Quality Characteristics of Moin-Moin Produced From Some Underutilized Legumes

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Abstract: **The study was aimed to investigate the utilization of mungbean and lab lab in the production of steam bean paste (moin-moin). The pastes produced were subjected to proximate, anti-nutrient analysis and sensory evaluation. From the result obtained, it was observed that the crude protein of moin-moin produced from mungbean 25.14 % was higher than that of lablab bean 23.69 % and cowpea (control) 22.50 %. Mungbean moin-moin had the least fat (7.07 %), ash (2.33 %), fibre (1.83 %) compared to the cowpea, fat (7.80%), ash (2.67 %), fibre (2.17 %) and lablab bean moin-moin fat (9.00 %), ash (2.50 %), fibre (2.00 %). Statistically there was no significant difference (P > 0.05) in the ash, fibre and carbohydrate content of moin-moin produced from cowpea, mung beab and lablab bean. The anti-nutritional factors identified in cowpea, mungbean and lablab bean moin-moin are saponin, alkaloid and tannin. The result of sensory evaluation showed that mungbean lablab bean competed favourably with cowpea moin-moin. The moin-moin produced from mungbean and lablab bean was most accepted in terms of taste. The overall acceptability of moin-moin produced from mungbean and lablab was higher which shows that substituting cowpea with mungbean and lablab bean would be effective in producing moin-moin of acceptable sensory quality.**

Keywords: **Mung bean, LabLab bean, Moin-moin, Proximate, Sensory**

I. INTRODUCTION

Moin-moin is made by steaming cowpea paste, garnished with various ingredients like fish, egg, meat, onion, pepper, oil, salt and tomato to flavor or season to curdle or puddy. It is eaten all over Nigeria and beyond (Osuji *et al.*, 2007; Osuji *et al.,* 2011). It is made from wet milled dehulled cowpea or more conveniently from reconstituted cowpea flour. The paste scooped into small cooking cups or wrapped in leaves or foil and boiled for about 40 minutes to produce a curdle or puddy called moin-moin (Ihekoronye and Ngoddy, 1985).

Cowpea which is used in the production of moin-moin is grown majorly in Northern Nigeria and transported to other part of the country including Eastern part of Nigeria which makes cowpea very expensive due to high transportation cost. Due to these limitations, there is a need to search for alternative legumes such as lablab, mung bean, kidney bean that could replace cowpea to cushion this effect on the populace.

Lablab bean and mung bean arelesser known legumesvery popular in the Eastern part of Nigeria. It is consumed dehulled, whole, boiled or roasted. Mung bean and lablab bean is rich in protein, carbohydrate, fiber, fat and ash but low in fat (Elsidig *et al.,* 2002). Legumes from various plant sources have their own unique properties that enable them to be used for various products.In order to increase mung bean and lablab bean production, utilization and product diversification, one of the approaches is to exploit the possibility of producing moin-moin from lablab bean and mung bean in Nigeria. However, no information exists on moin- moin produced from mung bean and lablab. In view of this, this work focuses on the quality characteristic of moin-moin produced from mungbean *(Vigna radiata)* and lablab bean (*Labalab purpureus*).

II. MATERIALS AND METHODS

Sources of Materials

Mungbean and lablab bean seeds were purchased from Main Market, Akabaliki, Ebonyi State, Nigeria

Sample Preparation

Mungbean and labalab bean seed were sorted to remove bad seeds, extraneous materials like stones, dirt, stalks and other foreign materials. Four hundred gram (400g) of each of the sample was soaked separately in a litre of cold water for soaked for 12 hours in order to soften the seed coats. There after the seed coats were removed manually by hand and the seeds rinsed in portable water. The dehulled seeds were milled with 200ml of water until a fine smooth paste was obtained. Each paste was transferred into a clean bowl and labeled accordingly.

Preparation of moin-moin

The moin-moin was prepared by mixing 300g of paste in a bowl with 120ml of warm water (40^0C), crayfish 10g, salt 10g, Tatashe pepper 30g, Maggi 7g, vegetable oil 80ml and Onion 50g. A wooden spatula was used to mix the paste and all the ingredients to form a smooth paste. Two hundred (200ml) of the smooth paste was dispensed into aluminum plate and steamed for 40minutes.

Proximate analysis

Crude protein, crude fibre, fat, ash, moisture and carbohydrate of moin-moin samples from mungbean and labalab beanwere determined. These analyses were carried out according to the AOAC official procedures (AOAC, 1990). The nitrogen was determined with a Kjeldahl method. The protein was calculated by Nitrogen x 6.25. Fat was obtained from a 4 h extraction with hexane. Ash was calculated from the weight

remaining after heating the sample at 550℃ for 2 h. Moisture was from the weight loss after oven drying at 110℃ for 2 h. The total carbohydrates excluding crude fiber were calculated from the difference.

Determination of Anti nutrients

The alkaloid content was determined using alkaline precipitation method as described by (Harborne, 1973). Tannin was determined using the Folin Dennis spectrometric method described by Pearson (1976). Saponin content of the sample was determined by double solvent extraction gravimetric method as described by (Obadoni and ochukwu , 2001).

