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Research Article

Comparison of Biochemical Composition and Some Mineral Content between New and Old Fruits of Adansoniadigitata (Tabaldi)

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Abstract

This study was carried out in Khartoum state –Sudan, the aims of this study is to identifying the nutrient value of new (Adansonia,digitata) baobab fruit pulp and seed compared with old baobab fruit pulp and seed , To determine the proximate composition, mineral content and vitamin c .The fats and protein contents were determined by extraction and micro Kjeldahl method respectively, while Sodium, Potassium, magnesium and Calcium were determined by using flame photometer. The results obtained showed that the seeds contained high protein (18.83%), carbohydrate (48.93%), fat (8.40%), Ash (2.24%), crude fiber (12.65%), vitamin c (76.25) and moisture content (8.53%). The concentration of some minerals in milligram per hundred gram (mg/100g) in seed as present in the ash of baobab fruit pulp and seeds were: Na (52.84), K (488.75),mg (530.18) and Ca (392.08) this value is degreased infruit pulp except Na(51.64) decreased. The value of old fruit pulp and seed is decreased than new pulp and seed. The results showed that baobab fruit pulp could serve as a supplementary source of carbohydrate, mineral, protein and vitamin c and seed is good source of oil, fiber, carbohydrate, mineral, protein, and vitamin c and lose notional value during storage. Database of this study will contribute in improve the health and nutrition of population.

Keywords: Nutritional, Composition, Baobab fruits, Flame photometry and mineral analysis; biochemical composition

Introduction

Adansonia,digitate Baobab (Tabaldi)belong to the Malvceae family [1]. The Baobab tree is tolerant to high temperature and drought [2]. There are 8 species of baobab trees (6 native to Madagascar, one in Australia, and one in Africa). In Sudan, the Baobab is mostfrequently found on sandy soils and by seasonal streams 'khors' in short grass savannas. It forms belts in central Sudan, in Kordofan, Darfur, Blue Nile; It is often associated with the tamarind, *Tamarindusindica L.*[3]. The fruit of the species is a large, egg shaped capsule (often>120 mm), covered with yellowish brown hairs andconsists of a hard, woody outer shell with a dry, powdery substance inside that covers the hard, black kidney-shaped seeds[3].

The nutrient consist of pulpand seed of baobab fruit is documentedas a sources of vitamin C and high percentage of Ca more than milk and good source of carbohydrates , protein ,fat ,vitamins ,and mineral that may be deficient in common diet[4]. The dry Baobab fruit pulp has a slightly tart, refreshing taste and is very nutritious, with particularly high values for carbohydrates, energy, calcium, potassium (very high), and vitamin C[5].Fruit pulp is also acidic and this is due to the presence of organic acids including citric, tartaric, malic, succinic as well as ascorbic acid, when eaten raw, the pulp is a rich source of calcium and vitamins B and C,a high amount of carbohydrate, low protein[6].The objective of this study to identifying the nutrient value of new baobab fruit pulp and seed

compared with old baobab fruit pulp and seed., To determine the proximate composition, mineral content and vitamin c .

Materials and Methods

Sample collection

5 kgof baobabfruits pulp and seeds were purchased and collected randomly from Khartoum markets

preparation of sample. The fruits were cracked using stones and placed in water for 24hours to soften the pulp. The soaked fruits were washed, and the seeds were separated from the pulp and rinsed with clean water, the seeds were dried under the sun for three days and pulverized by using a grinding machine.

Proximate analysis

The (Moisture ; Ash , Protein ; Crude fiber; oil and available Carbohydrate) Content were determined according to the method described by AOAC [7]with different formula as bellow ;but Mineral composition and vitamin C were determined according to AOAC [8] method.

Moisture content

The loss of weight was calculated as:

Moisture content% = (((wt$_1$-wt$_2$)×100))/((wt. of sample))

Where:

wt$_1$=weight of sample +dish before oven dry.

wt$_2$= weight of sample +dish after oven dry.

