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Antinutritional Content and Sensory Quality of Moin-Moin Produced from Jack Beans *(Canavalia ensiformis)* Flour

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Abstract

The study investigated the antinutritional content and sensory quality of 'moin-moin' produced from jack beans flour. Two (2) different pre-treatment methods (boiling and roasting) was used to produce jack beans flour samples while raw jack beans flour was used as control. The flour samples from the processed jack bean and the raw jack bean flour were used in the production of 'moin-moin'. The proximate, functional and anti-nutritional properties of the flour as well as the anti-nutritional content and sensory quality of the 'moin-moin' were determined. The protein content of raw jack bean flour was the highest (22.69%), while boiled jack bean flour had the lowest (19.48%). Functional properties were higher in roasted Jack bean flour than the boiled and raw jack bean flour samples, and processing methods significantly affect the anti-nutritional factors of the jack bean flour. 'moin-moin' produced from the roasted jack bean flour has the least content of anti-nutritional factors when compared to the 'moin-moin' produced from boiled and raw jack bean flour respectively. The study showed that pre-treatments reduced the antinutritional factors of flour samples, the steaming processing during production of 'moin-moin' reduced the antinutritional factors of the product and also 'moin-moin' produced from boiled jack bean flour was accepted.

Keywords: Jack bean, antinutritional factors, moin-moin, functional properties, sensory evaluation

INTRODUCTION

Legumes are good sources of cheap widely available proteins for human consumption, staple foods for many people in different parts of the world (Youseff *et al.,* 1989). Legumes range between the highly utilized soybeans and cowpeas to the lesser known ones like African yam beans. Studies have shown that the lesser known legumes together with other conventional legumes can be used for combating protein malnutrition which prevalent in the third world. It has therefore, a great potential in most tropical and subtropical parts of the world (Akpapunam and Sefa–Dedah, 1997). This can be achieved by the consumption of the legumes whole and in various processed forms (condiments) (Arisa and Aworh, 2007).
Jack bean has its origin in the Western part of India and Central America (Thompson *et al.,* 1986). Jack bean varieties were originally grown in the drought ridden regions of Arizona and Mexico in ancient times and used as high-protein food and forage crops for several centuries by the natives of Mexico, Southwestern United Stated, Central American

countries, Peru, Ecuador, Bolivia, Brazil, West Indies, Paraguay and Argentina (Akande, 2016).Jack bean is cultivated and distributed in Africa, Asia, the West Indies, Latin America and India (Marimuthu and Gurumoorthi, 2013). Jack bean has a good nutritional value (Pound *et al.,* 1982; Akande, 2004).The crude protein content of dry ripe jack bean seed ranges from 26 – 32%. Udedibie (1990) reported about 30% crude protein and 60%nitrogen free extract in raw jack bean seed. The gross energy content of 4.26kcal/g was reported by (Udedibie and Madubuike, 1988) for raw jack bean seed. Jack bean contains significant amounts of niacin, thiamine, phosphorus, calcium and iron (D'mello, 1985; Leon *et al.,* 1990). The macro-mineral that was most concentrated in raw jack bean seeds was found to be potassium with a value of 9.9 g/kg while the lowest was sodium with the content of 0.07 g/kg. On the other hand, among the micro-mineral, iron was found to be the most abundant with the value of 48.7 g/kg while manganese was found to be the lowest value of 15.6g/kg in the raw seed (Apata and Olighobo, 1994).Jack bean seed is relatively low in sulphur amino acids, but high in lysine. The most limiting amino acid in untreated jack bean seeds was methionine with the value of 0.46 while the lysine content of raw jack bean seeds was found to be4.42g16gN (Akande, 2004). In western countries this legume is used as a cover crop and the roasted seeds are ground to prepare coffee – like drink (Bressani *et al.,* 1987). Jack bean has been used in foods because of its good thickening and gelling properties. They are also a good texture stabilizer and regulator in food systems (Akande, 2016).There is a great need to search for more nutritionally good crop like jack bean to ensure that the potential in it as sources of human food are exploited e.g. 'moin-moin' production. 'Moin-moin' is a Nigeria steamed bean pudding made from whipped cowpea paste, flavoured with pepper, onion and salt. Whipping is usually done to incorporate air and enhances the formation of stable foam (Ngoddy *et al.,* 1986). This product is enjoyed by majority of the populace in Nigeria especially with the combination of cereal based dishes such as maize gruel ('akamu') or maize gelled product('agidi'). Jack bean seed is adversely affected by its anti-nutritional content, hence different processing methods such as soaking, cooking and autoclaving (Doss *et al.,* 2011) could be have been explored to reduce its antinutritional factors. There is little information on the utilization of this highly nutritious legume for 'moin-moin' production. The aims of this study is to produce 'moin-moin' from jack beans using three different processing methods such as roasting, boiling and raw to process the jack bean, evaluate the anti-nutritional content and determine its sensory quality.