Sensory Evaluation

The moin-moin samples were tasted by twenty panelists selected from Ebonyi State University CAS campus, Abakaliki. Quality parameters (appearance, mouthfeel, aroma, taste and overall acceptability) of the products were scored using a 9- point Hedonic scale ranging 1 = Dislike extremely, 9 = Like extremely

Statistical Analysis

Analysis of variance was conducted using complete randomized design. Means were separated using Turkey test to determine whether significant difference occurred among the samples. Significance was established at 5% probability level ($P < 0.05$).

III. RESULTS AND DISCUSSION

Proximate Composition

The proximate composition of moin-moin produced from cowpea, mung bean and Lablab bean is presented in Table 1 The moisture content ranged from 23.07- 22.00%. The results shows that moin-moin produced from cowpea had higher moisture content (23.07 %) followed by mung bean (22.33 %) while lablab bean had the least value (22.00 %). Nwosu *et al.* (2014) reported moisture content of moin-moin produced from cowpea and African yam bean as (14.98%) and (14.01%) respectively which is lower than the value reported in this work. The high moisture content of the produced moin-moin could be due to the absorption of moisture during soaking and also due to the amount of water added in the preparation of the moin-moin. The result revealed that the sample have high moisture content which implies that the sample may not store for long. The fat content of moin-moin samples ranged from 9.00- 7.07. The moin-moin produced from lablab bean had the highest fat content (9.00%) while the moin-moin produced from the mung bean had the least fat content (7.07%). The low-fat content observed in all the samples could be due to dehulling which caused the loss of much of the germs. However, Cowpea, Lablab bean and Mung bean has been reported to be low in fat (Elsidig *et al*., 2002; Inobeme *et al.*, 2014). The high value could be due the addition of cooking oil during preparation. Asogwa and Onweluzo (2010) reported that addition of cooking oil resulted in high fat content of moin moin.The value is higher than the value(2.00%) reported by Nwosu *et al.* (2014) for moin-moin produced from cowpea. The ash content ranged from 2.67- 2.33 %. Cowpea had the highest ash content (2.67%), while mungbean had the least value (2.33 %). There was no significant difference ($p>0.05$) between the moin-moin samples. The ash content is low than the value reported by Asogwa and Onweluzo (2010). The low value may be due to dehulling which caused loss of mineral content in the samples since minerals are known to be more concentrated on the seed coats of legumes (Ene-bong and Obizoba, 1996). The values are higher than the values obtained (Ekwu, 2004; Akusu and Kiin-Kabiri,2012) from moin moin produced from maize and bambara groundnut flour and cowpea/maize flour respectively. The crude fibre content ranged from 2.17-1.83%. The low crude fibre content could be as a result of the removal of the seed coat. The values are similar to thevalues obtained by (Nwosu *et al.*, 2014; Ihekoronye and Ngoddy, 1985).The protein content is presented inTable 1. The proteincontent ranged from22.58- 25.14 %. The result shows that mung bean moin-moin had higher protein content (25.14%), followed by lablab bean (23.58%) while cowpea moin-moin had the least value (22.58%). From the Table, the protein content of moin-moin produced from mung bean (25.14%) differed significantly ($P<0.05$) from lablab bean moin-moin (23.69%) and cowpea moin-moin (22.58%). The high value was expected since all the samples were legumes. Some authors reported that blending legumes with cereal in moin moin production was observed to increase the protein content (Ekwu, 2004; Akusu and Kiin-Kabari,2012). However, the values are low than the values obtained by Asogwa and Onweluzo (2010) but are higher than the value obtained (Ekwu, 2004; Akusu and Kiin-Kabari, 2012). It was observed that mung bean and lablab bean are better protein sources compared to cowpea. It is seen that these legumes could provide an ideal source of dietary protein for mankind. The carbohydrate content ranged from 41.72- 40.81%. There was no significant different ($P>0.05$) among the samples. It was observed that mung bean, lablab bean and cowpea are not good sources of carbohydrate.

Table 1: Proximate composition of moin-moin produced from cowpea, mungbean and lablab bean

Sample	Moisture%	Fat %	Ash %	Fibre %	Protein%	Carbohydrate%
CPB	$23.07^{a} \pm 0.34$	$7.80^{b} \pm 0.28$	$2.67^{a} \pm 0.24$	$2.17^{a} \pm 0.23$	$22.58^{b} \pm 0.62$	$41.72^{a} \pm 1.07$
MGB	$22.33^{ab} \pm 0.25$	$7.07^{c} \pm 0.09$	$2.33^{a} \pm 0.24$	$1.83^{a} \pm 0.23$	$25.14^{a} \pm 0.22$	$41.29^{a} \pm 0.67$
LBB	$22.00^{b} \pm 0.49$	$9.00^{a} \pm 0.00$	$2.50^{a} \pm 0.40$	$2.00^{a} \pm 0.00$	$23.69^{b} \pm 0.22$	$40.81^{a} \pm 0.52$

Values are means of three replicates. Values with the same superscript within a column are not significantly different ($p> 0.05$). CPB = Moin-moin produced from cowpea; MGB=

