Phytology

Comparative study of the chemical composition of two cultivars of melon: *Lagenaria abyssinica* (Egunsin Bojuri) and *Citrullus lanatus* (Egusin Sewere)

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Abstract

This study aimed at comparing the chemical composition of the seed flour of two cultivars of melon. The proximate, phytochemical and mineral analysis were carried out on the two cultivers (*Lagenaria abyssinica* (Bojuri) and *Citrullus lanatus* (Thumb) Mansf Sewere) of melon. AOAC 2010 method was adopted to determine the proximate analysis such as: moisture, ash, protein, fat, fibre and carbohydrate content. Mineral contents were determined using Atomic Absorption Spectrophotometry while Phytochemical analysis was determined using standard procedures. The results obtained from proximate analysis showed that the ash content (3.64±0.02), crude protein (26.34±0.01), and crude fat (32.67±0.01of *Citrullus lanatus* (Sewere) are significantly higher than *Lagenaria abyssinica* (Bojuri) (2.24±0.01), (23.72±0.02) and (26.73±0.01) respectively. While *Lagenaria abyssinaca* (Bojuri) had significantly higher percentage of carbohydrate (39.95±0.06), The mineral analysis also indicated higher value for *Citrullus lanatus* (Sewere) in Iron, Calcium and potassium compared to *Lagenaria abyssinica* (Bojuri) (151.45±0.21, 144.13±0.04), (0.35±0.16, 0.19±0.04 and (6.29±0.42, 4.83± 0.23) respectively. The result phytochemicals analysis of the two cultivars of melon indicated that the both melons were not significantly different from each other. This study revealed that *Citrullus lanatus (Sewere)* seed flour is a better source of important nutrients such as fat, protein and minerals. However, *Lagenaria abyssinica* (Bojuri) could be recommended as a better source of energy.

Keywords: melon, *Citrullus lanatus*, *Lagenaria abyssinica*, proximate, mineral, phytochemical

Introduction

Melon popularly called (Egusi) in yoruba part of Nigeria, is an edible vegetable crop, grown and cultivated in variety of species globally. (Van der Vossen *et al*., 2004) [1]. Mellon as a vegetable crop belongs to the family of Cucurbitaceae which contains about 119 genera out of which 22 are cultivated in Nigeria and 21 species are cultivated in Nigeria out of 825 species which are widely distributed globally, (Schippers, 2000) [2], (Oshingboye *et al*., 2013) [3]. About three genera such as Cucumis, Citrullus and Cucumeropsis that belong to this family are called melon and the popular ones in Nigeria are: Cucumis melo L. (true melon), *Citrullus lanatus* (Thumb). Matsum nakai (Watermelon), *Citrullus lanatus* (Thumb) and Brown-seeded melon. (Ajuru and Okoli, 2013) [4].

Melon is any plant that belongs to the family of cucurbitaceae with fleshy and edible fruit. Melon is herbaceous and they grows annually (Agba *et al*., 2009) [5]. The leaves of melon are usually smooth and denticulated. They are 10 - 15 cm long with lobes **(**Schafferman *et al.,* 1998) [6] and (Kehinde, 2008) [7].

The stem is soft and hairy, but later becomes thick and strong at the base as it grows old (Rice *et al*.,1987) [8]. Melon stems spread around and crawl, thereby attaching themself to nearby plants while the melon root system is usually from the stem (Kehinde, 2008) [7]. Melon flowers are monoecious, in the sence that they produce male and female gamates. Melon *(Egusi)* balls are smooth and spherical, and it is 5 to 10 cm diameter. It has green skin colors which could be deep or bright green, with relatively white irregular stripes, depending on the variety, (Dupriez and Deleener, 1989) [9].

Each melon plant produces almost 30 fruits/balls annually **(**Schafferman *et al.,* 1998) [6]. It has been reported that the shape of the fruit is not a determining factor of the inherent seeds. Hence a melon fruit can yield any of the seeds type. (Denton and Olufolaji, 2000) [10]. The weight of melon fruit varies from very heavy, considerably heavy, to light and this is pre-dominated by the pod and the very high water retained white pulp. The sign of maturity in melon is when the green stalk changes to brown. The weights of the seeds vary, with 50 seeds weighing 5.45 to 8.5 g (Denton and Olufolaji, 2000) [10]. Melon fruit is made up of a thick and fragile outer coat, with a softer internal fleshy part (Idoko *et al*., 2020) [11]." *Citrullus lanatus*, (Thumb Mansf) and (*Lagenaria abyssinica*) are few of the commonest cultivars of melon in Nigeria (Ogunsola *et al*., 2020) [12]. "*Citrullus lanatus* (Sewere), seeds coat is very thin and the seed edges are not pronounced. The seeds possess higher shelling percentage due to the lack of seed edges, thus providing a more edible endosperm. *Lagenaria abyssinica* (Bojuri) plant has bigger and longer seeds as well as broad-leaf

unlike others (Van der Vossen *et al*., 2004) [1] and (Denton and Olufolaji, 2000) [10].

