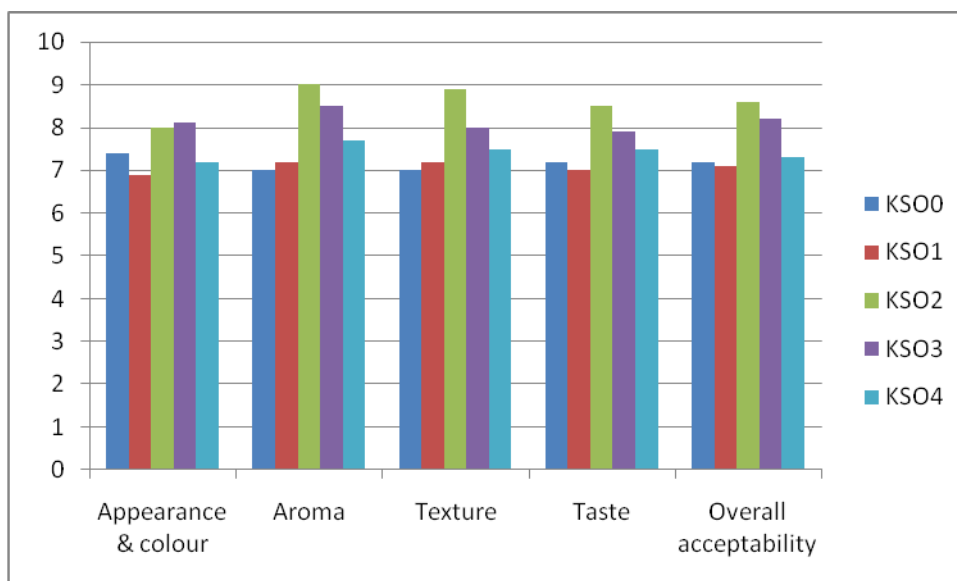
Sensory attributes of rice fortified papad



Sensory analysis of sago fortified kodo papad



Sensory attributes of green gram fortified kodo papad



**Sensory attributes of soybean fortified kodo papad**

The proximate analysis (Moisture content, crude protein, carbohydrates, ash, crude fiber and crude fat) in different samples was estimated as per the procedure given by A.O.A.C 1980 and 1995. Mineral contents of papad were obtained by calculation using table values.

Different types of blend papad were developed from cereals minor millets and pulses flour and subjected to sensory test on 9 point hedonic scale from the sensory mean scores and the comments of the panel list best combinations were selected kodo : rice (40:60) kodo :sago (60:40), kodo : green gram (85:15), kodo: soya bean (90:10). The moisture content of four samples varies from 11.12-12.2%, protein 8.72-11.98%, fat 1.4-3.03%, ash 1.16-3.05%, and carbohydrates 59.87-71.37 % fiber 3.7-7.3 %.

Moisture content decreased with formulation of various pulses grits. This might be due to fortification of grains in minor millet. A sharp increase in fat content was observed with the addition of the soya flour in papad. This might be due to high content of oil. Maximum ash content was found in KSO<sub>2</sub>, whereas minimum was found in rice fortified kodo based papad. This might be due to supplementation of soya flour in fortified papad.

Results showed that carbohydrate content was significantly differing in all fortified papad. Carbohydrate Content was decreased with supplementation of soya bean and green gram flours in all fortified papad. These findings might be due to incorporation of sago and pulses which are rich source of fiber. The supplementation of green gram and soybean flour increased the calcium content in all papad. This might be due to rich source of calcium in those flours Phosphorus content increased with the supplementation of soya and green gram flour in all fortified papad. Supplementation of soya flours had increased the iron content in fortified papad. This might be due to the incorporation of rich source of iron content flours.

On the basis of findings it was concluded that soya fortified papad could be considered the best from nutritional point of view, whereas overall acceptability point of view rice fortified papad could be considered the best. Fortification of soya and green gram flours increased the amount of fibers, calcium, phosphorus and iron in fortified papad.

Hence it was concluded that low cost high protein energy fortified papad could be developed. Efforts should also be made to suggest for transfer this technique to house hold women for cottage level. It is, therefore, recommended that inclusion of such papad in supplementary feeding programmes like ICDS would certainly help in improving the nutritional status of masses.

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