Physico-Chemical Properties of Premixes for Preparation of "Akara"

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ABSTRACT

Premix was formulated from cowpea flour, pepper powder and onion powder by mixing the ingredients together this was then packed. Proximate chemical composition and functional properties (water absorption capacity, solubility index, foaming capacity and foam stability) of the cowpea flour as affected by inclusion of other ingredients were determined. Inclusion of other ingredients separately and jointly in cowpea flour had significant effects on functional properties but little effect on proximate chemical compositions of cowpea flour. Foaming and water absorption capacities were decreased as a result of added ingredients. Akara prepared from pre-formulated premix prior to re-hydration into paste compared favourably with the control akara from freshly prepared cowpea paste but had texture rated lower and low overall acceptability.

Key Words: premix, ingredient, cowpea, akara, and functional property.

INTRODUCTION

Akara, a deep fat fried product, is traditionally obtained from whipped cowpea paste flavoured with pepper, onion and salt. Whipping of cowpea paste is usually done to incorporate air into the paste thus facilitate formation of stable foam (Ngoddy *et al.*, 1986; Hung and McWatters, 1990) just before inclusion of other ingredients. The traditional method of preparing fresh cowpea paste from cowpea seeds is labour intensive and time consuming (McWatters 1983; Ngoddy *et al.*, 1986). In addition to the cumbersome nature of the processing method, cowpea paste has short storage life especially when left under ambient conditions (Bulgarelli *et al.*, 1988; Hung and McWatters, 1990). In order to overcome problems associated with production and storage of fresh cowpea paste, several efforts have been put into production of ready to use cowpea flour (McWatters and Brentley, 1982; McWatters 1983, Ngoddy *et al.*, 1986; McWatters *et al.*, 1990; Olapade *et al.*, 2001). Cowpea flour is a product of soaking, dehulling, drying and milling of cowpea seeds (Olapade *et al.*, 2001). Premix is a form of convenience introduced in utilization of food items, whereby necessary ingredients are incorporated by the processor to reduce effort and time input by the end-users. The popularity of formulated convenience foods places greater emphasis on the reliability of functional properties of the ingredients (Onuoha *et al.*, 1983). Local food ingredients such as cowpea flour must be functionally reliable if they are to be accepted for use. Pour-El (1981) defined functionality as any property of a food or food ingredient other than the nutritional ones that affects its utilization. Akara produced from re-hydrated cowpea flour whipped before flavoured with fresh pepper and onion, and salt compared favourably with the traditional akara from fresh cowpea paste (Onuorah 1984; Olapade *et al.*, 2001). In our present work, it was considered necessary to incorporate pepper and onion powders to cowpea flour in form of prepackaged premix to further reduce time and effort that would be input by the end-user. The objective of this work was to investigate the effect of added ingredients on the proximate chemical compositions and functional properties of the cowpea flour, and the quality of akara.

MATERIALS AND METHODS

Cowpeas, pepper powder, onion powder, common salt (NaCl) and vegetable oil all were purchased from local markets within Lagos State.

Preparation of Cowpea Flour

Cowpeas were manually cleaned to remove impurity and soaked in water at room temperature (30°C) for 10min to soften the testa, which was manually removed and washed off. The cleaned cotyledons were dried in an air draught cabinet dryer at 65°C for 4hr and milled into flour using a hammer mill (Apex) to pass through a screen of 0.8mm opening.

Formulation of Premixes

200g cowpea flour (C) into four places were prepared, 5g pepper powder was added to one (CP), 5g onion powder was added to the second (CO), 5g each pepper and onion powder were jointly added to third sample (CPO). The mixtures were separately blended for 2min in a dry food blender (Moulinex), then packaged in polyethylene bags and stored under refrigeration (4°C) for further analysis.

Chemical Analyses

Proximate chemical compositions (moisture, fat, ash, crude fiber and crude protein [N x 6.25]) of the cowpea flour and premixes were determined according to the methods of AOAC (1984). Carbohydrate content was determined by difference. Iron, phosphorus and calcium content were determined using Atomic Absorption Spectrophotometer (Philips Scientific PU9100X, Great Britain).

