Open Access Journal
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THOMSON REUTERS
International Journal of Medical Research and Pharmaceutical Sciences
Volume 5 (Issue 10): October 2018 ISSN: 2394-9414
DOI- 10.5281/zenodo.1463868 Impact Factor- 4.174

PROXIMATE COMPOSITION OF COCOYAM VARIETIES X. SAGITTIFOLIUM (RED COCOYAM) AND X. ATROVIRENS (WHITE COCOYAM) COLLECTED FROM UMUOCHAM MARKET IN ABA, ABIA STATE, SOUTH EASTERN NIGERIA

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Keywords: *proximate composition, cocoyam, X. sagittifolium, X. atrovirens, Umuocham Market, Aba, South Eastern Nigeria*

Abstract

Cocoyam sample varieties: *X. sagittifolium* (Red cocoyam) and *X. atrovirens* (White cocoyam) were analyzed for their proximate composition using standard methods of analysis and experimental design was adopted for the study. The result showed that red cocoyam (*X. sagittifolium*) had a moisture content 65.57 (%); Ash content 3.48 (g/100g); crude fibre content 1.93 (g/100g); fat content 0.40 (g/100g); crude protein content 4.72 (g/100g) and carbohydrate content 20.92 (g/100g) while *X. atrovirens* (White cocoyam) had a moisture content 66.7 (%); Ash content 2.66 (g/100g), crude protein content 3.50 (g/100g), crude fibre content 1.31 (g/100g), fat content 0.41 (g/100g), and carbohydrate content 23.0 (g/100g). The ash, crude fibre and crude protein contents were significantly higher in red cocoyam than white cocoyam variety ($p<0.05$) respectively. However, the fat content was significantly lower in the red cocoyam variety than in the white cocoyam ($p<0.05$), whereas, the moisture contents and carbohydrate contents between both varieties of cocoyam did not differ significantly ($p>0.05$). Therefore, cocoyam consumption could be recommended to both children and adult as a cheap dietary nutrients source for the promotion of good health.

Introduction

Cocoyam, belonging to the Aracaea family is an ancient crop that is grown throughout the tropical and subtropical regions for its edible corms, cormels and leaves, as well as other traditional purposes (Pinto and Onwaeme, 2000). It is among the world's six most important root and tuber crops (FAO, 2012) and is widely cultivated in West Africa including Nigeria (Ihekoronye and Ngody, 1985). The Aracaea family consists of some hundred genera (Okoli and Osuji, 1996), with the genus, Xanthosoma made up of 50-60 species (Stevens, 2012). However, most of all the currently cultivated varieties are grouped into four species: *X. sagittifolium, X. caracu, X. atrovirens* and *X. nigrum* (FAO, 2013; CABI, 2014). According to Falade and Okafor, (2015), Nigeria was ranked the highest producer of cocoyam in the world with an estimated annual production of 3.45 million metric tonnes.

Nutritionally, cocoyam supplies easily digestible starch (Sefa-Dedeh and SacKey, 2002), and are known to contain substantial amounts of proteins, vitamin C, thiamine, Riboflavin, Niacin and significant amounts of dietary fiber (Niba, 2003). The leaves are cooked and eaten as vegetable and contain β-carotene, iron, and folic acid which

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protects against anemia (FAO, 1990; Sukamoto, 2003). Cocoyam is a rich source of carbohydrate, dietary fiber, but it is low in fat, protein and ash contents (Owusu-Darko *et al*., 2014). More so, the main nutrient supplied by cocoyam as with other roots and tuber crops is dietary energy provided by carbohydrates (Jirarat *et al*., 2006). Also, cocoyam has been reported to have superior nutritional value over other major root and tuber crops of West Africa, especially in terms of their protein digestibility and mineral composition (calcium, phosphorus, and magnesium) (Chukwu *et al*., 2008; Ekwe *et al*., 2009; Lim, 2016).

However, irrespective of the nutritional potentials cocoyam provides to its consumers, it has been largely neglected or underutilized in Nigeria. Hence, this study evaluated the proximate composition of cocoyam varieties *X. sagittifolium* (red cocoyam) and *X. atrovirens* (white cocoyam) collected from Umuocham Market in Aba, Abia State, South Eastern Nigeria.

Materials and methods

Sample collection and Preparation

Two varieties of cocoyam *X. sagittifolium* (red cocoyam) and *X. atrovirens* (white cocoyam) samples were randomly selected and purchased from Umuocham Market in Aba, Abia State, Nigeria. Subsequently, the succulent part of the red and white cocoyam was collected, washed in running tap to remove sand and stone. It was then sun dried and ground into fine powdered form using electric blender. Thereafter, the samples were placed in air tight container, well labeled for easy identification. Afterwards, it was kept in a refrigerator at 4 ^{o}C before the analysis.

Proximate analysis

The moisture content, ash content, fat content, crude fibre and crude protein contents of the samples of *X. sagittifolium* and *X. atrovirens* were determined using standard methods according to AOAC, (2005), while the carbohydrate contents of the samples were estimated by difference (%Carbohydrate = 100% - sum of percentage of moisture, ash, fat, crude fiber and crude protein contents).

