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Selected Chemical Composition and Acceptability Assessment of Pre-treated Dehydrated Telfairia Leaves

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Abstract
Telfairia leaves were harvested fresh, sliced and subjected to different blanching pre- treatments tests - in boiling water, steam, sodium chloride and sodium bicarbonate solutions before drying in a multipurpose produce drier (40-50^{0}C) for preservation. The control portion was dehydrated without any pre-treatment. All the dehydrated test portions were analyzed for proximate composition (moisture, crude protein, crude fat, crude fibre, ash and carbohydrate), microbial quality and sensory acceptability assessments. Dehydrated steam-blanched and water-blanched leaves had relatively lower moisture content (13.75 – 13.99%). Leaf nutrients (crude protein, crude fat and ash) concentrated relatively more in the steam blanched dehydrated leaves. No microorganism was detected in all the dehydrated treated and untreated test portions. Process treatments reduced the sensory acceptability rating of the dehydrated leaves as the untreated control portions were better accepted by assessors.
Keywords: Telfairia leaves, Blanching, Dehydration, Acceptability.

1. Introduction

Pumpkin (Telfairia occidentalis) is a Tropical plant, an African vine known as “ugu” among the Igbos in Nigeria. Telfairia plant belong to the order Curcubitales and family Curcubitacea (Ibekwe et al. 2011; Odiaka & Odiaka 2011). The plant has been fully described (Odiaka & Schippers 2004). The cultivation of the plant which is abundant in Nigeria has extended to Cameroon and Benin Republics and other adjoining West African countries. The composition of the leaves reported recently (Mohammed et al 2012) can be compared to those of other dark green leafy vegetables. Telfairia plant is cultivated for its leaves and edible seeds. The leaves were reported (Omojola & Olusola 2009) to contain high moisture (86.0%) and appreciable values of minerals (mg, fe, and k) and vitamins (ascorbic acid and carotene). The high nutritional content of the tender shoot has made the plant a valuable ingredient in local soup and herbal preparations (Ibekwe et al. 2011). Consumption of the leaves enhances breast milk production in lactating mothers (Akintayo 1997). Extract from the fresh leaves was reported (Schippers 2000; Oyolu 1978) to be a very rich source of protein and iron and has been recommended for anemic patients, weak persons such as those convalescing from attack of malaria. Consumption estimate in Nigeria alone is conservatively put at about 35-40 million.

Telfairia leaf is seasonal and abundant during the rainy season in Nigeria. The leaf is very sensitive to harsh weather (hot weather), wilts and looses freshness within few hours and subsequently become less turgid and unacceptable to consumers. Conservative estimate put average handling losses to about 60% within 24 hours in Nigerian markets. The perishable nature of the leaves creates handling problem after harvest.

Dehydration has potential to increase preservation of vegetables (Brains & Alexander 1989;). The process reduces water in the vegetable. Blanching slows down enzymic activities and growth of spoilage organisms (Kendal et al. 2014). Drying enhances convenience and shelf life and add value to the produce and could facilitate diversification of its uses in pharmacology and health preparations. The potential of the dried leaves as an export vegetable could also be enhanced.

Information on acceptability of pre-treated dehydrated leaves is scarce. There is therefore the need to develop treatments and dehydration processes that will add value and diversify the use of the leaves.

The study evaluated changes in selected chemicals and acceptability of pre-treated dehydrated Telfaira leaves.

Materials & Methods

Fresh shoots and succulent leaves of Telfairia (50kg) were harvested from an identified vegetable farm in Port Harcourt, Nigeria. The leaves were washed in potable water, drained and selected to remove diseased and non leafy portions. The leaves were cut into thin slices as practiced by local consumers and portioned to obtain 5 treatments as follows:

- Blanched in boiling water (2mins) and drained (BBW)
- Steam blanched (2mins) (SB)
- Blanched in boiling water containing sodium chloride (10g/L) 2 mins and drained (BSC).
- Blanched in boiling water containing sodium bicarbonate (10g/L), 2 mins and drained (BSB).
- No blanching, no chemical treatment as control (CONT)
- The treatments were replicated (3 replicates).

The test portions were dried in a multipurpose produce dryer (Akande et al. 2013) at 40-50^{0}C over night until the vegetables became hard and brittle. The samples were air-cooled, packaged in sealed polythene bag for laboratory tests. The following tests, moisture, crude protein, crude fat, ash and carbohydrate contents were done using AOAC, (1990).

Microbial Analysis

Cultivation and isolation of bacteria in the dehydrated leaves were done by serial dilution technique. One gram sample was aseptically introduced into different bottles containing 9ml sterile distilled water and stirred for about 5 min. The pour plate technique was used to determine microbial load (Ikuomola & Eniola 2010). One ml of the sample was pipetted from the first dilution and transferred into another sterile diluents containing 9ml to obtain 10^{-2} dilution. The procedure continued up to 10^{-6}. Inoculation was done using 0.1ml of diluents in sterile Petri dishes containing molten nutrient agar and incubated at 37^{0}C for 24 hours. Fungi was determined on agar plates of potato dextrose agar using pour plate and spread technique. One gram sample was aseptically transferred into 9ml sterile distilled water and stirred for 5 mins (Akhigbemidu et al. 2015). One ml was taken from the first dilution (sample) and inoculated into another 9ml of sterile diluents (10^{-2} dilution). 0.1ml of the dilution was transferred into sterile Petri dishes and molten potato dextrose agar was added and allowed to solidify. Incubation was done at 28^{0}C for 48 hours. Isolation and identification of organisms were determined by the methods of Obire et al. (2002), Ogbonna & Igbenije (2006).

