

UTILIZATION OF COWPEA IN THE PREPARATION OF PAPAD¹

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ABSTRACT

Physicochemical and sensory characteristics of cowpea papads were determined and compared with the blackgram papads. Dough making, rolling properties and physical appearance were similar in both the papads. Cowpea papads were rated to be highly acceptable by both trained and untrained panels. Proximate composition of all the papads was similar. Varietal differences of cowpea did not affect the quality characteristics of the papads. The results reveal that cowpea flour has all the desirable functional properties for making papads; hence cowpea flour makes an excellent raw material for the papad industry.

INTRODUCTION

Papads have been a popular food adjunct in the Indian diet and are consumed throughout the country by large groups of people. After frying or roasting, the papads are served alone or along with entrees. Papad is essentially a thin wafer-like product, dried, circular in shape and normally made from pulse/cereal flour with spices and alkaline or mucilaginous additives (Saxena *et al.* 1989). Traditionally, papads are prepared from blackgram or green gram flour. ISI specifications for quality attributes of these papads are available (Indian Standard Institution 1972).

Recently, the use of lesser known and cheaper pulses for the preparation of papads is being explored (Shurpalekar and Venkatesh 1975). Cowpea is one such

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important pulse, the food uses of which are receiving considerable attention (Okaka and Potter 1977; McWatter 1983; Mustafa *et al.* 1986). Nutritionally, cowpea is similar to other pulses having a protein content of 20–25%. It is also reported to have hydration properties that are desirable in a dried product and are superior even to soy flour (Okaka and Potter 1979).

The study reported here was undertaken to explore the possible utilization of cowpea flour in the preparation of papads.

MATERIALS AND METHODS

Two varieties (white and red) of cowpea seeds (*Vigna catjung* and *Vigna sinensis*) and blackgram (*Phaseolus mungo*) were procured in bulk from the local market. The seeds were cleaned, dehulled, milled and the flour was passed through a 60 mesh sieve and stored in containers at room temperature (28°C) until used. Common salt, spices (cumin seeds, black pepper, asafoetida) and groundnut oil were purchased locally. Black pepper was coarsely ground in a laboratory mill. The alkaline additives (sodium carbonate and sodium bicarbonate) used were chemically pure (L. R. grade BDH).

Preparation of Papads

Preliminary experiments were conducted to determine optimum preparatory conditions based on the procedure adopted for the preparation of blackgram papad (Shurpalekar *et al.* 1972). One hundred grams of cowpea flour or blackgram flour was blended with spices (cumin seeds, 1.2 g; black pepper, 2.4 g; salt, 8 g; asafoetida, 0.2 g) and alkaline additives (2:1 mixture of sodium carbonate and bicarbonate, 1.0 g) and was kneaded manually for 7–8 min with water (40–45 mL) to give a homogenous dough. Groundnut oil (refined) 2–3 mL was added during kneading of the dough. After allowing 30 min for dough development, the mass was divided into small balls, weighing 10 g each and pressed into thin discs using a mechanical press (0.8 mm thickness and 12 cm diameter). Cowpea and blackgram papads were oven dried at 50°C to a desired moisture level (<6%) and packed in 120 gauge polypropylene bags until fried and evaluated for physical and sensory qualities.

Physicochemical Characteristics

Physical characteristics of the raw papads were assessed by ISI (1972) methods. Thickness of the papads was measured using a screw gauge. Moisture, protein ($N \times 6.25$) crude fat and total ash were determined by AOAC (1975) methods.

Sensory Evaluation

Raw papads fried in refined groundnut oil for 10–15 s ($190 \pm 5^\circ\text{C}$) were coded in random order and served to a trained panel of 10 members. In three preliminary trials they were exposed to a 10 point descriptive scoring procedure developed by Govindarajan *et al.* (1971) along with some specimen samples of differing grade and quality. After confirming panelists' consistency in repeat evaluations of the specimen samples, they scored the control and experimental samples for all the sensory attributes: color, appearance, texture, aroma, taste and overall quality. The data were analyzed by analysis of variance and means separated by Duncan's New Multiple Range Test (Harter 1960). Later, the sensory quality of cowpea papads was also evaluated by an untrained panel of 30 university students on a 9 point hedonic rating for the individual quality attributes and overall quality. The frequency data were analyzed by Chi square test (Siegel 1956).

Storage Studies

Raw papads stored for a period of three months in air tight plastic containers were also evaluated for physical and sensory characteristics by the methods described earlier.

RESULTS AND DISCUSSION

Proximate composition of cowpea/blackgram flour and papads is given in Table 1. Moisture content of the papads ranged from 2.5–5.5% and was within the limits recommended by ISI (1972) to avoid microbial spoilage. The values of protein, fat and ash were similar in all the papad samples.


