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Effects of drying of cowpea grains on consumer acceptability *of moin-moin*

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ABSTRACT

A drying test was conducted on wet de-hulled cowpea grains to ascertain the effects of drying at 60°C, 70°C, 80°C, and 90°C *on the physico-chemical properties and sensory evaluation (consumer acceptability) of moin-moin from different flours. Chemical analyses were conducted on the flour to ascertain the effect of different levels of drying on the protein, carbohydrate and water binding capacity of the flours. A fifteen member trained panelist was purposively chosen to assess the quality of the moin-moin produced. The results of the analysis revealed that temperature of drying affected the protein, carbohydrate and water binding capacity of cowpea flour. The different drying scenarios also affected the acceptability of moin-moin by consumers. The study showed that moin-moin produced from a 60°C dried cowpea grains was sensorily preferred and accepted by consumers.*
Key words: *drying, cowpea flour, moin-moin, consumer preference.*

INTRODUCTION

Cowpea [*Vigna unguiculata* (L.) Walp.] is the most important source of vegetable protein in the daily diets of the rural and urban masses in the dry savannas of West and Central Africa and parts of East and Southern Africa (Singh *et al*, 1985). Because of its high protein, vitamins and minerals contents in daily diets, it impacts positively on the health of women and children (Kay, 1985; Lambot 2002). Cowpea has many uses; it is not only an important source of nutritious food and fodder but also contributes to improved soil fertility and parasitic weed control. Cowpea is consumed in many forms. Young leaves, green pods and green seeds are used as vegetables and dry seeds are used in various food preparations (Nielsen *et al*.1997). The crude protein content ranges from 22 to 30% in the grain and leaves on a dry weight basis (Omueti and Singh, 1987; Nielsen *et al*.1997). It is a source of rich minerals and vitamins in the daily diets and thus it positively impacts on the health of women and children. Bulk of the diet of rural and urban poor especially in Africa, consists of starchy food made from cassava, yam, plantain and banana, millet, sorghum and maize etc. The addition of even a small amount of cowpea ensures nutritional balance of the diet and enhances the protein quality by the synergistic effect of high protein and high lysine from cowpea and high methionine and high energy from the starchy foods (Singh *et al*., 1985).

The determination of the functionality/performance of cowpea varieties would benefit the producers and consumers of cowpea products (Kay, 1985). Whereas much work has been done in other areas, little or no work has been done in the areas of cooking quality and

industrial uses of cowpea, due to limited physico-chemical characterization of cowpea varieties (Ihedioha, 2006).

Cowpea is prepared for consumption in grain, split and ground forms (Mcwatters, 1983; Singh *et al*, 1985). The ground form, called "cowpea flour" is increasingly becoming popular in Nigeria where it is used in preparing various types of food. Compared with cowpea grains that are often damaged by pests during storage, cowpea flour are easier to store for future use. Access to cowpea flour thus enhances food security between harvests (Bliss, 1975). The growth in the dietary share of cowpea flour has been constrained by high labor requirements, the length of time needed for its preparation, some undesirable products characteristics, and difficulty in achieving appropriate drying time and temperature (Ihedioha, 2006).

In recent years, the consumption of *moin-moin* (a processed product from cowpea) has increased tremendously in many developing countries due to increasing populations, urbanization, changing food habits and improvement in value-addition on cowpea grains (Ihedioha, 2006). However, most developing countries rely on grinding home-dehulled cowpea grains in local wet-mills due to climate and lack of adequate drying platforms and milling equipment. Where these exist, their efficiency and operations are often hampered by limited electricity supply.

Recently, in response to consumer demand, Mr. Biggs (one of the most popular and nation-wide eatery outfits in Nigeria) has included *moin-moin* among its menu. The initial path followed by the company consisted of wet de-dulling of cowpea and wet-milling of the de-hulled cowpea into a paste for the production of *moin-moin*. This path was observed to be high labor-demanding and in addition to increasing the unit cost of the *moin-moin* produced (reducing profit), also failed to result in the volume required to steadily meet the demand for *moin-moin*. In order to overcome this constraint, the company resorted to contract buying of cowpea flour (ground form of cowpea grain), for use in making *moin-moin*. Although this effort resulted in increase in the quantity of *moin-moin* available for sale by Mr. Biggs, a sharp fall in demand and acceptability were observed.

This study was carried out to understand the reasons for the alterations in consumer acceptance of *moin-moin* produced using the less labor-demanding process of using cowpea flour. The study thus evaluated the effects of drying on the physico-chemical properties of cowpea flour and how these affect the acceptability of *moin-moin* produced. Components of the study included drying, laboratory tests and use of taste panels. Results from the drying tests, however, appeared to be the most revealing.

Materials and Methods

Source of cowpea grains: The cowpea grains (IT 89KD – 391) used for the experiment were obtained from the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria. This variety of cowpea is *Striga* resistant and usually matures 90 days after planting.

Preparation of cowpea flours: The cowpea grains were manually de-hulled and dried using a cabinet drier at 60^{o}C, 70^{o}C, 80^{o}C, and 90^{o}C for 24 hours in each case. The dried de-hulled cowpea samples were milled, using a hammer mill (model A1, Nigeria Tech. Co, Lagos). The milled flour was sieved through a 250 micro-mesh sieve.

