Quality and Sensory Properties of Pounded Cocoyam from Different Varieties of Cocoyam.

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ABSTRACT

In this study, quality and sensory properties of pounded cocoyam from different varieties of cocoyam was evaluated. The corms of two cocoyam varieties, *Colocasia esculentum* (OMC299) and *Xanthosoma sagittifolium* (OMX444) were used. Samples of the pounded cocoyam produced were analyzed to determine yield, lump quantity, proximate composition, flavor, and textural acceptability. The results obtained showed that there were increases ($p<0.05$) in the moisture contents of pounded cocoyam which ranged from 70.42% to 71.22% compared with cocoyam 63.78% to 65.82%. The yield range was 79.15% to 82.36%. The value was slightly higher for OMX 444 when compared with other variety. There were increases in quantities of crude fiber and ash while protein and fat contents decrease in the lumps. OMX 444 produced least quantity of lumps while OMC 299 produced higher quantity of lumps.

(Keywords: cocoyam, pounded cocoyam, quality, variety acceptability, protein, fiber, fat content, nutritive value, *Colocasia sp*., *Xanthosoma sp*.)

INTRODUCTION

Pounded yam is a very popular delicacy in Nigeria (Olaoye and Oyewole, 2012). Pounding of yam or cocoyam with pestle in a mortar is a special way of producing pounded yam, a special delicacy in most parts of Nigeria. Pounding of boiled yam or cocoyam in a mortar with intermittent addition of water makes the yam softer and finer and increases the surface area upon which digestive enzymes will act, thus bringing about more rapid absorption of glucose.

Studies on pounded yam, pounded cocoyam, yam flakes, yam flour and canned yam have been reported by various researchers (Makanjuola, 1974; Onayemi and Potter, 1974; Ayernor, 1976; Ajibola *et al,* 1988; Adegunwa, *et al.,* 2011; Olaoye and Oyewole, 2012; Adeyeye and Oluwatola, 2014).

Cocoyam (*Colocasia* and *Santhosoma spp.*) is a corm and herbaceous perennial plant belonging to the Araceae family and constitutes one of the six most important roots and tuber crops world-wide. It is also a nutritious root vegetable plant that is eaten in many different cultures around the world (Nwagbo, 2011). Cocoyam is used mainly for human food. It is commonly grown amongst small scale farmers who operate within the subsistence economy. In the past, it is regarded as a lowly important crop which cultivation and consumption lay within the less privileged farmers (www.ics-nigeria.org). It ranks third in importance after yam and cassava in extent of production among the root and tuber crops of economic value in Nigeria (FAO, 2006) and is in direct competition with cassava and yam as food (Okoye *et al.,* 2009).

The nutritive value of cocoyam can be found in many research studies. Like many plants of the Araceae family, cocoyam grows from the fleshy corm (tuber) that can be boiled, baked or mashed into a meal and used as staple food or snack. The corms supply easily digestible starch and are known to contain substantial amounts of protein, vitamin C, thiamine, riboflavin, niacin and significant amounts of dietary fiber (Niba, 2003). Leaves of taro (*Colocasia*) are cooked and eaten as vegetable. They contain _-carotene, iron and folic acid, which protect against anaemia (FAO, 1990; Sukamoto, 2003), and are important source of proteins and vitamins. The main nutrient supplied by cocoyam, as with other roots and tubers, is dietary energy provided by the carbohydrates (Jirarat *et al.,* 2006).

Cocoyam can be made into flour which is used for the preparation of soups, biscuits, bread, beverages, and puddings. Other uses of cocoyam include: (i) Cormels are peeled, cut into necessary pieces then fry and eat; boil and eat; or boil to pound like pounded yam. Cocoyam flour is made from dried cormels, and can be used for confectionary. The broad leaves are equally used for wrapping purposes for example kolanut, bitter-cola (orogbo), etc.

The quality of pounded cocoyam is very important and how cocoyam variety could affect it is very important. Hence, a study was carried out to assess quality and sensory properties of pounded cocoyam from different varieties of cocoyam.

MATERIALS AND METHODS

The corms of two cocoyam varieties, *Colocasia esculentum* (OMC299) and *Xanthosoma sagittifolium* (OMX444) were obtained from Omida market in Abeokuta in South Western part of Nigeria.

A traditional protocol for the production of pounded yam was developed (Osuji, 1983; Adeyeye and Oluwatola, 2014) in the laboratory. Samples of the pounded cocoyam produced were analyzed to determine yield, lump quantity, proximate composition, flavor, and textural acceptability.

Production of Pounded Cocoyam

The method used for the production of pounded cocoyam was as described by Osuji, (1983) and Olaoye and Oyewole (2012), and Adeyeye and Oluwatola (2014), and cut into small cubes of about 10 cm length and after weighing were boiled for 30 minutes to soft. The boiled cocoyam slices from each variety were pounded separately with a National yam pounder coded SD2100Y at maximum speed turning for 5 minutes and 50ml of water being added during pounding. The weight of pounded cocoyam and the quantity of lumps by number, weight and percentage in each pounded yam were determined and recorded.