MATERIALS AND METHODS

Materials

The jack bean used for the study was obtained from Federal Polytechnic experimental farm in Offa and other ingredients such as red pepper, fresh onion, salt, seasoning cube and vegetable oil for 'moin-moin' production were obtained from Owode market in Offa, Kwara State, Nigeria

Production of jack bean flour

Raw sample

600g of the raw jack bean sample was dried in the sun and broken by the use of mortar and pestle to remove the seed coats. The seeds was milled, sieved and package in air light container.

Roasted sample

The roasting method was carried out by the use of sand bath which was pre-heated to the temperature of 130±5^{0}C and 600g of jack beans seed was introduced and roasted for 10 min. The jack beans was removed and allow cooling to room temperature, the roasted seeds were dehulled using attrition mill slightly adjusted. The seed coat was removed by winnowing and the cotyledons were milled (attrition milling), sieved using 1 mm mesh size and packaged in an air tight container until required for used.

Boiled sample

600g of jack beans seed was weighed and boiled in water (100^{0}C) in a bean-water ratio of 1:10 (w/v) for 20 min. The boiled seed was rinsed with distilled water, dehulled and dried at 55^{o}C for 6 hr in a hot air oven (Doss et al., 2011) milled, sieved and packaged in air tight container.

Proximate composition

The approved AOAC method (2000) was used to determined moisture, total ash, crude protein, crude fat and crude fibre while carbohydrate content was calculated by difference.

Functional properties

The method of Wang and Kinsella (1976) was used to determine bulk density, while swelling power and solutions were determined using the method of Leach *et al.* (1959). Oil and water absorption capacities were determine with the method of Beuchat (1997), and foaming capacity and stability was determined by the method described by Fagbemi and Oshodi (1991). Emulsion capacity was determined using the procedure described by Kinsella (1979) while emulsion stability was determined using the method described by Sathe and Salunke (1981).

Antinutritional content

The heamagglutinin activity of jack bean flour was determined based on Pull *et al.* (1978), while tannin content was determined according to Swain (1979) and AOAC (2000). Trypsin inhibitor activity was determined based on Kakade *et al.* (1974), and total polyphenol was determined using the method of Sofowora (1993).

Concanavalin A determination

1g of flour was weighted into a 50ml digestion tube, 20ml of 6M HCl was added and allow digesting by placing in the digestion hole of Tecator BD 30 digestion unit to homogenize the sample to clear filtrate. The digest was allowed to cool and was filtered into 100ml volumetric flask up to mark with double distilled water. 1ml of the filtrate was pipette into a 20ml test tube, 0.5ml of phosphate buffer and 0.5ml of aqueous sodium nitroprusside solution were added. Working standard solution of concanavalin A of range of 0-5ppm were prepared from stock 25ppm concanavalin A solution was treated similarly with phosphate buffer and sodium nitroprussiate solution. The mixture was stirred vigorously and stored in a dark cabinet for 2hrs to a reddish colour indicating the presence of concanavalin A was obtained. After 2hours the absorbance of sample extract and working standard against blank were read on a spectronic 21D spectrophometer at a wavelength of a 520nm.
Concanavalin A (%)

$$= \frac{\text{absorbance X gradient factor X dilute factor}}{10000}$$

Preparation of ‘moin-moin’

Slurry for ‘moin-moin’ was prepared using the method described by Olapade and Adetunji (2007) with minor modification. 200g of processed Jack beans flour sample were weighed and the raw, boiled and roasted flour was hydrated with 450ml of water, respectively 60^0C and allow to stand for 1 h after which they were blend with 20g of red pepper, 20g of fresh onion, 10g of salt, 4g of seasoning cube and 50ml of warm vegetable oil (60^0C) for 4 min. The mixture was dispensed into nylon and steamed for 45 min at ambient pressure.