Determination of chemical compositions: The chemical determinations made of each of the cowpea flour samples include: moisture content, protein content, ash content, and carbohydrate and crude fibre content using AACC (1981) and AOAC (1975) methods. The flour hydration capacities were also measured using the method of Yasunaga *et al* (1968), and calculated using the formula:

$$\text{Hydration capacity (\%)} = \frac{\text{Uptake of water (g)}}{\text{Flour dry matter content}} * \frac{100}{1}$$

Methods of Data Analysis: Data were analyzed using the simple Analysis of Variance (ANOVA) procedure or the Super ANOVA (Abacus Concepts Inc, Berkeley, CA, USA) in the Statistical Analysis System (SAS) package. Duncan's Multiple Range Test was used to test and determine statistical differences.

Preparation of moin-moin: The basic recipe used to make *moin-moin* (see Table 1) and conditions were developed from those of Mr. Biggs (2004). The minimum salt, oil and pepper concentrations were determined using trained taste panel. All dry ingredients, including crushed pepper, were mixed using a Kenwood mixer (model KM 201) at low speed (No. 1 setting) for 1.5mins. Warm water (55 - 60^{o}C) was added at this stage, and since the flour is in powdery form, allow the mixture to hydrate and rise optimally for 20 min. The slightly cohesive and viscous paste was then scooped into nylon/cellophane bags, tied and put in a boiling water to cook for 45 min. This method (Table 1) was repeated for the flour samples corresponding to the various temperature of drying.

Sensory evaluation of moin-moin: A fifteen-member purposively trained sensory evaluation panel comprising of males and females from the low and middle income groups in Nigeria were used to evaluate the *moin-moin* produced using cowpea flour dried at the various temperatures. The quality attributes assessed were texture, taste, flavour, colour, and general acceptability.

Results and Discussion

The effects of different drying temperatures on the physico-chemical properties of cowpea flour

Protein content: Drying cowpea flour at various temperatures has effects on the protein content. The cowpea flour dried at 60^{o}C had a lower protein content than cowpea flour dried at 90C (Table 2).

Carbohydrate: Cowpea flour dried at 60^{o}C has more carbohydrate content than that dried at 90^{o}C (Table 2). At 90^{o}C, most of the carbohydrates would have gelatinized and caramelized, explaining why the carbohydrate content went down.

Water binding capacity (WBC): Drying of cowpea flour at various temperatures has profound effect on the water binding capacity. The water binding capacity of flour at temperature 60^{o}C was much lower than that at 90^{o}C (Table 3). Cowpea flour obtained from 90^{o}C dried cowpea absorbed much warm water during paste formation.

Effect of drying on cowpea flour: Food legumes including cowpea are affected by processing (e.g., cooking, drying) (Singh, *et al*, 1985; Hamid, *et al*, 1984; Onayemi, *et al*, 1976; Geervani, *et al*, 1980). Increasing the temperature of drying of cowpea flour up to 90^{o}C, increases the protein content, and decreases the carbohydrate content. Similarly, because cowpea dried at 90^{o}C has lost more water than that at 60^{o}C, it followed that it absorbed more water. It was also observed that the paste of cowpea flour dried at 90^{o}C needed for more water to form a good paste, even though, it retrograded on physically observation.

Sensory Evaluation: A multiple comparison scoring difference test was used to determine if there were any perceived differences (by the taste panel members) among the different moin-moin samples (see Table 3). The test showed that there was no significant difference in colour and sweetness of the moin-moin ($P<0.05$) dried at different temperatures. There was a significant difference in the texture, taste and general acceptability of the different moin-moin samples ($P<0.01$, 0.05). With respect to texture, most of the panel members felt that *moin-moin* prepared using cowpea flour dried at 60^{o}C had smooth texture, compared to the rubbery and sticky texture of moin-moin prepared using the cowpea flour dried at 90^{o}C ($P<0.05$). The *moin-moin* prepared using cowpea flour dried at 60^{o}C also had better rating on taste and general acceptability compared to the others.

Conclusion

Varying drying temperatures of de-hulled cowpea grain has profound influence on the quality and acceptability rating of *moin-moin*. Also, drying de-hulled cowpea at different temperatures affect the physico-chemical properties of cowpea flour.

Thus quality and acceptance of moin-moin is influenced by the temperature used in drying the cowpea for cowpea flour. The result from the sensory evaluation panel showed that *moin-moin* made from flour dried at 60^{o}C had better taste, texture and is more accepted by the public.

In order to sustain the interest of the consumers and maintain the demand for their *moin-moin*, Mr. Biggs must ensure that the firms from where they source their cowpea flour undertake the drying process at 60^{o}C temperature. It will be nice to explore the possibilities of even further increasing the demand for *moin-moin* by experimenting with other drying temperatures lower than 60^{o}C.