The major objective of this research work is to compare the chemical composition of seed flour of *Lagenaria abyssinica* and *Citrullus lanatus* planted and harvested in Rufus Giwa Polytechnic, Owo.

Lagenaria abyssinica (Bojuri) Plant *Lagenaria abyssinica* (Bojuri) fruits *Lagenaria abyssinica* (Bojuri) seeds

Fig 1: The plants, fruits and seeds of *Lagenaria abyssinica* (Bojuri), a cultivars of Melon (*Egusi*)

Citrullus lanatus (Serewe) plant *Citrullus lanatus* (Serewe) fruits *Citrullus lanatus* (Serewe) seeds

Fig 2: The plants, fruits and seeds of *Citrullus lanatus* (Serewe), a cultivars of Melon *(Egusi)*

Materials and methods

Collection of samples

The seeds of the two cultivars of melon used were purchased from a local market in Owo, Ondo State, Nigeria. The seeds were later planted separately at the botanical garden, located at Rufus Giwa Polytechnic, Owo Ondo State Nigeria, in the month of April 2022 until maturity. The fruits were later harvested and the seeds were separated from the pulp and air-dried. The shells of the melon seed samples were neatly removed and then air-dried. The air-dried melon sample were pulverized separately using a mechanical grinder. The obtained flours were stored in an airtight polyethylene bag, kept inside air-tight containers, and labeled appropriately.

Proximate composition analysis (AOAC, 2005) [13]

The proximate analysis such as moisture, fat, protein, carbohydrate, fiber and ash content were carried out on the two cultivars of melon using AOAC 2005 [13] method of analysis.

The moisture content of both melon samples was carried out by oven drying at 105 ^{0}C for about 24 hours and was presented on a percentage basis. The nitrogen content was discovered by micro kjehdal method and crude protein was estimated (NX6.25). The content of crude lipid, fiber, ash and carbohydrate was determined by method of (AOAC, 2005) [13].

Elemental analysis (AOAC, 2005) [13]

The mineral elements such as Sodium (Na), Iron (Fe), Calcium (Ca), Zinc (Zn), Magnessium (Mg) and Potassium (K) were analysed using atomic absorption spectrophotometer (200A Model, Bulk Scientific Ltd UK).

Phytochemical analysis

While the phytochemical analysis such as Alkaloid, Phytates, Tannin, Flavonoids, glycosides were determined by the method described by (Herborne 2005) [14].

Results

Table 1: Proximate Composition of two cultivars of Melon seed flour %

Parameters	*Lagenaria abyssinica* (Egusi Bojuri)	*Citrullus lanatus* (Egusi Sewere)
Moisture Content	4.55±0.04	4.71±0.02
Ash Content	2.24±0.01	3.64±0.02
Crude Fibre	2.83±0.05	2.25±0.04
Crude Protein	23.72±0.02	26.34±0.01
Carbohydrate	39.95±0.06	30.42±0.09
Crude Fat	26.73±0.01	32.67±0.01

Mean ±standard deviation of triplicate determination

Table 2: Mineral Composition of two cultivars of Melon seed flour (mg/100g)

Parameter	*Lagenaria abyssinica* (Egusi Bojuri)	*Citrullus lanatus* (Egusi Sewere)
Sodium (Na)	0.22± 0.01	0.28±0.02
Iron (Fe)	144.13±0.04	151.45±0.21
Calcium (Ca)	0.19±0.04	0.35±0.16
Zinc (Zn)	19.06±0.08	21.25±0.12
Magnessium (Mg)	20.48±0.02	21.27±0.14
Potassium (K)	4.83±0.23	6.29±0.42

Mean ±standard deviation of triplicate determination

Table 3: Phytochemical Composition % of two cultivars of Melon seed flour (mg/100g)

Parameters	*Lagenaria abyssinica* (Egusi Bojuri)	*Citrullus lanatus* (Egusi Sewere)
Tannins	0.280 ± 0.01	0.358± 0.01
Phytates	3.791± 0.07	3.382 ± 0.02
Flavonoids	0.192 ± 0.02	0.107 ±0.06
Alkaloids	0.072 ± 0.03	0.058± 0.04
Glycosides	1.510±0.01	1.460±0.08

