Production and Evaluation of Ready to Eat Soup Balls from Egusi, Egusi- Kirikiri, Sesame Seed and Groundnut

Abstract

The aim of this work is to produce ready to eat soup balls from some oil seeds. Soup balls were produced from egusi seeds (Citrullus vulgarius), egusi kirikiri seeds (Colocynthis citrullus L), sesame seeds (Sesamum indicum) and groundnut (Arachis hypogaea). The soup balls were dried to constant moisture content before packaging. The proximate composition of the soup balls were determined. The soup balls were used to prepare soups and sensory evaluation conducted. The microbial properties of the soup balls were determined after production and after twenty eight days of storage. The moisture content of the soup balls were between 4.4% to 5.5% which showed that they will maintain longer shelf- life. The protein contents though significantly different ($P< 0.05$) were high between 23.89% and 40.91%, which showed that the soup balls can compliment meat in soups. The overall acceptability results showed significant differences ($p< 0.05$) between soup balls produced from egusi and sesame seeds. Total viable count and fungal count of the soup balls after twenty eight days of storage were all below 10^6 CFU/g and no coli form was detected.

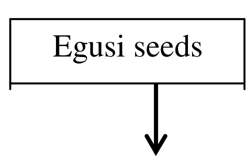
Keywords: soup balls, egusi, sesame, groundnut, egusi kirikiri

Introduction

Soup is an important type of food delicacy in the world. It is enjoyed by both the rich and the poor. The nutritional value of a particular soup type depends on its ingredients which is also determined by the financial strength of the person. There are various types of soups, which are peculiar to different tribes. Egusi *(Citrillus vulgarus*) seeds and usu (*p-tuber-regium sclerotia*) are the popular and most commonly used ingredients for making soup balls [1]. Soup balls are produced in small scale and mainly for immediate home use. The reason may be due to its low shelf-life. Production of soup balls is time and energy consuming. Production of ready to eat soup balls will make it convenient for use especially for working class mothers. It will increase consumption of soup balls that are rich in nutrients. Also using other seeds and nuts to produce soup balls will create variety.

Materials and Methods

Egusi seeds (*Citrullus vulgaris*), sesame seeds (*Sesamum indicum*) and egusi kirikiri (*Colocynthis citrullus)* were sorted separately, washed, dried and milled into flours using Corona manual grinder. Groundnuts (*Arachis hypogaea*) were sorted, soaked in warm water (70°C) for 2 min, dried for 1h in a hot air oven at 60°C. The dried groundnuts were roasted, cooled and peeled. The groundnuts after peeling were ground to paste using an attrition mill. The different samples were used to produce soup balls using [1] method with modifications. Four hundred grams (400g) of each flour were mixed with 40g of 'usu' in a clean dry mortar and kneaded with 5g of ground red pepper, 8g of salt. Warm water (100mls) was added drop wise to facilitate molding. Kneading continued until thick moldable dough was obtained and oil was manually expelled from the dough with the aid of a Muslim cloth. They were molded into small balls and cooked for 105min at 100ºC. The cooked soup balls were placed on trays and allowed to cool, then dried in the hot air oven at 70ºC for 5h to a constant moisture content. The balls were allowed to cool again, then packaged in a clean, dried and sterilized high density polyethylene film wrap. The production flow chart for the different soup balls were shown in figures 1 - 4.