Physical characteristics of dough and rolling properties are given in Table 2. In a papad dough, besides uniformly distributing the ingredients, water also determines dough plasticity essential for rolling. The optimum water requirement for the preparation of dough was similar in both cowpea and blackgram flour. Though all the doughs were soft to handfeel, the dough of cowpea flour was less elastic than that of blackgram dough. However, cohesiveness and rolling properties of both the doughs were similar. Varietal differences of cowpea did not affect the dough characteristics. The easy dough making and rolling characteristics of cowpea flour may be attributed to its high hydration properties. Okaka and Potter (1979) and Padmashree *et al.* (1987) have reported cowpea flour to possess excellent water absorption capacity. The physical characteristics of rolled papads are also given in Table 2. The color of the cowpea variety  papad was more appealing than that of blackgram papad. All the papads were uniform in thickness and the texture remained brittle to handfeel.

TABLE 1.
PROXIMATE COMPOSITION OF RAW FLOUR AND PAPADS OF COWPEA
AND BLACK GRAM*

Component (%)	Cowpea variety				Blackgram dhal	
	I		II		Flour	Papad
	Flour	Papad	Flour	Papad		
Moisture	4.50	2.50	5.00	3.00	5.50	2.50
Total ash	3.60	9.20	3.50	9.00	3.50	8.50
Protein (Nx6.25)	23.21	25.71	23.20	25.70	26.07	25.71
Fat	1.80	4.60	1.20	4.40	1.30	4.80
Carbohydrate (by difference)	66.89	57.99	67.10	57.90	63.63	58.49

All values are mean of two replicates.

*on dry basis.

I — *Vigna sinensis*; II — *Vigna catjung*.

All the papads after frying had acceptable color and an attractive appearance (Table 2). The quality of fried cowpea papads was considered very close to the control prepared from blackgram flour with respect to color (creamish yellow), aroma (spicy, balanced), texture (crisp and crunchy) and taste (spicy and balanced). There was no perceptible beany flavor. Expansion of cowpea papads after frying was 31% compared to 38% for papads prepared from blackgram.

The sensory quality ratings by the 10 trained panelists are given in Table 3. Cowpea papads were comparable in all the quality factors and showed significantly better appearance and aroma than the blackgram papads. Cowpea papads were rated by the untrained panelists to be highly acceptable, the frequencies falling in two categories of "like very much" and "like extremely." The frequency analysis by Chi square test (Table 4) showed that the cowpea papads of red variety were significantly better preferred in taste and after taste, and in all other quality factors, both white and red varieties were comparable. Quality ratings of all the papads remained similar even after three months of storage. Physical characteristics (color, shape, texture) or the raw papads remained unchanged during the storage period of three months. Sensory ratings of fried papads by the trained panelists also were similar to the earlier ratings.

From these observations, it may be concluded that cowpea flour could be successfully utilized in the preparation of papads.

TABLE 2.
DOUGH CHARACTERISTICS, ROLLING PROPERTIES AND QUALITY OF PAPADS
PREPARED FROM COWPEA AND BLACKGRAM FLOURS

Particulars	Cowpea variety		Blackgram flour
	I	II	
	Dough characteristics		
Water (mL)	40	45	47
Dough character	Moderately soft	Soft	Soft
Dough color	Golden yellow	Creamish yellow	Creamish yellow
Rolling property	Easy	Easy	Easy
	Fried papads		
Expansion (%)	31.5	31.5	38.0
Color	Golden yellow	Creamish yellow	Creamish yellow
Texture	Crisp & crunchy	Crisp & crunchy	Crisp & crunchy
Aroma	Spicy & balanced	Spicy & balanced	Spicy & balanced
Taste	"	"	"
Overall quality	Acceptable	Acceptable	Acceptable

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TABLE 3.
QUALITY MEAN RATINGS FOR FRIED PAPADS AS EVALUTED BY TRAINED PANELISTS

Quality attributes	Control (Blackgram dhal)	Cowpea		SE _m (18 df)
		I	II	
Color	8.2 ^a	9.2 ^a	8.8 ^a	± 0.49
Appearance	7.0 ^a	9.1 ^b	8.6 ^b	± 0.32
Texture	7.4 ^a	8.0 ^a	8.4 ^a	± 0.44
Aroma	7.2 ^a	9.0 ^b	8.6 ^{ab}	± 0.48
Taste	7.6 ^a	9.0 ^a	8.2 ^a	± 0.55
After-taste	7.6 ^a	8.8 ^a	7.2 ^a	± 0.56
Overall quality	7.8 ^a	9.2 ^a	9.0 ^a	± 0.50

SE_m(df) — Standard error of means (degrees of freedom).

Mean scores carrying different superscripts a, b, c in rows differ significantly (P < 0.05).

Scale: Excellent 10, 9; Good 8, 7; Fair 6.5, 4 and Poor 3, 2, 1 anchored by suitable grade description (Govindarajan *et al.* 1971).

TABLE 4.
CHI SQUARE VALUES (1 DEGREE OF FREEDOM)

Color	0.88 ^{NS}	White & Red comparable
Appearance	2.70 ^{NS}	"
Texture	2.58 ^{NS}	"
Aroma	3.59 ^{NS}	"
Taste	13.30**	Red significantly better
After-taste	15.15**	"
Overall quality	0.66 ^{NS}	White & Red comparable

NS — Not significant.

** — 0.05 (P < 0.01).

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