Collection of Analytical Samples

Samples were collected into different containers for specific analysis; those for physical and chemical analysis were collected into zip laboratory bags and those for sensory analysis in small Chinese plates. Analyses were done immediately.

Determination of the Physico-Chemical Parameters

Proximate analyses were carried out on the two varieties of cocoyam used for the experiment. The yield analysis was also done. The moisture contents of the samples were obtained by direct oven drying of the tubers after being cut into thin slices while the dried thin slices were made into flour before other analyses were carried out.

Moisture content and crude fiber of the tuber, pounded cocoyam and lumps were determined by AOAC method (1990). Crude protein content was determined by the standard Kjeldahl method AOAC method (1990). Fat contents of the samples were measured using the Soxhlet extraction method according to AOAC method (1990). Ash content was determined by igniting 5g of sample in a furnace (Hot pack, Waterloo, Ontario) for 4 hours at $550^{o}C$ until a light grey ash color was observed and a constant weight achieved (Josyln, 1970; Osborne and Voogt, 1978). Carbohydrate content was determined by difference. Amylose content was determined by a rapid colorimetric procedure (Charistil, 1987) in each sample of cocoyam and lumps from pounded cocoyam.

Sensory Analysis

A panel of nine (9) untrained students (5 men and 4 women) was used to do sensory evaluation. Panelists were on separate sensory booths and water was given in between taste e test. They were asked to describe the sensory characteristics of the samples of pounded yam on a 9-point hedonic scale which ranged from like extremely to dislike extremely. The attributes tested were color, taste, texture, elasticity and overall acceptability (Table 6).

Data Analysis

The data obtained were analyzed using SPSS 16.0. Means and Standard deviations were determined using descriptive statistics. Comparisons between samples (Table 6) were determined using analysis of variance (ANOVA). Statistical significance was defined at P<0.05.

RESULTS AND DISCUSSION

The data obtained on the physico-chemical characteristics of cocoyam, pounded cocoyam and lumpsare presented in table 2 to 5. The parameters examined were among the quality parameters required in pounded yam and were selected based on the anticipated effects these could have on the quality of pounded cocoyam.

Moisture Content

Moisture content of the two cocoyam varieties ranged from 63.78% to 65.82%. These values were lower than the range given by different authors (Oyenuga, 1968; Ihekoronye and Ngoddy, 1985; Adegunwa, *et al.,* 2011). There was an increase in the moisture content of the boiled yam compared to raw yam, this might be due to absorption of water and subsequent swelling of starch granules of the cocoyam. The moisture content of the lumps was lower than that of the boiled yam. This may be implicated in the quantity of lumps and the size of each lump found in each product from different cocoyam varieties.

Ash Content

The ash contents of the yam varieties and that of the pounded yam are in agreement with those reported by Oyenuga 1968; Ihekoronye and Ngoddy,1985; Adegunwa, *et al.,* 2011. The ash contents of the lumps are higher than those of the raw cocoyam and *Colocasia esculentum* (OMC299) had the highest ash content. This also corresponds with the crude fiber and mineral contents as reported by Iherokonye and Ngoddy (1985); Adegunwa, *et al.,* (2011).

Crude Fiber Content

The crude fiber contents of the two cocoyam varieties ranged from 2.55% to 2.58% while their lumps were moderately higher with the range between 2.88% and 2.95%. These are in agreement with those reported by Oyenuga (1968); Ihekoronye and Ngoddy (1985); Adegunwa, *et al.,* (2011).

Protein Content

The protein contents of the cocoyam varieties used were in the range 7.63% to 7.75% and are in agreement with the range given by Oyenuga (1968); Ihekoronye and Ngoddy (1985); Adegunwa, *et al.,* (2011). However, the protein contents found in the lumps from pounded cocoyam decreased with respect to each sample. This low value of fat in yam makes it an insignificant factor. However, Osagie (1977) found that the viscosity and texture of pounded yam is due to the fat content present in the yam in combination with the starches.

Amylose Content

The amylose contents of the two cocoyam varieties used for this study raised from 21.32% to 23.10% and are in agreement with those reported by Rasper and Coursey (1967), Onwueme (1978) and Ihekoronye and Ngoddy (1985).

Yield Analysis

Some variation was observed in the yield analysis. The range was 79.15% to 82.36%. The value was slightlyhigher for *Xanthosoma sagittifolium* (OMX444) when compared with other variety. *Colocasia esculentum* (OMC299) produced lowest yield. The range of lumps in each variety was between 7.41% to 7.68%. *Colocasia esculentum* (OMC299) produced highest lumps while *Xanthosoma sagittifolium* (OMX444) produced lowest lumps.

Sensory Analysis

Presented in Table 6 are the results from the sensory analysis on pounded cocoyam samples. Samples of freshly prepared pounded cocoyam were used for the evaluation. On the scale of aroma description, there was a significant difference at 5% probability level (p<0.05) between the samples of pounded cocoyam obtained from different yam varieties. For taste, there was significant difference between all the samples produced from different yam varieties at 1% (p<0.01) and 5% (p<0.05) probability levels.