Wt.=weight of sample

Ash content

The ash content was calculated as follows:

Ash content (%) = (((w$_1$-w$_2$)×100))/((wt. of sample))

Where:

w$_1$=weight of crucible with ash.

w$_2$= weight of empty crucible.

Wt=wet of sample

Protein content

The total nitrogen and protein were calculated using the formula:

Nitrogen[%]=(Volume of HCL×N×14×100))/((wt. of sample)100)

Protein[%]= Nitrogen[%]×6.25×100)

Where:

Protein[%]=crude protein.

N=Normality of Hcl.

14=Equivalent weight of nitrogen.

Crude fiber

The fiber percentage was calculated as follows:

Crude fiber % =(wt1-wt2×100)/(wt of sample)

Where:

Wt$_1$=weight of sample and dish

Wt$_2$=weight of dish with ashed sample.

WT = weight of sample

Oil content

Crude fat was determined according to the AOAC [7] method. A 5g weight of sample was extracted with hexane using Soxhlet apparatus. The solvent was evaporated, and the remaining crude fat was determined.

Fat [%] = (wt$_2$-wt$_1$×100)/(wt of sample)

Where:

wt$_1$= weight of empty flask.

wt$_1$= weight of flask with oil.

Wt = weight of sample

Available Carbohydrate Content

Total Carbohydrate was calculated by difference according to Pearson (1970) using the following formula:

Available Carbohydrate%=100-(moisture%+Crudefiber%+CrudeFat%+Crude Protein%+Ash%).

Mineral composition

5 grams of the fruit pulp and seed flour was weighed into the crucible. The sample was ashedin a muffle furnace at 550oC until completely ashed. The ash was dissolved into 10% (V/V) HCl, heated to boiling, cooled and filtered and made up to 100 mL mark in a volumetric flask with deionized water and the mineral analysis was determined by Atomic Absorption Spectroscopic AOAC [8].

Vitamin C

Macerate 50 g of sample for 3 min in blender with 350 ml of 0.4% oxalic acid solution and filter. Obtain L$_1$ as described above . To tube S, add 1 ml filtrate +9mldyeandrecord L$_2$ after 15 second s.Calculated L$_1$-L$_2$ and obtain the concentration of ascorbic acid from the standard curve.

Result and Dissection

I. Proximate composition of Baobab

The proximate composition ofAdansoniadigitata fruit in this study include moisture content, ash content , crude protein ,cured fiber ,oil content and carbohydrate showed asin Table 1.

Table 1: Proximate composition and vitamin C of new and old baobab fruit pulp and seed.

Sample	Moisture content (%)	Ash content (%)	Crude protein (%)	Crude fiber (%)	Oil content (%)	Carbohydrate (%)
New baobab fruit pulp	3.24^{c}	2.58^{a}	5.48^{b}	2.28^{c}	0.39^{c}	85.84^{a}
	±0.03	±0.09	±0.20	±0.15	±0.01	±0.42
New baobab seed	8.53^{a}	2.34^{b}	18.83^{a}	12.65^{a}	8.40^{a}	83.13^{b}
	±0.09	±0.15	±0.15	±0.32	±0.15	±0.48
Old baobab fruit pulp	8.24^{a}	1.42^{c}	5.34^{b}	0.38^{d}	0.27^{c}	48.93^{d}
	±0.20	±0.28	±0.20	±0.01	±0.01	±0.38
Old baobab seed	7.66^{b}	2.25^{b}	18.50^{a}	11.41^{b}	5.49^{b}	53.99^{c}
	±0.20	±0.15	±0.14	±0.23	±0.30	±0.38

II. Moisture content

Moisture contents varied different from New fruit pulp, new seed, old fruit pulpand old seed(3.24c, 7.66b, 8.24aand8.53 a) respectively.The old pulp (8.24 a)is higher than new pulp (3.24 c) andold seed (8.53 a) is higher than value of new seed (7.66 b) these results can disagreed with Osman [9](10.4)Table 2.