Sensory evaluation

The ‘moin-moin’ sample was coded and presented to a twenty panel of judges who are familiar with cowpea ‘moin-moin’ for sensory evaluation. The trained panel scored for the colour, flavour, taste, texture and overall acceptability of the jack bean ‘moin-moin’ using a five point hedonic scale (where 5 = like extremely, 4 =Like very much, 3 =Neither like nor dislike, 2 = dislike very much and 1 = dislike extremely).

Statistical analysis

All data were statistically analyzed using SPSS version 17.0 for analysis of variance, while Duncan multiple range test (DMRT) was used to separate means where there is a significant difference. For each sample, triplicate determinations were carried out.

Table 1. Proximate composition of jack bean flour (%)

Samples	Moisture	Total ash	Crude protein	Crude fat	Crude fibre	Carbohydrate
Raw	6.15[a]	2.97[c]	22.69[a]	3.17[c]	3.67[b]	61.35[b]
Boiled	13.21[c]	2.56[a]	19.48[b]	3.06[a]	2.79[a]	58.90[a]
Roasted	7.13[ab]	2.78[ab]	21.87[b]	3.25[bc]	3.81[bc]	61.16[b]

Values are means of trplicate determination.
Mean values with different superscripts within the same column are significantly different ($p<0.05$).

RESULTS AND DISCUSSION

Proximate composition of jack beans flour samples

Table 1 shows the proximate composition of jack bean flour. The crude protein content of raw jack bean flour (22.69%) were found to be lower when compare to an earlier report on certain common legume grains such as *Mucuna pruriens* (24.9g1kg) (Udedibie and Carlini, 1998),*Canavalia gladiata* (29.3glkg) (Siddhuraju and Becker, 2001) and *Entada scandens* (26.82lkg) (Vadivel *et al.,* 2008). The crude protein of the roasted jack beans was found to be higher (21.87%) than the boil jack bean flour (19.48%), this may be due to fact that roasting would concentrate the nutrients present in the food as the water molecule are evaporated or volatilized out (Bressani and Sosa, 1990), on the other hand the boiled seed has a reduced protein content which may be due to the breaking down of protein coupled with leaching effect into water during boiling. The crude fat of raw jack bean flour (3.17%) was found to be higher than *Cassia floribouda* (2.1-3.1%) (Vaelivel and Janardhanad, 2001); *Canavalia gladiata* (2-4.6%) (Siddhuraju and Beckers, 2001) but lower than the value reported earlier on *Mucuna pruriens* (9.6%) (Adebowale *et al.,* 2005) and *Entada scandens* (9.53%) (Vadivel *et al.,* 2008). The fat content was found to be higher in roasted jack bean flour (3.25%) than the boiled (3.06%) and raw flour (3.17%) respectively. The crude fibre content of the raw jack bean flour (3.67%) was found to be lower with that of earlier report on the same jack bean (4-71-11.4%) (Sridhar and Seena, 2006); *Canavalia gladiata* (9.32%), *Cicuta virosa* (10-47%) (Siddhuraju and Becker, 2001) and *mucuna monosperma* (8.9-9-2%) (Pugalenthi *et al.,* 2003). The crude fibre content of the boiled jack bean flour was found to be lesser (2.79%) than that of raw (3.67) and roasted flour (3.81%). Crude fibre is nutritionally appreciated because it traps less protein and carbohydrate (Balogun and Fetuga, 1986). The ash content of the raw jack bean flour (2.97%) was found to be lower with that of earlier report on the same jack bean (4.48g/100g) (Doss *et al.,* 2011), Asparagus bean (2-8.9%) and cowpea (3-20%) (Nwosu, 2011). Ash content of boiled jack bean flour (2.56%) was found to be lesser than that roasted (2.79%) and raw flour (2.97%). Moisture content of the raw jack bean flour (6.15%) was found to be lower than that of earlier report on the same jack bean (8.41gl100g) (Doss *et al.,* 2011). Moisture content of boiled jack bean flour was found to be higher (13.21%) than the raw and roasted jack bean flour, 6-15 and 7.13% respectively and this may be due to the absorption of moisture during boiling (Nwosu, 2011). The crude carbohydrate of raw jack beans flour (61.35%) was found to be higher when compared to previous reports on certain under-utilized food legumes such as *Cassia floribunda* (58 - 60.5%) (Vadivel and Janardhanan, 2001), and *Mucuna monosperma* (59.60%) (Pugalenthi *et al.,* 2003). The carbohydrate content of raw jack beans flour was found to be higher than that of roasted (61.16) and boiled jack bean flour (58.9%).

