Research Journal of Agriculture and Biological Sciences, 4(6): 639-642, 2008

Comparative compositional analysis on two varieties of melon (*Colocynthis citrullus and Cucumeropsis edulis*) and a variety of almond (*Prunus amygdalus*)

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Abstract: Three oil seeds namely, almond (*Prunus amygdalus*), *Colocynthis citrullus* and *Cucumeropsis edulis*, the last two being two melon varieties were analyzed for any similarities in their proximate and mineral compositions. The oils extracted from them were subjected to physico-chemical analysis. The proximate composition, mineral composition and physico-chemical properties of the seedflours and oils show some levels of significant differences at ($P \leq 0.05$). However, similarities were found to occur in the energy and the manganese contents of the seed flours. The refractive indexes of the oils were also found to be similar.

Key words:

INTRODUCTION

Colocynthis citrullus and *Cucumeropsis edulis* are varieties of melon seeds, which are popularly called 'egusi' in West Africa. *Egusi*, which is a creeping annual plant and an intercropping plant made use of in traditional farming practices, thrives well on rich light soil in the hot climatic regions of Africa. It, however, has been noted to tolerate low rainfall[1]. In the South Eastern region of Nigeria, *egusi*, is best cultivated after the first rains of each year[2]. The first fruits are harvested at about thirteen weeks after planting. They belong to the family of the *Cucurbitaceae*, and are widely cultivated for their seeds, which have high content of fat and protein. The seeds are obtained either in shelled or unshelled forms in West African markets and are used greatly in West African cookery. The shelled seeds can be ground or milled before and after roasting and are used in soups and as soup condiments. An example of such is 'ogiri', a fermented highly proteinous, Nigerian soup condiment. Melon seeds may be eaten as snacks, either as whole toasted seeds or as fried cake prepared from milled seeds[3,4,5]. Almonds (*Prunus dulcis or Prunus amygdalus*) are important tree nuts, which rank as number one in tree nuts, productions. They are typically used as snack foods and as ingredients in a variety of processed foods, notably, in bakery and confectionery products. The United States of America is the largest almond producer in the world and Californian State typically generates 70% of the world's almond supply in any given year[6].

The use of almond and *egusi* as oil seeds and also in cookery prompted the search for any similarities/differences in the proximate and mineral compositions of the seedflours and also in the physico-chemical properties of the oils extracted from their seeds.

MATERIALS AND METHODS

The two varieties of melon, *Colocynthis citrullus* and *Cucumeropsis edulis*, were purchased from the local market in Akure, Ondo State, Nigeria. A packet of the almond *(Prunus amygdalus)* was bought from a supermarket also situated in Akure, Ondo State, Nigeria.

The seeds were sun dried, and blended into fine powder with a domestic kitchen blender. The milled samples were packed in airtight plastic containers and stored in a refrigerator at 4 ^{o}C prior to analysis.

Moisture, crude protein, fat, crude fibre and ash contents were determined by the standard procedures of the AOAC[7]. Carbohydrates were calculated by difference, and energy content of the samples, by multiplying the protein, fat and carbohydrates by factors of 17, 37 and 17 respectively[8].

The minerals were analysed from solutions obtained by first dry-ashing the sample at 525^{o}C and dissolving the ash in volumetric flasks using distilled, de-ionised water with a few drops of concentrated hydrochloric acid. Sodium and potassium were then determined using a flame photometer (Corning, UK, Model 405), using NaCl and KCl for

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Table 1: Proximate composition % of two varieties of melon seedflours (*Colocynthis Citrullus and Cucumeropsis edulis*) as compared with that of almond (*Prunus amygdalus*) in %.

Parameter	*Colocynthis citrullus*	*Cucumeropsis edulis*	*Prunus amygdalus*
Moisture	4.85^{a}±0.04	5.21^{a}± 0.40	6.10^{b}± 0.03
Protein	25.73^{b}±0.06	31.85^{c}±0.04	14.70^{a} ±0.03
Crude Fat	46.24^{c} ±0.02	38.85^{a}±0.04	42.14^{b}±0.02
Crude Fibre	5.00^{b}±0.07	4.33^{a}±0.02	5.70^{c}±0.02
Total ash	4.48^{b}±0.02	7.00^{c}±0.03	3.34^{a}±0.02
Carbohydrate	13.70^{b}±0.02	12.76^{a}±0.03	28.05^{c}±0.03
Energy*	2381^{a}±2.10	2196^{a}±2.00	2283^{a}± 2.20

* Energy in KJ per 100g of seed flour of the samples.
Values represent means of triplicate determination ± standard deviations. Means followed by same letter within a row are not significantly different according to Duncan's test (P<0.05).

Table 2: Mineral composition of two varieties of melon (*Colocynthis citrullus and Cucumeropsis edulis*) as compared with that of almond (*Prunus amygdalus)* mg/100g.