Table 2: ineral composition and vitamin c of new and old baobab fruit pulp and seed.

Sample	Potassium (mg/100g)	calcium (mg/100g)	Sodium (mg/100g)	magnesium (mg/100g)	Vitamin C (mg/100g)
New baobab fruit pulp	583.88^{a}	546.28^{a}	23.07^{c}	552.68^{a}	281.00^{a}
	±2.42	±5.10	±0.31	±0.68	±0.89
New baobab seed	488.75^{b}	392.08^{b}	51.64^{a}	530.18^{b}	76.26^{c}
	±47.06	±9.35	±0.77	±7.85	±2.00
Old baobab fruit pulp	565.66^{a}	544.53^{a}	22.07^{c}	542.32^{a}	216.37^{b}
	±5.10	±14.84	±0.52	±5.25	±3.00
Old baobab seed	397.73^{c}	279.95^{c}	43.26^{b}	507.35^{c}	30.00^{d}
	±0.10	±53.94	±0.75	±6.14	±1.56

III. Ash content

Ash contents varied different from New fruit pulp, new seed, old fruit pulpand old seed is (2.58a, 2.34b, 1.42c, 2.25 b) respectively. The new pulp value (2.58 a) is higher than old pulp (1.42 c) and new seed (2.34 b) is higher than old pulp (2.25 b). These results were disagreed with Murray [10](5.1)Table 3.

Table 3: Proximate composition of baobab fruit (%).

Vitamin C	Carbohydrate	Oil	Fiber	Protein	Ash	Moisture	Name
281±0.89	85.84±0.42	0.39±0.01	2.28±0.15	5.48±0.20	2.58±0.09	3.24±0.03	New Fruit pulp
76.26± 2	48.93±0.48	8.40±0.15	12.65±0.32	18.83±0.15	2.25±0.15	8.53±0.09	New Seeds
216.37±3	83.13±0.38	0.27±0.01	0.38±0.01	5.34±0.20	1.42±0.28	8.24±0.20	Old Fruit pulp
30.0 ±1.56	53.99±0.38	5.49±0.30	11.41±0.23	18.50±0.14	2.34±0.15	8.24±0.20	Old Seeds

IV. Crude protein

Crude protein varied different from New fruit pulp, new seed, old fruit pulp and old seed is 5.48, 18.83, 5.34 and 18.50, respectively. The result value in new seed (18.83) is the higher than value of old seed (18.50) and the new pulp(5.48) is higher than old pulp(5.34). These results were similar to Obizoba and Amaechi[11]who report a very high protein contents in seed, (17 and 19.1) g/100 g.

V. Crude fiber

Crude fiber varied different from New fruit pulp, new seed, old fruit pulpand old seed is2.28c ,12.65a ,0.38 dand 11.41b respectively. The value of new seed (12.65a) is higher than old seed (11.41b) and new pulp (2.28c) is higher than old pulp(0.38 d) Table 4.

Table 4: The Proximate compositionmean of new baobab fruits.

Name	Moisture	Ash	Protein	Fiber	Oil	v\c
Fruit pulp	3.22	2.63	5.3	2.33	0.38	281.41
	3.24	2.48	5.48	2.11	0.41	281.63
	3.26	2.63	5.67	2.41	0.39	279.99
Mean ± SD	3.24 ± 0.03	2.58 ± 0.09	5.48± 0.20	2.28±0.15	0.39±0.01	281± 0.89
Seeds	8.46	2.11	18.86	12.29	8.41	76.19
	8.51	2.41	18.97	12.77	8.14	78.29
	8.63	2.22	18.67	12.89	8.39	74.29
Mean ± SD	8.53± 0.09	2.25 ± 0.15	18.83±0.15	12.65±0.32	8.40±0.15	76.26±2.00

VI. Oil content

Oil content varying from New fruit pulp, new seed, old fruit pulp and old seed is(0.39c ,8.40a ,0.27c, 5.49b) respectively. The value of new seed (8.40a) is higher than old seed (5.49b) and new pulp (0.39c) is higher than old pulp (0.27c) this result was disagreed with Lockett [12]2.1 g/100.