Sensory Assessment of Pre-Treated Dehydrated Telfairia Leaves

The acceptability tests of the leaves were done using a 20 member panelist drawn from the institute research staff. The test portions were assessed for colour, odour, texture and overall acceptability. Score rating was based on 9 point hedomic scale where 1 represented dislike extremely while 9 represented liked extremely (Okoro & Isa 2008).

Statistical Analysis of Data

Data collected from the study were subjected to analysis of variance using SPSS version 17. Least Significance Difference (LSD) was accepted at 95%.

Results and Discussion

The proximate composition values of the dehydrated leaves are presented in Table 1. Steam blanched (SB) and the water blanched (BBW) dehydrated leaves had relatively lower moisture content values (13.75% - 13.95%) as against 16.80% - 18.60% recorded for portions blanched in sodium chloride (BSC), sodium bicarbonate solutions (BSB) and the control (CONT) respectively. The trend in moisture content thus suggested that steam and water blanching treatments were relatively more effective in enhancing dehydration of Telfairia leaves. Blanching among other benefits softens cell structure for removal of water which is important in the shelf life of the dehydrated leaves. Similar observation was reported (Babatola & Adewoyin 2011) on pepper parboiled before dehydration. Chemical test results further showed that most of the nutrient chemicals (crude protein, crude fat and ash) concentrated relatively more in the steam blanched dehydrated leaves (SB) (Table 1).

Crude protein content values of steam blanched dehydrated leaves (SB) (9.45%) and the control (CONT) (9.98%) were significantly higher ($P \geq 0.05$) than values for the other treatments (2.95 – 8.4%) (Table 1). The lower protein value observed in the water blanched dehydrated leaves (BBW) may partly be due to loss of soluble nitrogen-containing components into the boling water (Giami & Nwachukwu 1997); on fluted pumpkin seed flour Adindu 1995) on boiled African breadfruit seed proteins. Earlier report (Singh et al. 1991) showed that steam blanching, water blanching and boiling water reduced protein content to a variable extent. The lower protein content value of leaves blanched in sodium chloride solution (BSC) before dehydration agreed with the findings of Adindu (1995) on extraction of African breadfruit seed proteins. Some of the proteins may have solubilized into sodium chloride solution.

The results implies that blanching the green leaves in sodium chloride solution (BSC) before dehydration may not be useful since it enhances loss of protein. The low crude fat content value of the leaves irrespective of treatment (0.24% - 1.98%) varied significantly ($P \geq 0.05$) and revealed that Telfairia leaves may not quantitatively be a good source of fat. Variations ($P \geq 0.05$) were similarly observed in the ash, crude fat and carbohydrate content value of the treated and untreated dehydrated vegetables. The inconsistent changes in proximate content during processing observed in this study was similarly reported (Adegunwa et al. 2011) during blanching and sundrying work on vegetables.

The mean acceptability rating scores of the dehydrated vegetables are presented in Table 2. Rating for control samples (CONT) not given any pre-treatment before dehydration was highest and most acceptable by assessors. Microbial result did not indicate the presence of bacteria and mould spores after dehydration in all the treatments.

4. Conclusion

The results obtained in this study suggested that dehydration of Telfairia leaves may not require any pre-treatment for consumer acceptance. In addition, the nutrient content values of the untreated dehydrated portion compared very well with values reported in literature (Mohammed et al. 2012) and could support nutrition. The results obtained from this study will be useful in post harvest handling of Telfairia leaves.

5. Recommendation

Further studies to determine the storage quality stability of the dehydrated Telfairia leaves is envisaged.

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Table 1 Proximate Composition of Pre-treated Dehydrated Telfaira leaves**

Treatment	Moisture content	Crude protein	Crude fat	Ash	Crude fibre	Carbo Hydrate by diff
BBW	13.90[a] ± 0.01	2.95[b] ± 0.01	1.32[b] ± 0.01	5.30[a] ± 0.01	15.95[b] ± 0.03	60.57[b] ± 0.01
SB	13.75[a] ± 0.02	9.45[a] ± 0.02	1.98[a] ± 0.01	5.90[a] ± 0.02	17.35[a] ± 0.01	52.16[a] ± 0.02
BSC	16.80[b] ± 0.01	3.93[c] ± 0.01	0.24[c] ± 0.02	6.95[b] ± 0.00	16.05[c] ± 0.02	56.04[c] ± 0.01
BSB	18.60[b] ± 0.01	8.45[d] ± 0.00	0.46[d] ± 0.01	5.90[a] ± 0.01	8.55[d] ± 0.03	58.04[d] ± 0.01
CONT	16.80[b] ± 0.02	9.85a ± 0.03	1.76[e] ± 0.01	5.65[c] ± 0.00	8.90[e] ± 0.01	57.01[d] ± 0.00

Means and Standard Deviation (± SD) of Triplicate Analysis. Means With the Same Letter (Superscript) in the Same Vertical Column are not Significantly Different (P ≥0.05).
** Data Expressed as Percentages.

Table 2: Acceptability Rating and Micro Organisms of Dehydrated Telfairia Leaves.

Treatment Code	Mean Acceptability Score**	Micro – organism
BBW	3.0 ± 0.0	ND
SB	3.0 ± 0.0	ND
BSC	3.0 ± 0.0	ND
BSB	5.0 ± 0.1	ND
CONT	8.0 ± 0.0	ND

**Means and Standard Deviation (± SD) of Triplicate Analysis.
ND – No Microorganism was Detected.