Mean ±standard deviation of triplicate determination

Discussion

The result of the proximate composition in table 1 revealed that moisture content, ash content, crude fibre, crude protein, crude fat and carbohydrates of *Lagenaria abyssinica* (Egusi Bojuri) and *Citrullus lanatus* (Egusi sewere) are (4.55±0.04 and 4.71±0.02), (2.24±0.01 and 3.64±0,02), (2.83±0.05 and 2.25±0.04), (23.72±0.02 and 26.34±0.09), (26.73±0.01 and 32.67±0.01) and (39.95±0.06 and 30.42±0.09) respectively.

The moisture content, ash content, crude protein and crude fat in *Citrullus lanatus* (Egusi sewere) (4.71±0.02), (3.64±0.02), 26.34±0.09) and 32.67±0.01) are higher than those found in *Lagenaria abyssinica* (Egusi Bojuri) (4.55±0.04), (2.24±0.01), (23.72±0.02) and (26.73±0.01) respectively. This study reveals that *Citrullus lanatus* (Egusi sewere (4.71±0.02), because of the higher moisture will attract the growth of microorganism and lead to its lower shelf life which has been reported by (Remi, O (2023) to cause early spoilage of food. that is *Citrullus lanatus* (Egusi sewere will spoil due to a convenient medium for microbial growth.

However, the fat content of *Citrullus lanatus* (Egusi sewere) is significantly higher than that of *Lagenaria abyssinica* (Egusi Bojuri), which indicated that Egusin Sewere could be a better source of fat than Egusin Bojuri. The percentage of protein, fat, and carbohydrate in this research were similar to the values reported by Gado *et al*., (2019) [15] in their evaluation of Melon using proximate and fatty acid analysis. The proximate analysis result is closely related to the work of Abbah *et al.* (2014) who reported that melon had 4.6± 0.3, 3.7±0.1 and 23.4± 0.2 for moisture ash and protein respectively. However, the carbohydrate content ((39.95±0.06) of *Lagenaria abyssinica* (Egusi Bojuri) in this study is higher than the carbohydrate content (30.42±0.09) found in *Citrullus lanatus* (Egusi sewere). This means that *Lagenaria abyssinica* (Egusi Bojuri) is a good source of energy to man and animals than *Citrullus lanatus* (Egusi sewere). However, this study indicated that the two cultivars of melon had high amount of carbohydrates than the amount found in musk melon and watermelon seed flour reported by Manika *et al* 2015. Similarly, the result of the moisture content, protein, carbohydrate and crude fact in this study are higher than the ones reported by Adulkadir and Adedokun (2019) except in ash content and crude fiber.

Amadi *et al*. (2018) reported the following values of carbohydrates 36% and protein 35% for melon seed flour which are relatively similar to the report of this present study. However, the reports by Falade *et al*. (2020) 19.16 and 8.33 for protein and carbohydrate in watermelon and Egusi melon were significantly different and lower compared to the present report (23.72±0.02 and 26.34±0.09) and (39.95±0.06 and 30.42±0.09) in *Lagenaria abyssinica* (Egusi Bojuri) and *Citrullus lanatus* (Egusi sewere) respectively.

The result in Table 2 showed the mineral composition of the two studied cultivars of melon. The sodium (0.28±0.02), iron (151.45±0.21), calcium (0.35±0.16), Zinc (21.25±0.12), Magnessium (21.27±0.14) and Potassium (6.29±0.42) in *Citrullus lanatus* (Egusi sewere) are significantly higher than the values found in *Lagenaria abyssinica* (Egusi Bojuri) (0.22±0.01), (144.13±0.04), (0.19±0.04), (19.06±0.08), (20.48±0.02) and (4.83±0.23). This report indicated that *Citrullus lanatus* (Egusi sewere) is a better source of mineral than *Lagenaria abyssinica* (Egusi Bojuri).