Mineral	*Colocynthis citrullus*	*Cucumeropsis edulis*	*Prunus amygdalus*
Na	1.75^{b}±0.01	1.85^{c}±0.01	1.60^{a}±0.02
K	2.85^{c}± 0.05	2.75^{b}±0.02	2.65^{a}±0.05
Ca	1.90^{b}±0.01	1.65^{a}±0.01	2.00^{c}±0.04
Mg	1.10^{b}±0.02	1.05^{b}±0.01	0.90^{a}±0.04
Zn	0.31^{a}±0.02	0.31^{a}±0.02	0.39^{b}±0.02
Fe	0.10^{b}±0.01	0.10^{b}±0.01	0.03^{a}±0.01
Cu	0.10^{a}±0.01	0.10^{a}±0.01	0.20^{b}±0.01
Mn	0.02^{a}±0.01	0.02^{a}±0.01	0.02^{a}±0.01

Values represent means of triplicate determination ± standard deviations. Means followed by same letter across a row are not significantly different according to Duncan's test (P<0.05).

Table 3: Physico-chemical properties of the oils extracted from two varieties of melon seedflours (*Colocynthis citrullus and Cucumeropsis edulis*) as compared with that from almond seed flour *(Prunus amygdalus).*

Mineral	*Colocynthis citrullus*	*Cucumeropsis edulis*	*Prunus amygdalus*
Refractive Index (at 40°C)	1.47^{a}±0.02	1.47^{a}±0.02	1.47^{a}±0.02
Specific Gravity (at 20 °C)	1.51^{a}±0.02	1.67^{b}±0.02	1.71^{c}±0.02
Saponification Value (mg KOH/g)	8.00^{a}±0.03	9.90^{c}±0.01	9.40^{b}±0.02
Acid value (mg KOH/g)	8.02^{a}±0.07	9.36^{b}±0.03	9.66^{c}±0.07
Peroxide value mEq/kg	1.72^{c}±0.01	1.42^{b}±0.01	0.93^{a}±0.01
Iodine value (wijs)	3.45^{c}±0.02	3.02^{b}±0.02	2.65^{a}±0.01

Values represent means of triplicate determination ± standard deviations. Means followed by same letter across a row are not significantly different according to Duncan's test (P<0.05).

preparation of standards. The other metals in this report were determined by means of an atomic absorption spectrophotometer (PYE Unicon, UK, Model SP9), using the following salts: $FeSO_4.(NH_4)_2SO_4.6H_2O$, $CaCO_3$, $MgSO_4$, $CuSO_4$, MnO_2 and $Zn(NO_3)_2$ for preparation of standards.

The physico-chemical properties of the extracted oils such as the refractive index. specific gravity, the saponification value and acid value were by the method of AOAC[7]. The iodine value was by Josyln's method[9] and the peroxide value was determined by the Pearson's method[10].

The experimental results are expressed as the means ± s.d. Analysis of variance (ANOVA) in SPSS B. O. Computer programme was used to analyze the results.

RESULTS AND DISCUSSION

Discussion: The proximate composition of two varieties of melon, *Colocynthis citrullus* and *Cucumeropsis edulis* seed flour, were compared with the seed flour of almond (Prunus amygdalus) Table1.

The moisture content ranged from 4.85% to 5.39%. *Colocynthis citrullus* has the lowest value and *Prunus amygdalus* has the highest value. However, the moisture contents of the seed flours are low and comparable. Crude protein, crude fat, crude fibre, and the carbohydrate contents of the seed flours differ significantly at the 0.05% level. Melon seed flour has higher crude protein values than the almond seed flour. The crude protein value observed for *Colocynthis citrullus* (25.73%) is comparable to 21.35% reported for *Kerstingiella geocarpa* otherwise known as 'Hausa groundnuts'[11], to 20.5% reported for beans[12], and to 24.9 – 25.2% crude protein range of values reported for three underutilized legumes in China[13]. The protein value of 31.85% for *Cucumeropsis edulis* is similar to the value of 33.8% reported for *egusi*[5]. 14.70% value of crude protein observed in this work for almond seed flours is lower than 25% reported for almond by Sathe[14] in 1993.

Colocynthis citrullus has a higher crude fat content (46.24%) this is closely followed by 42.14% for almond (*Prunus amygdalus*) and lastly by 38.85% in *Cucumeropsis edulis*. The crude fat of the two melon varieties show an opposite trend to what is noticed in their crude protein values (Table 1).

The crude fibre and total ash contents of all the three seed flours are moderate in values. The carbohydrate content for almond seed 28.05% is more than twice the carbohydrate contents of the melon seed flours, which means that:

The mineral composition of the seed flours considered in this report is Presented in Table 2, and it reveals that the levels of the elements are low in the seed flours. However, there are still significant differences at 0.056 level ($P<0.05$) in the mineral contents with an exception in manganese content for all the seed flours considered in this report.

Table 3 shows the result obtained for the physico-chemical properties of the oils extracted from the seed flours. All the properties observed for the oils indicate edibility. There are significant differences in all the properties but one, which is the refractive index. The peroxide values are low and are pointers to the fact that the oils may not be easily susceptible to deterioration. The peroxide values of the melon seed flours fall in the range of values (1.59 - 2.50 mEq/kg) reported for peanut oils by Amoo and Asoore[15] in 2006.

The iodine values (2.65-3.45) for the samples are higher than the values 1.29 and 1.60 wijs reported for raw and boiled walnut seed oils respectively by Amoo and Akpambang[16] in 2006. This only indicates some unsaturation in the oils.

Conclusion: *Colocynthis citrullus, cucumeropsis edulis* and *prumus amygdalus* are oil seeds with similar energy content, but with some significant level of differences in the properties of their seed flours and seed oils.

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