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Waste to wealth: Tigernut discards as an underutilized feed resources

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Abstract

Phytochemical and Nutrients assay of raw and fermented tigernut discard meals coded as RTDM and FTDM respectively were studied using standard methods. Results of the proximate analyses showed that FTDM contained significantly ($p<0.05$) higher nutrients than RTDM except the Nitrogen free extract (soluble carbohydrate). Nevertheless, the phyto-toxins in FTDM were significantly lower ($p<0.05$) in concentration compared with RTDM especially the polyphenols but no significant ($p>0.05$) difference was observed in Phytates and oxalate values respectively. It could be deduced from this study that tigernut discards contained valuable nutrients comparable with some orthodox energy feedstuffs such as maize and millet, hence, should not be allowed to rot on the field thereby constituting environmental filths and disposal problems.

Key words: Tigernut, Discard meals, Phytochemical, Nutrients assay, Feed resources.

Introduction

The search for lesser-known and underutilized Agricultural by-products and wastes which are potentially viable as animal feedstuff have been intensified more in recent times. This has become a necessity to maintain a balance between population growth and food security through animal agriculture (Agbabiaka, 2010a).

Many Agro-wastes and by-products have been identified and utilized in monogastric nutrition in particular with encouraging results, these include Dried rumen digesta as protein supplement (Esonu *et al.*, 2006; Dairo *et al*., 2010 and Agbabiaka *et al*., 2011a,b; Agbabiaka *et al*., 2012a), Mango seed kernel (Agbabiaka *et al*., 2010b), yam peel meal (Akinbami and Ayoola, 2011), peels of mango, pawpaw and plantain (Omole *et al*., 2004), cassava leaves (Bichi and Ahmad, 2010), tigernut meal (Agbabiaka *et al*., 2012b), maize offal (Vantsawa *et al*., 2008) among others.

Tigernut (*Cyperus esculentus*) was reported as noxious, invasive and injurious weed in the tropic and temperate zones (Tigernut and Health, 2005).

The nuts have excellent nutritional qualities with a fat composition similar to Olive oil, also rich in mineral content especially phosphorus and potassium but with low sodium content (Martinez, 2003; Belewu *et al*., 2007). Chuffa as it is also called is cultivated in Nigeria primarily because of its rich vegetable milk which is an alternative to cow milk among the rural poor, production of yoghurt and “Kunnu” (beverage) to quench thirst in Northern Nigeria (Sowonola *et al*., 2005). Tigernut tubers have also been used as alternative to cassava in baking industry (Bosch *et al*., 2005). The crude protein content ranged between 7.15 – 9.7% depending on the variety (Oladele and Aina, 2007). However, there is paucity of information on tigernut discards which are the fairly rotten, insect infested tubers that floats while washing the nuts, often, are allowed to rot away on the field hence constituting environmental and disposal problems.

In view of the relative abundance at relatively cheap or no cost depending on the geographical location, this work was aimed at determining the nutrients and phytochemical assays of tigernut discards as a baseline information on its potential as feedstuff in animal agriculture.

Materials and Methods

Proximate analysis: The tigernut tubers (discards) were purchased from the open market "Ama Hausa" in Owerri, Southeastern Nigeria. The nuts were sorted of stones and other foreign materials prior to being washed thoroughly. The tubers were divided into two batches, a portion was soaked in water (trice the volume of seed) for 3days, supernatant water removed and was sundried separately with the other portion (raw) until crispy for 7 days to reduce the moisture content and prevent the growth of moulds. The sundried tigernut discards were passed through hammer mill to produce tigernut discard meal (TDM). The raw and fermented tigernut discard samples were coded as RTDM and FTDM respectively. Triplicate samples of the RTDM and FTDM were taken respectively for laboratory analyses such as proximate and anti- nutritional compositions according to standard methods (AOAC, 2000).

Determination of phytochemicals in tigernuts discards: Phytate and Phytin-phosphorus were determined by Young and Greaves (1940) methods. Tannic acids concentration (polyphenols) was determined as outlined by Makkar and Goodchild (1996). However, oxalate was determined according to Day and Underwood (1986) while alkaloids and saponins were analyzed by Harbone (1973) and Obadoni and Ochuko (2001) methods respectively.

