Quality Assessment and Acceptability of Pounded Yam from Different Varieties of Yam

Adeyeye Samuel Ayofemi [1]and Oluwatola Olatunde Jacob [2]

[1.] Department of Food Science & Technology, Federal University of Agriculture, Abeokuta, Nigeria
[2.] Consumer Protection Agency, Abuja, Nigeria
saadeyeye@yahoo.com

Abstract: A study was carried out to assess the quality of pounded yam produced from different varieties of yam. Pounded yam is a very popular delicacy in Nigeria. Pounded yam was produced from four yam varieties, *Dioscorea esculenta* (TDE 170), (TDR 179), *Dioscorea cayenensis* (TDC 760), and *Dioscorea alata (*OMD 840). A traditional protocol for the production of pounded yam was simulated in the laboratory. Samples of the pounded yam produced were analyzed for yield, lump quantity, proximate composition, flavour and textural acceptability. Data obtained were evaluated. The results obtained suggested that there were increases in the moisture content of the pounded yam compared with the yam. There were also increases in crude fibre and ash contents of the lumps while protein and fat contents decrease in the lump. OMD 840 gave high quantity of lumps among the yam varieties used, followed by TDC 760, TDR 179 and TDE 170. The results of sensory analyses done showed that pounded yam samples from TDE 170 were more acceptable than those from TDE 179, TDC 760 and OMD 840.
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1.0 Introduction

Yam, *Dioscorea* (*spp.*) is an important source of carbohydrate for many people of the sub-Sahara region, especially in the yam zone of West Africa (Akissoe, *et al.,* 2003). Babaleye (2003) reported that yam contributes more than 200 dietary calories per capita daily for more than 150 million people in West Africa and serves as an important source of income to the people. Yams are commonly consumed with sauces after boiling, roasting, or frying. It is mashed or pounded into dough after boiling (Ferede *et al.,* 2010; Omonigho and Ikenebomeh, 2000).There are indications that yam has great prospect of contributing to closing the projected food deficit in Africa in the 21st century, if efforts are made to identify and overcome the constraints to its production (FAOSTAT, 1994).

Pounded yam is a very popular delicacy in Nigeria (Olaoye and Oyewole, 2012).Pounding of yam with pestle in a mortar is a special way of producing pounded yam, a special delicacy in most part of Nigeria. Pounding of boiled yam 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, Abonyi and Onayemi, 1988; Adegunwa, *et al.,*2011; Olaoye and Oyewole, 2012).The quality of pounded yam is very important and that the yam variety couldaffect it. Hence, a study was carried out to assess thequalityof pounded yam produced from different varieties of yam.

2.0 Methodology

A traditional protocol for the production of pounded yam (Fig.1) was simulated (Osuji, 1983) in the laboratory. Samples of the pounded yam produced were analyzed to determine yield, lump quantity, proximate composition, flavour and textural acceptability.

2.0.1 Materials

The tubers of three yam varieties, *Dioscorea rotundata* Poir (TDR 179), *Dioscorea cayenensis* (TDC 760) and *Dioscorea esculenta* (TDE 170) were obtained from IITA, Ibadan and tubers of *Dioscorea alata* (OMD 840) were obtained from Omida market in Abeokuta both in South Western part of Nigeria.

2.0.2 Production of Pounded Yam

The method used for the production of pounded yam was as described by Osuji (1983) and Olaoye and Oyewole, (2012). Yam tubers were peeled, washed, cut into small cubes of about 10cm length and after weighing were boiled for 30 minutes to soft. The boiled yam 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 (Fig. 1).

The weight of pounded yam and the quantity of lumps by number, weight and percentage in each pounded yam were determined and recorded.

2.1 Analysis of Sample

2.1.1 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.

2.1.2 Determination of the physico-chemical parameters

Proximate analyses were carried out on the four varieties of yam 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 fibre of the tuber, pounded yam 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 colour was observed and a constant weight achieved (Josyln, 1970; Osborne and Voogt, 1978). Carbohydrate was determined by difference. Amylose content was determined by a rapid colorimetric procedure (Charistil, 1987) in each sample of yam and lumps from pounded yam.

2.2 Sensory Analysis

A panel of nine (9) untrained students was used to do sensory evaluation. Panelists 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 colour, taste, texture, elasticity and overall acceptability (Table 6).