Moin-moin produced from mungbean; LBB= Moin-moin produced from lablab bean

Anti- nutritional factor of moin-moin made from cowpea bean, mung bean and Lablab bean

The antinutritional factors of the moin-moin made from mungbean and lablab bean is presented in Table 2. It was observed that processing led to significant decrease in the entire anti nutrient determined.The saponin content of the moin-moin (Table 2) ranged from0.30- 0.67%. The moin-moin produced from lablab bean had the highest value (0.67%) while mung bean moin-moin had the least value of (0.30%). The saponin content of the moin-moin produced from mungbean was significantly ($P<0.05$) difference from lablab bean and cowpea bean moin-moin while no significant different ($P>0.05$) was observed in the saponin content of moin-moin produced from the cowpa and lablab bean. Saponin in seeds imposes an astringent taste that affects palatability, reduce food intake, and affects the utilization of protein (Alertor, 1993). Saponin reduces hypercholesterolemia by binding cholesterol making it unavailable for absorption. Due to the low level of saponin in the sample, it can serve as phytochemical. The alkaloid content of the moin-moin ranged from0.47- 1.00. The alkaloid content of the moin-moin produced from the cowpea bean and lablab bean did not differ significantly ($P>0.05$) while alkaloid content of moin-moin produced from mung bean differed significantly ($P<0.05$) from lablab bean and cowpea bean. The level of alkaloid present in the moin-moin samples are low and cannot constitute any hazard to other nutrients from other sources.

The tannin content of the moin-moin samples ranged from 0.70- 0.43 mg/100g. The moin-moin produced from lablab bean had the highest value (0.70mg/100g) while mung bean moin-moin had the least value (0.43mg/100g). Tannins bind dietary protein and digestive enzymes to form complex that are not readily digestible (Aletor, 1993). The low level of tannin could be attributed to the fact that most tannins are located in the outré layer of legumes. During decortications of legumes, most of them are removed (Bressani, 2002). This is because tannin is water soluble; soaking brings about their leaching out into the soaking medium (Asogwa and Onweluzo, 2010).

Table 2: Anti-nutritional factor of moin-moin made from cowpea bean, mung bean and lablab bean

	Saponin (%)	Alkaloid(%)	Tannin(%)
CPB (control)	$0.57^{a} \pm 0.05$	$0.87^{a} \pm 0.09$	$0.60^{ab} \pm 0.00$
MGB	$0.30^{b} \pm 0.08$	$0.47^{b} \pm 0.09$	$0.43^{b} \pm .0.05$
LBB	$0.67^{a} \pm 0.05$	$1.00^{a} \pm 0.00$	$0.70^{a} \pm 0.08$

Values are means of three replicates. Values with the same superscript within a column are not significantly different ($P>0.05$). CPB = Moin-moin produced from cowpea; MGB= Moin-moin produced from mungbean; LBB= Moin-moin produced from lablab bean

Sensory Properties of Moin-Moin produced from mung bean and lablab bean

The sensory result of moin-moin produced from mung bean and lablab bean are presented in Table 3.The result showed that the taste scores ranged from 7.05- 7.95 with moin-moin produced from mung bean having the highest taste score of (7.95), while the moin-moin produced from cowpea(control) had the least taste score (7.05). The taste scores revealed that the moin-moin produced from mung bean and lablab bean were enjoyed more than moin-moin produced from cowpea. Moin-moin produced from mung bean had better mouthfeel, aroma, and overall acceptability, followed by moin-moin made from lablab bean and cowpea respectively, while moin-moin from cowpea had better appearance (7.7). There was significant difference ($P < 0.05$) among the samples. This study revealed that mung bean and Lablab bean can be used to substitute cowpea in moin-moin production.

Table 1: Sensory scores of moin-moin produced from cowpea, mung bean and lablab bean.

	Taste	Mouth feel	Aroma	Appearance	General Acceptability
MGB	$7.95^{a} \pm 0.97$	$7.9^{a} \pm 0.83$	$8.05^{a} \pm 0.86$	$7.55^{a} \pm 0.86$	$8.15^{a} \pm 0.79$
	$7.9^{a} \pm 0.94$	$7.55^{a} \pm 0.97$	$7.75^{a} \pm 0.83$	$7.5^{a} \pm 0.92$	$7.9^{ab} \pm 0.83$
CPB (control)	$7.05^{b} \pm 0.92$	$7.3^{a} \pm 1.05$	$7.55^{a} \pm 0.86$	$7.7^{a} \pm 0.90$	$7.4^{b} \pm 0.97$

Values with the same superscript within a column are not significantly different ($P> 0.05$). CPB = Moin-moin produced from cowpea; MGB= Moin-moin produced from mungbean; LBB= Moin-moin produced from lablab bean

IV. CONCLUSION

This study revealed that mung bean and Lablab bean can be used to substitute cowpea in moin-moin production. The use of mung bean and lablab bean as a substitute in the production of moin-moin is cheaper than using cowpea. The results of this study show that mung bean and lablab are rich in protein hence, it has the potential for combating hunger and malnutrition prevalent in most developing countries.

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