Statistical analysis: Data on mean values collected on the nutrients and anti-nutrients assay of RTDM and FTDM were subjected to statistical analysis using student "t" test to detect differences in mean (Snedecor and Cochran, 1978).

Results and Discussion

The data on chemical composition of Raw and Fermented tigernut discards is shown in table 1 . While table 2 presents the results of the phyto-chemical analyses. The moisture content of RTDM and FTDM ranged between 9.04 - 9.81%, these values were higher than moisture content of mango seed kernel (6%) reported by Zein *et al*., 2005. However, it is far below the value of 68.42% in cassava (Bressani and Ortiz, 2000) but in agreement with 9.5% recorded for sweet maize (Cortez and Altamirano, 1999). This shows that RTDM and FTDM may have good shelf-life relatively due to the low water activity (a_w) as reported by (Frazier and Wwstoff, 2010).

The crude protein concentration differ ($p<0.05$) significantly with values of 7.49 and 10.17% for RTDM and FTDM respectively. These values were within the range of 7- 9.5% reported by Oladele *et al*. (2009) and 8.44% recorded by Agbabiaka *et al*. (2012b) for brown variety of tigernut. The higher value 10.17% of FTDM is similar to the value of 9-10% crude protein found in conventional feedstuff such as millet and maize respectively (Aduku ,1993); but is higher than 6% for mango seed kernel documented by Agbabiaka *et al.* (2010b) respectively. This was attributed to the action of microbes of fermentation. Similar observation was recorded when cassava peel was fermented (Ezeronye, 2001; Ubalua and Ezeronye, 2008). Crude fiber of the RTDM and FTDM ranged between 15.48 – 16.77%. These were slightly above the values of 13.35 and 14.20% found in raw and soaked tigernut seed in distilled water for 12 hours (Oladele *et al*., 2009). The Ash content varied between 6.80 and 9.02% for RTDM and FTDM. These values compared favourably with the Ash content of *Dioscorea bulbifera* peel (6.15%) according to Abara (2011). The ether extract for RTDM and FTDM have values of 14.58 and 14.35% which is lower than the range of 22.11 and 27.44% recorded for raw tigernut seeds by Oladele *et al*. (2009). There was no significant difference ($p>0.05$) between the two samples. The variations in nutritional assay of TDM may be due to variety, geographical location and soil types that often affect the nutrient composition of plant materials (Agbabiaka *et al*. 2010b). The nitrogen free extract reduced significantly ($p<0.05$) from 46.61 to 39.88% in RTDM and FTDM respectively; this is attributed to the effect of fermentation which prompted the soluble carbohydrate to be used for energy by microbes of fermentation (Ezeronye, 2001). There was a general reduction in the concentrations of phyto-chemicals (table 2) in the fermented tigernut discards (FTDM) compared with RTDM which was significantly ($p<0.05$) different between the two samples except oxalate and phytate ($p>0.05$). These may also be attributed to hydrolysis and action of microbes responsible for fermentation especially polyphenols that is affected by leaching. Similar observation was recorded in processed castor oil seeds (Agbabiaka *et al*., 2011b).

Table (1): Proximate composition of RTDM and FTDM (g/100g Dm)

	SAMPLES	
Parameters	RTDM	FTDM
Moisture	9.04[a]	9.81[a]
Crude protein	7.49[a]	10.17[b]
Crude fiber	15.48[a]	16.77[a]
Ash	6.80[a]	9.02[a]
Ether extract	14.58[a]	14.35[a]
Soluble carbohy-drate	46.61[a]	39.88[b]

Means on rows with same superscripts are not significantly different (p>0.05) .

Table (2): Phyto-chemical analysis of RTDM and FTDM

	SAMPLES	
Parameters	RTDM	FTDM
Tannin (%)	1.43[a]	0.38[b]
Saponin (%)	1.31[a]	1.03[b]
Phytate (mg/g)	16.12[a]	14.82[a]
Phytin phosphorus (mg/g)	6.70[a]	4.18[b]
Oxalate (%)	1.44[a]	1.26[a]
Phenols (%)	1.22[a]	0.35[b]

Means on rows with same superscripts are not significantly different (p>0.05) .

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