2.3 Data Analysis

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

2.4 Results and Discussion

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

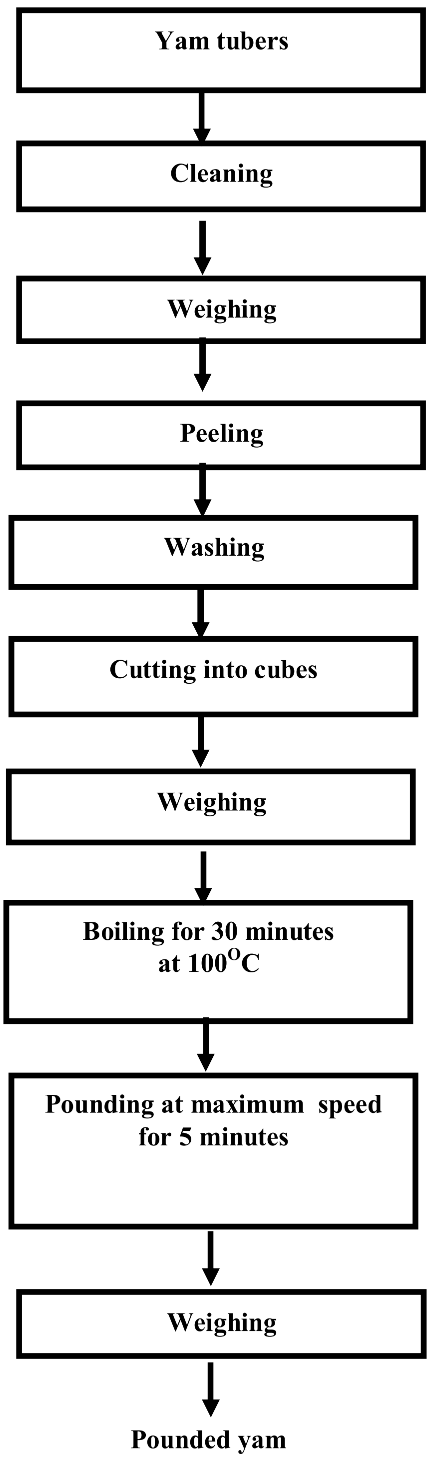

Fig: 1: Process flow chart of pounded yam.

2.4.1 Moisture Content

Moisture content of the four yam varieties ranged from 44.66% to 66.92%. These values were lower than the range given by different authors (Oyenuga, 1968; Osuji, 1983; Ihekoronye and Ngoddy, 1985; Ferede *et al.,* 2010; Omonigho and Ikenebomeh, 2000; Adegunwa, *et al.,* 2011). The variation in moisture content might be due to the length of storage. 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 yam. The moisture content of the lumps were 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 yam varieties.

2.4.2 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; Ferede *et al.,* 2010; Omonigho and Ikenebomeh, 2000; Adegunwa, *et al.,* 2011.The ash contents of the lumps are higher than those of the raw yam and *Dioscorea alata* (OMD 840) had the highest ash content. This also corresponds with the crude fibre and mineral contents as reported by Eka (1985); Iherokonye and Ngoddy (1985); Ferede *et al.,* 2010; Omonigho and Ikenebomeh, 2000; Adegunwa, *et al.,* 2011.

2.4.3 Crude Fibre Content

The crude fibre contents of the four yam varieties ranged from 1.23 to 1.92% while their lumps were moderately higher with the range between 1.56 and 2.95%. These are in agreement with those reported by Oyenuga (1968), Eka (1985), Ihekoronye and Ngoddy (1985); Ferede *et al.,* 2010; Omonigho and Ikenebomeh, 2000; Adegunwa, *et al.,* 2011.

2.4.4 Protein Content

The protein contents of the yam varieties used were in the range 6.50 to 6.75% and are in agreement with the range given by Oyenuga (1968); Ihekoronye and Ngoddy (1985) but slightly higher than the one reported by Eka (1985). However, the protein contents found in the lumps from pounded yam 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.

2.4.5 Amylose Content

The amylose contents of the four yam varieties used for this study raised from 15.12 to 23.25% and are in agreement with those reported by Rasper and Coursey (1967), Onwueme (1978) and Ihekoronye and Ngoddy (1985); Ferede *et al.,*(2010); Omonigho and Ikenebomeh, (2000).

2.4.6 Yield Analysis

Some variation was observed in the yield analysis. The range was 70.82 to 81.63%. The value was slightly higher for *Dioscorea rotundata* (TDR 179) when compared with other varieties. *Dioscorea alata* (OMD 840) produced lowest yield. The range of lumps in each variety was between 5.86 to 6.57%. *Dioscorea cayenensis* (TDC 760) produced highest lumps while *Dioscorea alata* (OMD 840) produced lowest lumps.

2.4.7 Sensory Analysis

Presented in Table 6 are the results from the sensory analysis on pounded yam samples. Samples of freshly prepared pounded yam were used for the evaluation. On the scale of aroma description, there was a significant difference at 10% probability level ($p \leq 0.10$) between the samples of pounded yam obtained from different yam varieties. For taste, there was no significant difference between all the samples produced from different yam varieties at 5% ($p \leq 0.05$) and 1% ($p \leq 0.01$) probability levels. For texture, colour and elasticity, there was no significant difference at 5% ($p \leq 0.05$) and 1% ($p \leq 0.01$) probability levels for the samples produced from different yam varieties. Overall acceptability as indicated by the panelists showed that pounded yam produced from *Dioscorea esculenta* (TDE 170) has better organoleptic properties compared to the pounded yam from other yam varieties.