Functional properties of jack beans flour samples

The loose bulk density of the jack bean flour and that of the loose bulk density (LBD) range from 0.52 to 0.56 g/ml, while the packed bulk density (PBD) range from 0.67 to 0.71 g/ml which was higher when compare with composite flour of pigeon pea and cowpea whose loose bulk density is 0.46g/ml and packed bulk density is 0.63 to 0.66gm^3 reported by Adediran *et al.* (2013). The lower the bulk density the higher the floatation of the legume flour on top of water and hence may not soak and mix properly in water during mixing to produce the 'moim-moin'. The higher the bulk density the greater the compactness of the flour because particle size is inversely proportional to bulk density (Falade and Olugbuji, 2010) and this is a positive effect on the compactness of the flour and firmness of the 'moin-moin' produced. Plaami (1997) observe that bulk density is influenced by the structure of starch polymers resulting in low bulk density. Foaming properties are much important in the maintenance of the texture and structure of different food products during and after processing. The foam capacity and stability of the flour depends on the presence of the flexible protein molecules which may decrease the surface tension of water (Sathe, 1982).The highest foam capacity was obtained for the roasted jack beans flour (17.59%) which incidentally had the highest foam stability (8.15%) on the other hand the least foam capacity was obtained for boiled jack beans flour (11.24%) as well as the lowest foam stability. In food foams, foaming

Table 2. Functional properties of jack beans flour

Functional properties	RAW	BOILED	ROASTED
Oil absorption capacity (g/100g)	90.60^{a}	88.2^{b}	91.5^{bc}
Water absorption capacity (g/100g)	100.10^{abc}	91.8^{a}	104.3^{cd}
Loose bulk density (g/ml)	0.53^{a}	0.52^{a}	0.56^{ab}
Pack bulk density (g/ml)	0.68^{a}	0.67^{ab}	0.71^{bc}
Foaming capacity (%)	15.67^{b}	11.24a	17.59^{cd}
Foaming stability (%)	7.38^{bc}	5.11^{a}	8.15^{d}
Emulsion capacity (g/100g)	46.44^{ab}	37.49^{a}	54.46^{cd}
Emulsion stability (g/100g)	12.23ab	9.84^{b}	14.79^{bcd}

Values are means of trplicate determination.
Mean values with different superscripts within the same column are significantly different ($p<0.5$)

performance depends on the ability of the continuous phase to include air (foam capacity) and also retain it for specific period of time (foam stability) (Prins, 1988). Damodaran (1997) also reported that ability of protein to reduce surface tension upon adsorption affects foam formation. According to Hettiarachchy *et al.* (1996) ability to form stable foam depends on sufficient intermolecular (protein-protein) interaction and thus degree of cohesion. Emulsion capacity determines the maximum amount of oil that can be emulsified by protein dispersion. On the other hand, emulsion stability determines the ability of an emulsion with a specific composition to remain unchanged. Jack bean flour exhibited good emulsion capacity and emulsion stability ranging from 37.49-54.46g/100g and 9.84-14.79g/100g respectively with boiled jack bean having the lowest value while roasted jack bean had the highest value for emulsion capacity and emulsion stability. Emulsion stability is important in food emulsions as it indicates the capacity of emulsion droplets to remain dispersed without separation by creaming, coalescing and flocculation (Damodaran, 1997). Unfolding of proteins at oil and water interfaces plays a significant role in formation and stability of emulsions. The result obtained in this study shows that jack bean flour could be attributed to protein denaturation during isolation. The highest value for water absorption capacity (104.3g/100g) was obtained from roasted jack beans flour while the boiled jack beans flour had the least (19.8g/100g). The values are comparatively lower than the value of soybean flour (130%) as reported by Lin et al. (1974), lima beans flour (130-140%) (Oshodi and Adeludun, 1993) but higher than the value of *Telfairia occidentals* (90.2%) reported by Akintayo (1997). The high water absorption obtained in this present study suggests that jack beans may be used in the formulation of some foods such as sausage, doughs, processed cheese soups and baked products (Olaofe *et al.,* 1998; Oshodi and Ekperigin, 1989).The highest oil absorption capacity (OAC) was found in roasted jack bean flour (91.5kg/100g) and lower in boiled jack beans flour (88.2g/ 100g). These values are lower than the value of the earlier report on the same jack beans (170%), vicuna beans (160%) and the bambara groundnut (130%) reported by Adebowale and Lawal (2004). Oil absorption capacity is important since oil acts as flavour retainer and incenses, the mouth feel of foods in the presence of non-polar side chains of oil among of the flours explain differences in the oil binding capacity of the flours (Adebowale and Lawal 2004)