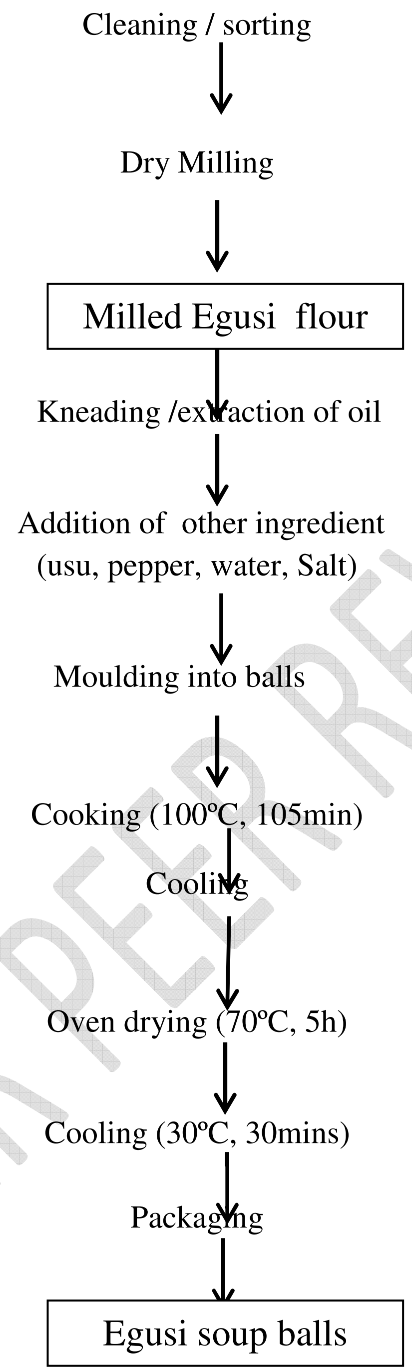
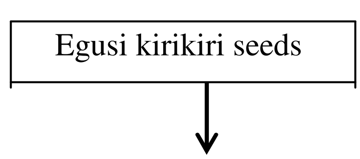


Fig.1: Flow chart for the production of Egusi (*Citrullus vulgaris*) Soup Ball.



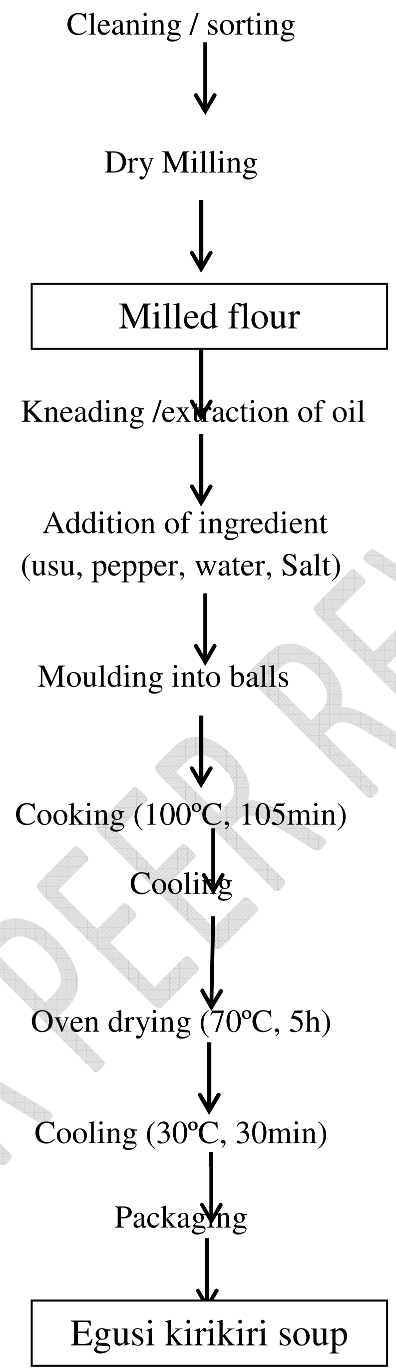
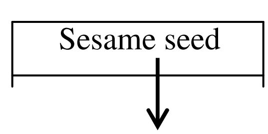


Fig.2: Flow chart for the production of Egusi Kirikiri Soup Ball.