REFERENCES

AACC (1981): Official Methods of Analysis. American Association of Cereal Chemists, St. Paul, M.N

AOAC (1975): Official Methods of Analysis. Association of Official Analytical Chemists, Washington, DC

Bliss F. A (1975): Cowpeas in Nigeria. In Milner, M, ed. Proceedings of a nutritional improvement of food legumes by breeding, 3 – 5 July, 1972, NY, United Nations Protein Advisory committee

Geervanid, P. and Theophilus F (1980): Effects of home processing on the protein quality of selected legumes. J. of Food Science 54: 243 - 245

Hamid Abbas, E. L. Faki, Venkataramen L. V, and Desikachar, H S K (1984): Effect of processing on the in-vitro digestibility of proteins and carbohydrates in some Indian legumes: Qualitas plantarum plant foods for human nutrition 34: 122 - 133

Ihedioha D. O (2006): Constraints/Solutions to cowpea value chain for processors/adding value to cowpea in Nigeria; paper presented in Cowpea Utilization meeting, 14 – 17 July, 2007, Abuja, Nigeria

Kay H. Mcwatters (1985): Functionality of Cowpea Meal and Flour in Selected Foods; in Cowpea Research, Production and Utilization. John Wiley and Sons Ltd.

King, J., D.O. Nnanyelugo, H.Ene-Obong and P.O.Ngoddy, (1986). Nutrient Supplied by Cowpeas and other legumes in diets of Pregnant Women and Pre-School Children in Northern Anambra State: Nigeria. Special Issue, Tropical Grain Legume bulletin 32, World Cowpea Research Conference 5-9 November 1984, Country Reports 1986. IITA Ibadan, Nigeria.

Lambot, C. (2002). Industrial potential of cowpea. In: Fatokun,C.A., S.A. Tarawali, B.B. Singh, P.M.Kormawa, and M. Tamo(editors) 2002. Challenges and Opportunities for enhancing sustainable cowpea production. Proceedings of the World Cowpea Conference III held at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, 4-8 September 200. IITA, Ibadan, Nigeria.

Mcwatters, K. H (1983): Compositional, physical and sensory characteristics of Akara processed from cowpea paste and Nigerian cowpea flour. Cereal chemistry 60: 333 – 336

Mr. Biggs (2004): Recipe Booklet for Mr. Biggs Catering Services

Nielsen, S.S., Ohler, T.A., and Mitchell, C.A. (1997). Cowpea leaves for human consumption: production, utilization and nutrient composition. In: Singh, B.B., Moham Raj D.R.,

Dashiell, K.E., and Jackai, L.E.N. (Eds.). Advances in Cowpea Research. Copublication of International Institute of Tropical Agriculture (IITA) and Japan International Research Centre for Agricultural Science (JIRCAS). IITA, Ibadan, Nigeria. Pp. 326-332

Omueti, O. and B.B. Singh (1987).Nutritional attributes of improved varieties of cowpea (Vigna unguiculata[L.] Walp.) Food Sciences and Nutritions 41F:103-112

Onayemi, O., Pond, W. G., and Krook, L. (1976): Effects of processing on the nutritive value of cowpeas for growing rat. Nutrition Reports International 13: 299 - 305

Singh, B.B., Cambliss, O.I., and Sharma, B., (1997). Recent advances in cowpea breeding. In: Singh B.B. Mohan Raj, ., D.R., Dashiell, K., and Jackai, L.E.N. (Eds.) 1997. Advances in cowpea research. Copublication of International Institute of Tropical Agriculture (IITA) and Japan International Centre for Agricultural Sciences (JIRCSA), IITA, Ibadan, Nigeria. Pp. 30-49

Singh, S. R., and K. O Rachie (1985): Cowpea research, production and utilization, pg 351- 367

Yasunaga Y., Bushul W., and Irvine G.N. (1968): Gelatinization of Starch during bread baking. Cereal Chemistry 45: 269 – 279

Table 1: Formula for making *moin-moin*

Ingredients	Amount
Cowpea flour (at different temperatures)	500g
Warm water (55^{o}C)	800ml
Salt	25g
Red oil	30ml
Crushed pepper	30g
Maggi/seasoning	20g

Table 2: Effect of drying in some physico-chemical properties of cowpea flour

Drying temperature	% Protein Content	% Carbohydrate content	% Water Binding Capacity
60	18.5a	66.8d	103.6a
70	19.7a	65.2c	106.2b
80	21.3b	63.4b	109.3c
90	22.1b	61.6a	116.7d

*** The sample score means with the same letters are not significantly different (P<0.05)*

Table 3: Taste panel evaluation of moin-moin: multi-comparison scoring difference test

Temperature	Sweetness	Color	Texture	Taste	General Acceptability
60^{o}C	3.2a	2.9a	2.5a	2.2a	1.5a
70^{o}C	3.3a	3.2a	3.4b	3.4b	2.4b
80^{o}C	3.5a	3.2a	4.5c	4.6c	3.5c
90^{o}C	3.8a	3.3a	5.3d	5.5d	5.2d

** Samples scores are based on a seven-point scale with 1 --- excellent, 2 ---- very good, 3--- good, 4 ----- fair, 5 ---- poor, 6 ---- very poor, 7 ---- unacceptable.*

*** The sample score means with the same letters are not significantly different (P<0.05)*