Anti-nutritional content the jack bean flour samples and ‘moin-moin’

The concanavalin A content was found to be lower in boiled jack beans flour (0.355) than the roasted (0.89) and then the raw flour (1.065) respectively. However, it was found to be lower in the ‘moin-moin’ produced from the roasted jack bean flour (0.015) than other ‘moin-moin’ produced from the raw (0.0275) and boiled jack beans flour (0.022). Concanavalin A was reported as one of the most important anti-nutritional factors of *Canvalian ensiformis* seeds (Udedibie and Carlini 1998). It was also reported that concanavalin binds to carbohydrate of intestine and resist digestion (Putsztai, 1989)**.**The level of tannin content in jack beans flour was found to be lower in boiled flour (0.028) than roasted and raw flour (0.355 and 0.0545) respectively. But it was found to be lower in the ‘moin-moin’ produced from the roasted flour (0.0045) than the ‘moin-moin’ produced from raw (0.012) and boiled flour (0.0075). Tannin was reported to affect the digestive tract and their metabolites are toxic (Ene-Obong, 1992). The tannin content (0.0045 – 0.0545g/mg) was also found to be lower when compared with the tannin content of certain common legume seeds such as *Pisum sativum*(0.92%) (Nikolopou *et al.,* 2007); *Phaseolus Vulgaris* (1.7%) and *Cajanus Cajan* (1.4%) (Sangronis and Machado, 2007).The level of polyphenol content of jack beans flour was found to be lower in boiled flour (0.32) than roasted (0.51) and raw flour (0.80). But it was found to be lower in the ‘moin-moin’ produced from roasted flour (0.028) than the ‘moin-moin’ produced from raw (0.068) and boiled flour (0.0425). The content of both polyphenol and tannin are not desirable for human consumption phenolics compound were reported to decrease the digestibility of proteins,

Table 3. Anti-nutritional factors of jack bean flour

Processing Techniques	Concanavalin A (g/100g)	Tannin (g/100g)	Polyphenol (g/100g)	Trypsin inhibitor (TIU/mg)	Haemagglutinin (g/100g)
Raw	1.065^{c}	0.0545^{b}	0.800^{c}	18.305^{c}	52.650^{c}
Boiled	0.355^{a}	0.0280^{bc}	0.320^{ab}	2.275^{a}	28.805^{a}
Roasted	0.890^{b}	0.0355^{a}	0.510^{b}	9.775^{b}	36.445^{b}

Values are means of trplicate determination.
Mean values with different superscripts within the same column are significantly different (p<0.05).

Table 4. Anti-nutritional factors of 'moin-moin' produced from jack beans flour

Processing Techniques	Concanavalin A (g/100g)	Tannin (g/100g)	Polyphenol (g/100g)	Trypsin inhibitor (TIU/mg)	Haemagglutinin (g/100g)
Raw	0.028^{bc}	0.0120^{c}	0.068^{c}	0.335^{ab}	4.765^{c}
Boiled	0.022^{b}	0.0075^{ab}	0.043^{b}	0.220^{a}	2.390^{b}
Roasted	0.015^{a}	0.0045^{a}	0.028^{a}	0.125^{c}	1.650^{a}

Values are means of trplicate determination.
Mean values with different superscripts within the same column are significantly different (p<0.05).