Functional Properties:

Foaming capacity and foam stability were determined according to the method described by Narayana and Rao (1982) and water absorption capacity was determined as described by Sosulski (1962). Bulk-density was determined as described by Okaka and Potter (1979).

Preparation of Akara

Akara samples were prepared from the cowpea flour, premix and fresh cowpea paste. Premix (CPO) and cowpea flour were each re-hydrated with 300ml water, stirred manually using a plastic spatula, then whipped in a Kenwood food mixer at setting 6 for 4min. 8g table salt was added to each while paste of cowpea flour was flavoured with 20g fresh chopped pepper and 20g fresh onions. Fresh cowpea paste was prepared by soaking 200g cowpeas in 300ml water for 10min to soften the testa for manual removal. The clean cotyledons were steeped in 300ml water for 30min, the water was drained and the softened cotyledons blended in a Kenwood food mixer at speed 6 for 4min into a paste then whipped in a Kenwood food mixer at setting 6 for 4min. The paste was flavoured with 20g fresh chopped pepper, 20g fresh onions and 10g salt. Tablespoon (15ml) portions of each mixture were separately deep fried in vegetable oil at 190°C for 4min on each side. The akara balls were removed from the oil, drained of excess oil and stored in an incubator at 30°C for sensory evaluation.

Sensory Evaluation

The akara samples were coded and presented to a ten-member panel of judges who were familiar with the product for sensory evaluation. The samples were scored for the colour, flavour, texture and overall acceptability using a nine point scale, where 9 indicated "liked extremely" and 1 indicated dislike extremely".

Statistical Analysis

Data obtained were statistically analyzed using Analysis of Variance and means were separated using Duncan's multiple range tests (Duncan 1955).

RESULTS AND DISCUSSION

Proximate Chemical Composition

The proximate chemical compositions of the cowpea flour and premixes (Table 1) were essentially similar and within the range generally reported for cowpeas (Eljas *et al.*, 1964; Bressani, 1985; Lasekan *et al.*, 1987; Ikenebomeh and Sobowale, 1996; Olapade *et al.*, 2001). The moisture content varied from 7.40 to 7.80% for samples C and CPO respectively and they were within the safe moisture range for flour. Addition of pepper to cowpea flour resulted in significant increase in ash content of the cowpea flour (Table 1). Pepper has been described as essentially source of minerals (Tundall 1983; Ihekoronye and Ngoddy, 1985; Bamigbose *et al.*,1991). Crude

fibre, crude protein, ether extract and carbohydrate were not significantly different (p=0.05).

Functional Properties

Inclusion of onion and or pepper in the cowpea flour produced appreciable changes in water absorption and foaming capacities of the cowpea flour (Figure 1). Water absorption and foaming capacities of the premixes ranged from 72.8 and 22 in cowpea flour and pepper to 95% and 31% in cowpea and onion respectively (Table 2). Presence of onion increased water absorption capacity of cowpea flour from 89.5 to 95% while pepper reduced it to 72.8%. Effect of pepper superceded the effect of onion on water absorption capacity of the flour. Previous work reported water absorption capacity of dry milled cowpea flour to be 97-116% for some varieties of cowpeas (Olapade *et al.*, 2001). Foaming capacity of the cowpea flour was reduced by inclusion of either pepper or onion prior to whipping of the flour. Foam stability of the premixes was not significantly ($p>0.05$) different from the flour (Table 2). Both foaming capacity and foam stability values were within the range of reported values for some cowpea flours (Deshpande *et al.*, 1982, Abbey and Ibeh, 1988, Olapade *et al.*, 2001). Also both loose and packed bulk densities of premixes were significantly higher than the flour densities. The results agreed with previous reported values of some cowpea flours (Henshaw and Sobowale, 1996; Olapade *et al.*, 2001).