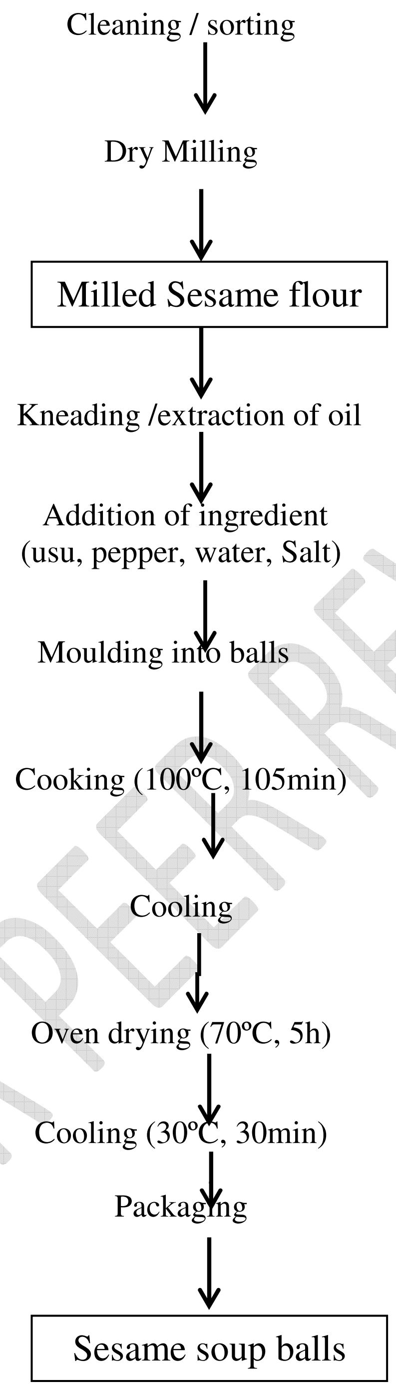
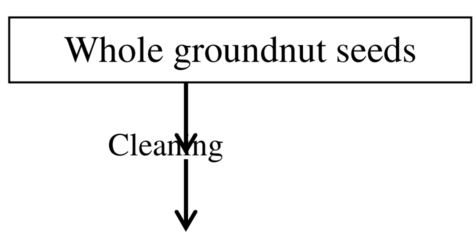


Fig.3: Flow chart for the production of sesame Soup Ball.



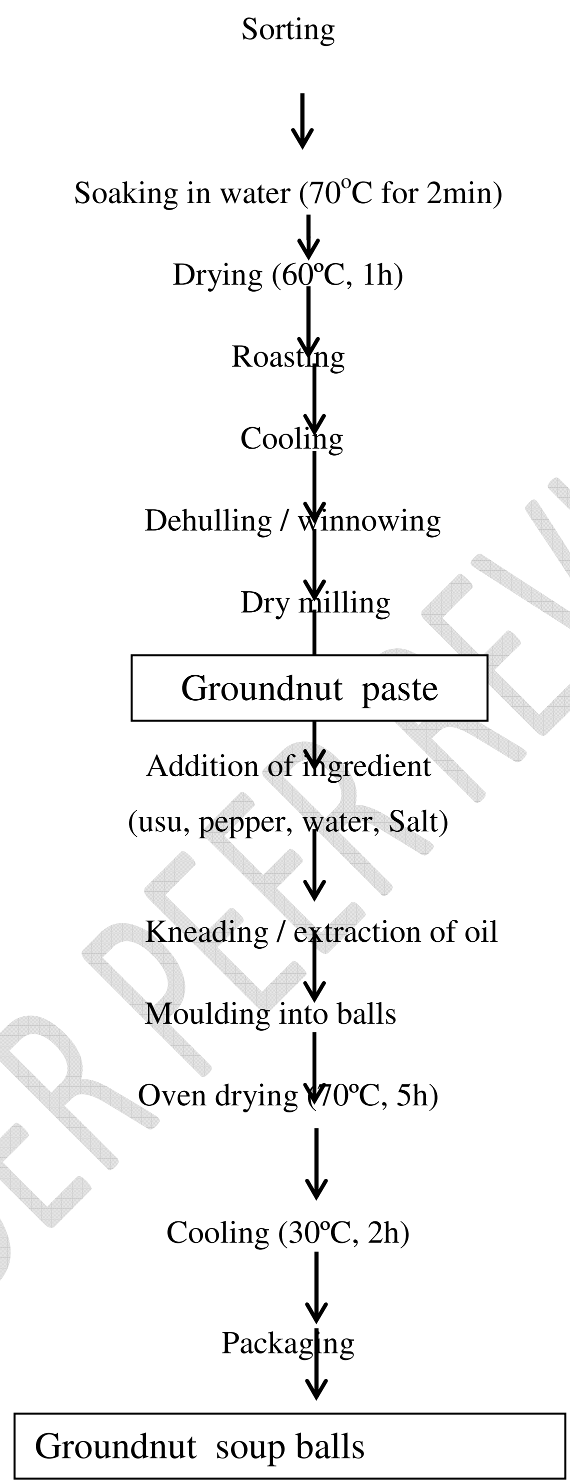


Fig.4: Flow chart for the production of groundnut Soup Ball.

Proximate Analysis

The soup balls were subjected to proximate analysis. The ash content, crude fibre and moisture content were determined using AOAC [2]. Kjeldahl method was used to determine crude protein, fat was by soxhlet extraction and carbohydrate was by difference.