carbohydrate and the availability of vitamins and minerals (Liener, 1994). They also have decreased the activity of digestive enzymes such as and α-amylase, trypsin, chymotrypsin and lipase and may cause damage to the mucosa of digestive tract and also reduced the absorption of nutrient such as vitamins (Doss *et al.,* 2011).The trypsin inhibitor activity of boiled flour was found to be lower (2.275 TIU/mg) than that of roasted (9.775TIU/mg) and raw flour (18.305 TIU/mg), respectively. This shows that boiling is more effective in the reduction of trypsin inhibitors than the roasting; however it was found to be lower in the residual 'moin-moin' produced from roasted flour (0.125 TIU/mg) than the 'moin-moin' produced from the raw (0.335 TIU/mg) and boiled flour (0.22 TIU/mg) and all these value are found to be higher when compared with that of previous result on *Mucuna pruriens varutilis* (94TIU) (Vadivel and Pugalenthi, 2007). The haemagglutinin activity was found to be lower in boiled flour (28.805g/100g) than roasted(36.455) and raw flour (52.65g/100g), however it was found to be lower in the 'moin-moin' produced from roasted flour (1.65g/100g) than 'moin-moin' produced from raw (4.765g/100g) and boiled flour (2.39g/100g). The study showed that roasting and boiling significant reduced antinutritional factors of the jack bean flours and its 'moin-moin'.

Sensory evaluation of 'moin-moin'

Taste is the sensation of flavour perceived in the mouth and throat. The result showed that 'moin-moin' prepared from raw and boiled jack beans flour are not significantly different and are rated high with 4.8 and 4.2 respectively while the 'moin-moin' prepared from the roasted jack bean flour is rated the least with 1.9 and is significantly different from both the raw and boiled samples at 5% level. Colour is very important parameter in judging the suitability of raw materials used for the preparation and also provides information about the quality of the product. The mean score of the colour of the 'moin-moin' showed that the 'moin-moin' from raw and boiled jack beans flour was 4.5with no significant difference while the sample from the roasted jack bean is the least with 3.6 and is significantly different to both the raw and the boiled samples. This is the main factor that makes the product to be like or disliked. Quality score from the aroma of the 'moin-moin' revealed that the aroma of the 'moin-moin' from raw and boiled jack bean flour are preferred with 4.4 over 'moin-moin' from roasted jack bean flour with the least data of 3.8 and it was significantly different from the raw and boiled sample. Unlike the taste, colour and aroma, the softness of the 'moin-moin' are not significantly different from each other. Just like the taste, colour and aroma, the greasiness of the 'moin-moin' from the raw and boiled jack bean flour are preferred with 4.1 over 'moin-moin' from roasted jack bean flour with the least (3.1) and it was significantly different from the raw and boiled sample. The study showed that 'moin-moin' prepared from raw and boiled jack bean flour are not significantly different and are rated high with 4.5 and 4.6 respectively while the 'moin-moin' produced from the roasted jack bean flour is rated the least with 3.3 and is significantly different from both the raw and boiled samples at 5% level. The reason for the dull appearance may be as a result of overheated samples of jack beans during roasting process. It is obvious from the result that the 'moin-moin' from the raw jack beans flour have the highest score of 4.8 and it is not significantly different from the 'moin-moin' produced from boiled jack bean flour with 4.6 but both are significantly different from the 'moin-moin' produced from roasted jack bean flour.

Table 5. Sensory attributes of jack bean 'moin-moin'

Samples	Taste	Colour	Aroma	Softness	Greasiness	Appearance	Overall acceptability
Raw	4.80[b]	4.50[b]	4.40[b]	4.10[a]	4.10[b]	4.50[b]	4.80[b]
Boiled	4.20[b]	4.50[b]	4.40[b]	4.00[a]	4.10[b]	4.60[b]	4.60[b]
Roasted	1.90[a]	3.60[a]	3.80[a]	4.10[a]	3.10[a]	3.30[a]	2.90[a]

Values are means of trplicate determination.
Mean values with different superscripts within the same column are significantly different ($p<0.05$).

Conclusion

The results revealed that jack bean flour has potential for human consumption judging from their proximate composition and its anti-nutritional content after processing. It also indicated that processing such as roasting and boiling had varying effect on the functional properties and reduces the anti-nutritional factors of jack bean which provide opportunity for the exploitation of its potential. However, roasting on the other hand affects the appearance, aroma, taste and overall acceptability of the 'moin-moin'. Hence, 'moin-moin' produced from the two processing methods (raw and boiled methods) were accepted by the panelist.

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