Table 1: Samples of Cocoyam and Pounded Cocoyam Analyzed and their Codes.

Sample	Code
Cocoyam corm	(*Colocasia esculentum)* OMC 299
Cocoyam corm	(*Xanthosoma sagittifolium)* OMX 444
Pounded cocoyam	(*Colocasia esculentum)* OMC 299$_b$
Pounded cocoyam	(*Xanthosoma sagittifolium)*OMX 444$_b$
Pounded cocoyam lumps	(*Colocasia esculentum)* OMC 299$_c$
Pounded cocoyam lumps	(*Xanthosoma sagittifolium)* OMX 444$_c$

Table 2: Yield and Lump Analyses for Pounded Cocoyam.

Sample	Yield (% fresh wt basis)	Lump (% w/w)	Lump Number Long Pounded Cocoyam	Lumps Weight (g) /100g pounded cocoyam
OMC 299	79.15 + 0.65^a	7.68 + 0.05^a	11^a	7.69 + 0.02^a
OMX 444	82.36 + 0.70^b	7.41 + 0.05^b	9^b	7.41 + 0.01^b

Data are means of triplicate measurements ± standard deviation
Data with different superscripts on the same row are significantly different (p<0.05)

Table 3: Proximate Analysis of Cocoyam Varieties per 100g on Dry Weight Basis.

Component	OMC 299	OMX 444
Ash	3.30 + 0.02^a	2.99 + 0.02^b
Fat (Esther extract)	0.32 + 0.01^a	0.21 + 0.01^b
Crude Fiber	2.58 + 0.01^a	2.55 + 0.02^b
Protein	7.75 + 0.02^a	7.63 + 0.05^b
Moisture (Raw)	63.78 + 1.01^a	65.82 + 0.50^b
Moisture (Boiled)	72.63 + 1.05^a	76.10 + 0.50^b
Amylose	21.32+1.05^a	23.10 + 0.05^b

Data are means of triplicate measurements + standard deviation
Data with different superscripts on the same column are significantly different (p<0.05)

Table 4: Proximate Analysis of the Lumps from Pounded Cocoyam per 100g on Day-Weight Basis.

Component	OMC 299$_c$	OMX 444$_c$
Ash	3.75+ 0.02^a	3.06 + 0.02^b
Fat (Esther extract)	0.38 + 0.01^a	0.26+ 0.01^b
Crude Fiber	2.95 + 0.01^a	2.88 + 0.01^b
Protein	7.68 + 0.03^a	7.60 + 0.03^b
Moisture (Raw)	63.74 + 0.50^a	65.82 +0.50^b
Moisture (Boiled)	70.42 + 0.50^a	71.22 + 0.50^b
Carbohydrate	85.24 + 0.60^a	86.20+ 0.60^b
Amylose	21.31+ 0.30^a	23.10 + 0.30^b

Data are means of triplicate measurements + standard deviation
Data with different superscripts on the same column are significantly different (p<0.05)

Table 5: Yield of Pounded Cocoyam per 500g of Peeled Fresh Cocoyam Corm.

Sample	OMC 299$_c$	OMX 444$_c$
Yield (g)	770^a	780^b
% increase in yield (%w/w)	54^a	56^a

Data are means of triplicate measurements + standard deviation
Data with different superscripts on the same column are significantly different (p<0.05)

Table 6: Yield and Lump Analyses for Pounded Cocoyam.

Sample	Color	Texture	Taste	Elasticity	Overall Acceptability
OMC 299$_b$	6.0^a	6.5^a	5.8a	5.1^a	5.2^a
OMX 444$_b$	7.3^b	6.8^b	6.8^b	5.6^b	6.6^b

Data are means of triplicate measurements + standard deviation
Data with different superscripts on the same column are significantly different (p<0.05)

For texture there was significant difference between all the samples produced from different yam varieties at 1% ($p<0.01$) and 5% ($p<0.05$) probability levels. For color and elasticity, there was significant difference at 5% ($p<0.05$) and 1% ($p<0.01$) probability levels for the samples produced from different cocoyam varieties. Overall acceptability as indicated by the panelists showed that pounded cocoyam produced from *Xanthosoma sagittifolium* (OMX444) has better organoleptic properties compared to the pounded cocoyam from other cocoyam variety, *Colocasia esculentum* (OMC299).

CONCLUSION

The physico-chemical characteristics, notably, yield, proximate composition and amylose content of pounded cocoyam, produced from two different cocoyam varieties were studied. Generally, there appeared to be a significant difference in some quality parameters of pounded cocoyam from different cocoyam varieties. These observations suggest that varieties may affect quality and acceptability of pounded cocoyam, but there is the possibility of getting good quality and acceptable pounded cocoyam from different cocoyam varieties. *Xanthosoma sagittifolium* (OMX444) produced the most acceptable and preferred pounded cocoyam samples. Since some consumers would still prefer pounded cocoyam from *Xanthosoma sagittifolium* (OMX444), it is recommended that further work should be done on this and the production of *Xanthosoma sagittifolium* (OMX444) should be improved on through the work of agronomists and extensionists.

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