3.0 Conclusion and Recommendations

The physico-chemical characteristics, notably, yield, proximate composition and amylose content of pounded yam, produced from four different yam varieties were studied. Generally, there appeared to be a significant difference in some quality parameters of pounded yam. These observations suggest that varieties may affect quality and acceptability of pounded yam, but there is the possibility of getting good quality and acceptable pounded yam from different yam varieties. *Dioscorea esculenta* (TDE 170) which is less known in Nigeria produced the most acceptable and preferred pounded yam samples. Since some consumers would still prefer pounded yam from *Dioscorea esculenta* (TDE 170), it is recommended that further work should be done on this and the production of *Dioscorea esculenta* should be improved on through the work of agronomists and extensionists.

TABLE 1. Samples of yam analysis and their codes

Sample	Code
Yam Tuber (*Dioscorea rotundata)*	TDC 760
Yam Tuber (*Dioscorea esculenta)*	TDE 170
Yam Tuber (*Dioscorea alata)*	OMD 840
Pounded Yam (*Dioscorea rotundata)*	TDR 179b
Pounded Yam (*Dioscorea cayenensis)*	TDC 760b
Pounded Yam (*Dioscorea esculenta)*	TDE 170b
Pounded Yam Lumps (*Dioscorea rolundata)*	TDR 179c
Pounded Yam Lumps *(Dioscorea coyenensis*)	TDC 760c
Pounded Yam Lumps (*Dioscorea alata)*	OMD 840c

TABLE 2. Yield and lump analyses for yam

sample	yield (% fresh wt basis)	lump (% w/w)	lumps number long pounded yam	lumps weight (g) /100g pounded yam
TDR 179	81.63 ± 0.75	6.20 ± 0.05	7	6.20 ± 0.9
TDC 760	78.91 ± 0.70	6.40 ± 0.05	9	6.40 ± 001
TDE 170	77.21 ± 0.70	5.86 ± 0.05	8	5.86 ± 0.02
OMD 840	70.82 ± 0.65	6.57 ± 0.65	6	6.57 ± 0.01

Data are means of triplicate measurements ± standard deviation

TABLE 3. Proximate analysis of yam varieties per 100g on dry weight basis

COMPONENT	TDR 179	TDC 760	TDE 760	OMD 840
Ash	4.02 ± 0.02	4.19 ± 0.5	3.21 ± 005	4.731 ± 0.06
Fat (Esther extract)	0.36 ± 0.01	0.41 ± 0.01	0.08 ± 0.02	0.59 ± 0.03
Crude fibre	1.76 ± 0.01	1.89 ± 0.2	1.23 ± 0.02	1.92 ± 0.5
Protein	6.50 ± 0.02	6.63 ± 0.06	6.75 ± 0.05	6.56 ± 0.06
Moisture (Raw)	44. 66 ± 1.12	58. 84 ± 0.60	50. 65 ± 0.60	66.92 ± 0.65
Moisture (Boiled)	62.68 ± 1.15	74.96 ± 0.65	76.70 ± 0.65	86.97 + 070
Amaylose	23.25 ± 1.05	21.81 ± 0.06	15.12 ± 0.05	21.76 ± 0.06

Data are means of triplicate measurements ± standard deviation

TABLE 4. Proximate analysis of the lumps from pounded yam per 100g on day-weight basis.

COMPONENT	TDR 179c	TDC 760c	TDE 170c	OMD 840 c
Ash	4.06± 0.03	4.25 ± 0.03	3.28 ± 0.02	4.81 ± 0.02
Fat (Esther extract)	0.36 ± 0.01	6.38 ± 0.01	0.07 ± 0.01	0.53 ± 0.01
Crude fiber	2.88 ± 0.02	2.95 ± 0.02	1.56 ± 0.02	2.90 ± 0.01
Protein	6.49 ± 0.03	6.60 ± 0.03	6.72 ± 0.03	6.51 ±0.03
Moisture (Raw)	44.66 ± 0.50	58.84 ±0.50	50.65 ± 0.50	66.92 ± 0.60
Moisture (Lumps)	60.21 ± 0.60	69.87 ± 0.60	71.70 ± 0.60	68.25 ±0.60
Carbohydrate	86.00 ± 0.65	85.82 ± 0.65	88.37 ± 070	85.24 ± 0.65
Amaylose	23.12 ± 0.30	21.46 ± 0.30	15.02 ± 0.30	21.0 ± 0.30

Data are means of triplicate measurements ± standard deviation

TABLE 5. Yield of pounded yam per 500g of peeled fresh yam tuber .

SAMPLE	TDR 179b	TDC 760 b	TDE 170 c	OMD 840c Parameter
Yield (g)	800	765	780	730
% increase in yield% w/w	60	53	56	46

Data are means of triplicate measurements ± standard deviation

TABLE 6. Means scores for sensory attributes for poundedyam samples

Sample	Aroma	Colour	Texture	Taste	Elasticity	Overall Acceptabilty
TDR179b	6.4	5.6	5.4	6.3	6.1	5.9
TDC 760b	6.2	4.4	5.5	4.0	4.8	4.4
TDE 170b	6.5	6.6	6.8	7.3	6.3	6.4
OMD 840b	5.2	4.1	4.1	4.9	4.3	4.4

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Corresponding Author:
Mr. Samuel Ayofemi Adeyeye
Department of Food Science & Technology
Federal University of Agriculture,
Abeokuta, Nigeria
E-mail: **saadeyeye@yahoo.com**

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