Microbial Analysis

The pour plate colony method was used to carry out the microbial examination of the soup ball samples after production and after four weeks of storage.

Sensory evaluation

The soup balls were used to prepare soups and sensory evaluation was carried out on the four soup samples prepared with the different soup balls using 20-member semi trained panelist. Nine point hedonic scale ranging from extremely liked (9) and extremely disliked (1) was used to score for colour, flavour, texture, taste and overall acceptability.

Statistical analysis

Results obtained were statistically analyzed using ANOVA and means separated by Duncan multiple range method [3].

Results and Discussion

The result of the proximate analysis showed that the moisture content of the soup balls were low between 4.4% to 5.6%, indicating that the soup balls will exhibit longer shelf-life [4]. There were no significant difference ($p > 0.05$) between groundnut soup balls and sesame soup balls in terms of moisture content. The moisture content of egusi-kirikiri is in agreement with the report of [5].

The fat content of the samples were high and ranged from 30.68 - 41.15%. There were significantly difference ($p<0.05$) from each other. The results were different from the report of [1], the difference in the results may be attributed to the method of oil extraction (manual extraction) used. Since the samples were oilseeds, the high fat content obtained were expected as no organic solvent such as hexane was use for removal of fat.

The use of solvent like hexane for fat extraction may not be advisable, as complete removal of the solvent from the samples cannot be guaranteed.

The protein content of the soup balls were high and significantly different from each other ($p < 0.05$). The soup balls been residues remaining after the oil had been extracted from oilseeds, are important sources of nutrient for farm animals, they provide nutritionally balanced feed [6]. The high protein content was desirable, indicating that they can be used as meat substitute.

The sesame soup balls had the highest ash and fiber contents. The high ash content indicated that sesame soup balls were rich in minerals also the high fibre content could be attributed to its fibrous texture. The results showed that the soup balls will be suitable for metabolic and gastrointestinal system in man [7].

Table 1: PROXIMATE COMPOSITION OF THE SOUP BALLS

Sample	MOISTURE	FAT	PROTEIN	ASH	CRUDE FIBER	CHO
Egusi	5.00 ± 0.57^{b}	30.68 ± 2.44^{a}	37.03 ± 0.03^{a}	3.48 ± 0.03^{a}	3.33 ± 0.04^{a}	20.48 ± 1.84^{a}
Egusi kirikiri	5.60 ± 0.00^{a}	36.39 ± 2.41^{b}	40.91 ± 0.08^{b}	4.22 ± 0.40^{b}	3.46 ± 1.46^{a}	10.36 ± 2.86^{b}
Sesame	4.40 ± 0.00^{c}	41.15 ± 1.51^{c}	23.89 ± 0.08^{c}	7.20 ± 0.33^{c}	8.75 ± 2.52^{b}	13.59 ± 2.84^{c}
Ground nut	4.40 ± 0.00^{c}	33.75 ± 1.96^{d}	31.81 ± 0.01^{d}	4.97 ± 0.02^{d}	6.92 ± 2.74^{c}	16.10 ± 1.80^{d}
LSD	**0.35**	**1.86**	**0.05**	**0.23**	**I.76**	**2.09**

NB.: means values in a column bearing different superscripts are significantly different ($P<0.05$)

Microbial Analysis Result

The results of the microbial analysis in Table 2. below showed the total viable count, fungal count and total coliform count of the samples after production and after 28 days of storage. The total viable count ranged from 2.1×10^{4} CFU/g to 1.0×10^{4} CFU/g for egusi soup ball sample and groundnut soup ball sample respectively, while the fungal count ranged from 1.0×10^{5} CFU/g for egusi kirikiri sample and groundnut soup ball to 1.9×10^{4} CFU/g for egusi soup ball sample. After twenty eight (28) days of storage, the results ranged from 3.9×10^4 CFU/g for sesame seed soup ball sample to 2.0×10^4 CFU/g for groundnut soup ball sample . The fungal count ranged from 1.7×10^5 CFU/g for egusi kirikiri sample to 1.9×10^4 CFU/g for egusi soup ball sample. Egusi soup ball sample and egusi kirikiri soup ball sample had the highest total viable count of 2.1×10^4 CFU/g and 1.8×10^4 CFU/g respectively. This could be attributed to the high moisture content of egusi (4.95%) [8] and egusi-kirikiri (5.6%) [5].