Sensory Scores of the Akaras

The results of sensory evaluation of akara samples are presented in Table 3. Akara from premix compared favourably with control samples from fresh cowpea paste in all sensory attributes except texture, which affected overall acceptability of the sample. Low rating for texture of the sample from premix could be attributed to its poor water absorption capacity and foaming capacity. Doyle *et al.* (1976) attributed poor acceptance of akara prepared from cowpea flour to poor re-hydration problem. Formation of stable foam is essential in akara preparation (Ngoddy *et al.*, 1986) since it contributes to the desirable spongy texture of the final product (Hung and McWatters, 1990).

CONCLUSION

The investigation carried out so far had revealed that the premix was not suitable for preparation of acceptable akara balls especially with regards to the texture. However onion and pepper powders mix could be separately packed alongside cowpea flour to reduce time and effort that would be put by the end user of the flour.

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Table 1: Mean[1,2] Proximate Composition of Premixes.

Sample	Moisture %	Crude protein %	Ether extract %	Crude fibre %	Ash %	Carbohydrate %	Iron %	Phosphorus %	Calcium %
Cowpea flour	7.40a	24.39a	1.37a	1.88a	3.67b	61.29a	0.006a	0.750b	0.021a
Cowpea and onion	7.54a	23.65a	1.35a	1.76a	3.95ab	61.75a	0.006a	0.780b	0.027a
Cowpea and pepper	7.42a	24.42a	1.98a	1.83a	4.30a	60.23a	0.007a	0.970a	0.022a
Cowpea, pepper and onion	7.80a	24.17a	1.35a	1.93a	4.11a	61.01a	0.006a	0.710a	0.022a

[1] Mean of three replicates
[2] Means with the same subscripts in a column are not different (p=0.05)

Table 2: Mean[1,2] Functional Properties of Premixes

Sample	Water absorption capacity (%)	Foaming capacity (%)	Foam stability after 120 min (%)	Loose bulk density (g/ml)	Packed density (g/ml)
Cowpea flour	89.5b	54a	80a	0.496b	0.713b
Cowpea and onion	95.0a	31b	82a	0.536a	0.748ab
Cowpea and pepper	72.8c	22c	79a	0.510ab	0.782a
Cowpea, pepper and onion	73.3c	20c	88a	0.531a	0.783a

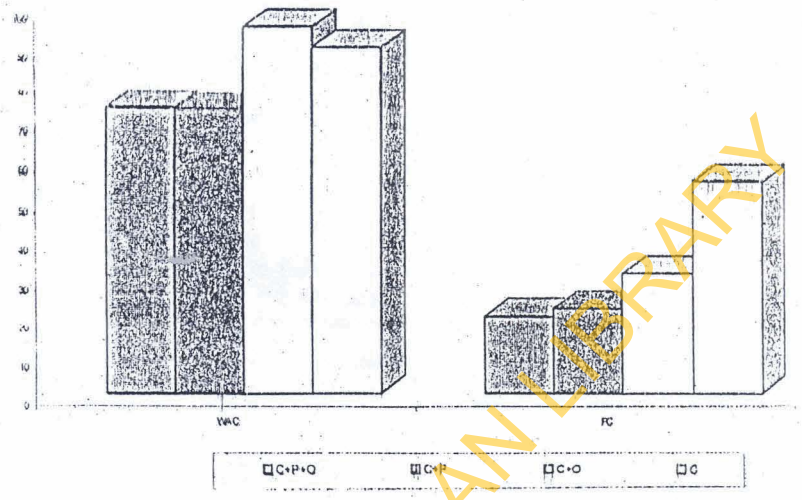
[1] Mean of three replicates
[2] Means with the same subscripts in a column are not different (p=0.05)

Table 3: Mean[1,2] Sensory scores of akara

Sample from	Colour	Flavour	Taste	Texture	Overall acceptability
Fresh cowpea paste	8.2a	8.6a	7.9a	8.6a	8.1a
Cowpea flour	8.6a	8.2a	8.5a	8.3a	8.4a
Cowpea flour, pepper and onion	8.4a	8.4a	8.2a	6.2b	6.5b

[1] Mean of three replicates
[2] Means with the same subscripts in a column are not different (p=0.05)

Figure 1: Water absorption and foaming capacities of different cowpea premixes.



WAC = Water Absorption Capacity
FC = Foaming Capacity

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