Statistical Analysis

Samples were analyzed in triplicates and values were evaluated using independent t-test. $P<0.05$ was considered statistically significant.

Results

Table 1 shows the proximate composition of the two varieties of cocoyam (*X. sagittifolium* and *X. atrovirens*).
The moisture contents indicated 65.57% and 66.7% for red and white cocoyam respectively. The moisture contents of both varieties of cocoyam did not differ significantly ($p>0.05$). The ash content showed that red cocoyam contained 3.48g/100g DM while the white cocoyam contained 2.66g/100g DM of ash content. The ash contents was significantly higher in red cocoyam than white cocoyam variety ($p<0.05$). Also, crude fibre and crude protein were significantly higher in the red cocoyam compared with the white cocoyam ($p<0.05$).

However, the fat content was significantly lower in the red cocoyam variety than in the white cocoyam ($p<0.05$). Furthermore, the carbohydrate contents between both varieties of cocoyam did not differ significantly ($p>0.05$).

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Table 1: Proximate composition of X. sagittifolium (red cocoyam) and X. atrovirens (white cocoyam).

Parameters	Red cocoyam	White cocoyam	p-value
Moisture content (%)	65.57±0.03	66.7±0.3	>0.05
Ash (g/100g DM)	3.48±0.02	2.66±0.06	<0.05
Crude fiber (g/100g DM)	1.93±0.10	1.31±0.09	<0.05
Fat content (g/100g DM)	0.40±0.10	0.41±0.01	<0.05
Crude protein (g/100g DM)	4.72±0.02	3.50±0.10	<0.05
Carbohydrate content (g/100g DM)	20.92±0.02	23.00±0.80	>0.05

*values are triplicate determinations for each variety; $p<0.05$ is considered statistically significant.

Discussion

Table 1 presents the proximate composition of cocoyam varieties *X. sagittifolium* (red cocoyam) and *X. atrovirens* (white cocoyam). The moisture contents of the red and white cocoyam were analyzed to be 65.57% and 66.7%, ash: 3.48 and 2.66, crude fibre: 1.93 and 1.31, fat content: 0.40 and 0.41, crude protein: 4.72 and 3.50, carbohydrates: 20.92 and 23.00 g/100g DM respectively. This study revealed a significantly higher ash content, crude fibre and crude protein in the red cocoyam than in white cocoyam respectively ($p<0.05$). However, the fat content was significantly lower in the red cocoyam than in the white cocoyam variety ($p<0.05$) but moisture content as well as carbohydrate content did not differ significantly between both varieties of cocoyam ($p>0.05$). This is in consonance with the report of similar studies (Sefa-Dedeh and Agyir-Sackey, 2002; Ndabikunze *et al*., 2011; Ukom and Okerue, (2018). Our finding is however in contrast with the reports of some similar studies (Olaleye *et al*., 2013). More so, the protein content and carbohydrate content obtained in this study is comparable with the report of Yahaya *et al*., (2013) who investigated the chemical studies of the peel of *Xanthosoma sagittifolium* (Tannia cocoyam). Also, ash content and moisture content reported by Alinnor and Akalezi, (2010) for *Colocasia esculenta* (white cocoyam) were similar to our findings. These results demonstrate that *X. sagittifolium* (red cocoyam) is nutritionally superior to *X. atrovirens* (white cocoyam).

The high level of carbohydrate observed in both varieties of cocoyam suggests that the main nutrient supplied by cocoyam as with other roots and tuber crops is carbohydrate which provides dietary energy for various organ functions in the body. Furthermore, the high moisture content observed in both varieties of cocoyam may indicate the vulnerability of both varieties to microbial attack. This may imply that the sample may not be stored favourably for a long period of time because it may deteriorate. This agrees with the report of Oladebeye *et al*., 2008a.

Interestingly, the ash contents were relatively high. Ash is a measure of total mineral content in the samples. This result indicates that cocoyam contain mineral elements having nutritional importance.

In this study, the fat contents of both varieties of cocoyam were low. This may be due to the high carbohydrate contents observed in both cocoyam varieties. Also, low crude protein content was seen in both varieties of cocoyam, although higher in the red cocoyam compared with the white variety. On the other hand, this study shows that red cocoyam has higher fibre content than the white cocoyam. Dietary fibre plays an essential role in digestion and maintenance of blood pressure.

Conclusion

The present study revealed that cocoyam has an appreciable quantity of ash content, crude fiber, protein and carbohydrate content as well as a high moisture content. However, *X. sagittifolium* (red cocoyam) variety was found to be nutritionally superior to *X. atrovirens* (white cocoyam) in terms of carbohydrate content, moisture content, ash

Volume 5 (Issue 10): October 2018 ISSN: 2394-9414
DOI- 10.5281/zenodo.1463868 Impact Factor- 4.174

content, crude protein and fibre content. Therefore, cocoyam consumption could be recommended to both children and adult as a cheap dietary nutrients source for the promotion of good health.

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