The result of the phytochemical analysis of the seed flours of the two cultivars of melon in Table 3 revealed the following values (0.072±0.03 and 0.058± 0.04), (0.280± 0.01 and 0.358± 0.01), (3.791± 0.07 and 3.382± 0.02), (0.192± 0.02 and 0.107± 0.06) and (1.510± 0.01 and 1.460± 0.08) for Alkaloids, Tannin, phytates, flavonoids and glycosides in *Lagenaria abyssinica* (Egusi Bojuri and *Citrullus lanatus* (Egusi sewere). Study indicated that Alkaloids (0.072±0.03), phytates (3.791± 0.07), flavonoids (0.192± 0.02) and glycoside (1.510± 0.01) in *Lagenaria abyssinica* (Egusi Bojuri) are higher that the values of Alkaloids, phytates, flavonoids and glycosides (0.058± 0.04, 3.382± 0.02, 0.107± 0.06 and 1.460± 0.08) accordingly, in *Citrullus lanatus* (Egusi sewere) except Tannin with lower value of 0.280± 0.01 in *Lagenaria abyssinica* (Egusi Bojuri) than 0.358± 0.01 in *Citrullus lanatus* (Egusi sewere).

Conclusion

The results of the chemical composition of the two studied cultivars of melon indicated that *Citrullus lanatus* (Egusi Sewere) had higher nutritional values in terms of ash content, protein and fat, minerals such as sodium, magnesium, calcium, potassium, zinc and iron However, the two cultivars can be recommended to combat the problem of malnutrition. The low concentrations of anti-nutritional factors suggest that the seed flours are good sources of food for humans and animals.

References

1. Van der Vossen HAM, Denton OA, El Tahir IM. *Citrullus lanatus* In Grubben, G. J. H. Denton O. A. (Eds.): *Plant Resources of Tropical Africa vegetables*. Wageningen. The Netherlands. CTA; Leiden, The Netherlands: Buckhuys Publishers, 2004, 185-191.

2. Schippers RR. *African Indigenous Vegetables. Cal An Overview of the Cultivated Species.* Natural Resources Institute/ACP-EU Technical Centre for Agricultural and Rural Cooperation, Chatham, UK, 2000, p214.
3. Oshingboye AO, Adeyemi TO, Ogundipe OT. Phylogenetic and genomic relationship Among the Melon Population based on RAPD. International Journal of Botany. 2013;9(2):91-95.
4. Ajuru MG, Okoli BE. The morphological characterization of the melon species in the family Cucurbitaceae Juss. and their Utilization in Nigeria. International Journal of Modern Botany. 2013;3(2):15-19.
5. Agba OA, Adinya IB, Agbogbo EA, Oniah MA, Tiku N, Abam P. Responses of *Egusi* melon (*Colocynthis citrullus* L.) to poultry manure in Obubra, Cross River, South-South Nigeria. Continental Journal of Agronomy. 2009;3:13.
6. Schafferman D, Beharav A, Shabelsky E, Yaniv Z. Evaluation of *Citrullus colocynthis*, a desert plant native to Israel, is a potential source of edible oil. Journal of Arid Environments. 1998;40:431-439.
7. Kehinde IA. Identification and control of field and storage fungal pathogens of *Egusi* melon: *Citrullus lanatus* (Thumb) Mansf. in Southwestern Nigeria. Ph.D. Thesis. Dept. of Crop Protection and Environmental Biology, University of Ibadan, 2008, p211.
8. Rice RP, Rice IW, Tindall HD. Fruit and Vegetable production in Africa. London: Macmillian Publishers Ltd., 1987, p371.
9. Dupriez H, Deleener P. African gardens and orchards (Growing vegetables and fruits). Macmillan Publishers Ltd. London and Basingstoke, 1989, 275-285.
10. Denton L, Olufolaji AO. Nigeria's most important vegetable crops. In: Agronomy in Nigeria M.O. Akoroda (ed). University of Ibadan, 2000 September, 85-93.
11. Idoko O, Emmanuel S, Adebisi F. Phytochemical and Physicochemical Studies of Fermented Liquid of *Citrulus lanatus* (Egusi) Pod as a Potential Herbicide. Journal of Science and Mathematics Letters. 2020;8(2):68-73.
12. Ogunsola JF, Ikotun B, Ogunsola KE. Incidence of leaf blight disease of egusi melon in South-West Nigeria. African Crop Science Journal. 2020;28(2):255-265.
13. Association of Analytical Chemists (AOAC). Official methods of analysis of the AOAC International. 15thed DC, USA, 2005.
14. Harborne JB. Phytochemical Methods, a guide to modern techniques of plant analysis, 3rd Edn. Springer (India) Private Limited, New Delhi, 2005.
15. Gado AA, Mohammad ML, Falusi OA, Adebola MO, Madaki FM, Koto JT. Evaluation of Egusi melon (*Colocynthis citrullus*) using proximate and fatty acid analysis. Journal of Bioprocessing and Biotechnique. 2019;9:346.