The results showed increase in total viable count for all the samples after 28 days of storage and an increase in the fungal count for egusi kirikiri soup ball sample (1.7×10^5CFU/g) and sesame soup ball (8.4×10^4 CFU/g) while egusi soup ball sample showed no increase but groundnut soup ball sample showed a decrease in the fungal count after 28 days of storage. Coliform organisms were not detected in any of the samples during the period of the study. Hence, the microbial result for after production and after 28 days of storage were within the standard set for the international commission on microbiological specification of food (ICMSF) that set a limit of 10^6 CFU/g for aerobic count and coliform count of less than 10^2 CFU/g [9]. The low count recorded for the results is desirable and it implied that the samples were processed from wholesome raw materials and under good sanitary conditions. The absence of coliform organism implied that there were no faecal contamination.

Sample	Total viable count CFU/g		Fungal count CFU/g		Coliform CFU/g	
	0 Day	28 Days	0 Day	28 days	0 day	28 days
Egusi	2.1×10^4	2.3×10^4	1.9×10^4	1.9×10^4	Nil	Nil

Egusi kirikiri	1.8×10^4	2.5×10^4	1.0×10^4	$1.7x10^5$	Nil	Nil
Sesame	1.4×10^4	3.9×10^4	$2.5x10^4$	$8.4x10^4$	Nil	Nil
Groundnut	$1.O\times10^4$	2.0×10^4	$1.0x10^3$	$3.3x10^5$	Nil	Nil

Table 2: MICROBIAL COUNTS OF THE SOUP BALLS

Sensory Evaluation Results

The results of the sensory evaluation carried out on the soup ball samples were shown in Table 3. Egusi and egusi kirikiri soup balls soups were not significantly different ($P<0.05$) and both had higher scores in terms of colour (8.45% and 7.65%), while groundnut and sesame seed soup balls soups had lower score (6.20%) and were also not significantly different ($p<0.05$) from each other. This may be attributed to the fact that egusi soup balls and egusi kirikiri were from different species of egusi and the panelists were already familiar with the colour of egusi soup balls.

The taste of the egusi soup balls and egusi kirikiri soup balls were significantly different from sesame seed and groundnut soup balls ($P<0.05$), and ranged from 7.95% for egusi soup balls to 4.25% for sesame seed soup balls. The high score for egusi soup balls may be attributed to the fact that egusi soup balls were already known and accepted by the judges. Groundnut soup balls were also accepted since the score was 4.9 on a nine point hedonic scale. The lowest score obtained for sesame seed soup balls may be because of the slightly bitter taste of sesame seed, also sesame seed is not a common soup thickener or ingredient in the eastern part of the country where the evaluation was conducted [10]. Other parameters (flavour and texture) followed the same pattern. The fibrous nature of sesame seeds could be responsible for its low score in terms of texture.

Table 3: Results of the Sensory analysis of soup-ball samples

Sample	COLOUR	TASTE	FLAVOUR	TEXTURE	GENERAL ACCEPTABILY
Egusi	8.45^{a}	7.95^{a}	8.05^{a}	7.60^{a}	8.05^{a}
Egusi kirikiri	7.65^{a}	7.55^{a}	7.25^{a}	7.10^{a}	7.35^{a}
Sesame	6.20^{b}	4.25^{b}	4.90^{b}	5.90^{b}	5.40^{b}
Groundnut	6.20^{b}	4.90^{b}	5.65^{b}	5.20^{b}	5.65^{b}
LSD	**0.94**	**1.00**	**0.93**	**0.87**	**0.79**

Mean values with the same superscript in each column are not significantly different($p< 0.05$).

CONCLUSION

This work had succeeded in showing that good quality 'ready-to- use' soup balls could be produced from egusi seeds, egusi – kirikiri, Sesame seed and Groundnut. From the sensory evaluation results, egusi seed and egusi – kirikiri were more acceptable to the judges than soup balls from groundnut and Sesame seeds. This has been attributed to unfamiliar flavour of sesame seed to the judges.

The moisture contents were quite low which was desirable since the samples were to be packaged and used in convenient forms. Also the protein contents were high which showed that the products could serve as meat substitute or meat analogue in soups. The soup balls showed good microbial stability even after 28 days of storage and can be said to be a safe, healthy and convenient food.

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