Carbohydrate

Carbohydrate varied different from new fruit pulp, new seed, old fruit pulp and old seed is (85.84a, 53.99c, 83.13b, 48.93d) respectively. The value of new pulp (85.84a)higher valuethan old pulp (83.13b) and the value of new seed (53.99c) is higher than old seed (48.93d) Carbohydrates represented more than 60% of the dry matter had high values, 71.7 and 60.8 % DM of fruit pulp, reported of seed from 26.1 to 43.9 %. The carbohydrate n seed content rangesfrom 22.1 g/100g dw (Ajayi et al., 2003) to 48.1 g/100 g dw[13].The mineral analysis show that the baobab Fruit pulp and seed contain high, Potassium, calcium , sodium and magnesium there for the fruit pulp and seed can be excellent source of Potassium, calcium and magnesium Table 5.

Table 5: The Proximate composition mean of old baobab fruits.

Name of sample	Moisture	ash	Protein	fiber	Oil	v\c
Fruit pulp	8.81	1.11	5.34	0.86	0.28	216.67
	8.48	1.67	5.22	0.84	o.26	212.78
	8.24	1.48	5.61	0.83	0.27	218.66
Mean ± SD	8.24±0.20	1.42±0.28	5.34±0.20	0.38±0.01	0.27±0.01	216.37±3.00
Seed	7.86	2.18	18.46	11.67	5.84	28.67
	7.46	2.48	18.66	11.36	5.34	30.86
	7.67	2.36	18.39	11.21	5.29	3o.48
Mean ± SD	7.66±0.20	2.34±0.15	18.50±0.14	11.41±0.23	5.49±0.30	30.00±1.56

Potassium

Potassium varied different from New fruit pulp, new seed, old fruit pulp and old seed is (583,88a, 488.75b, 565.66a) and (397.73c) respectively. The value of new pulp (583,88a) is higher than old pulp (565.66a) and new seed (488.75b) is higher than old seed (397.73c) this result can disagreed with (Maha2016) which was cited (594.8)

Calcium

Calcium varied different from New fruit pulp, new seed, old fruit pulpand old seed is(546.28a ,392.08b ,544.53a, 279.95c) respectively. Thevalue of new pulp (546.28a) is higher than old pulp (544.53a)in new seed andold seed (392.08b) is higher than old seed(279.95c). (Maha2016) reported that Ca contents was 558.5 in the Sudan because for the different of soil

Sodium

Sodium varied different from New fruit pulp, new seed, old fruit pulpand old seed is (23.07c ,51.64a ,22.07 c, 43.26b) respectively. The value ofnew seed is (51.64a) is higher than old seed(43.26b) and new pulp (23.07c)is higher than old pulp (22.07 c).

Magnesium

Magnesium varied different from New fruit pulp, new seed, old fruit pulpand old seed is 552.68a, 530.18b, 542.32a and

507.35c,respectively. Thevalue ofnew seed is (530.18b) is higher than old seed(507.35c) and new pulp (552.68a)is higher than old pulp (542.32 a), thisresultwas disagreed with (maha2016),(574.20).

Vitamin C

Varied different from New fruit pulp, new seed, old fruit pulpand old seed is (281.01a , 76.26 c, 216.37b)and (30.00d)respectively. The value of new pulpis (281.01a) is higher than old pulp (216.37 b) and new seed (76.27 c) highervalue thanold seed (30 d).

Conclusion

The present results of this research recorded that the baobab pulp and seed have high economic value in terms of protein, fat, and carbohydrate contents. They were also good and cheap source of macro , micro elements, and vitamin c, and indicated that (Adansoniadigitata) pulp had low fat and protein content, fat, and moisture contents. It is also a good source of macronutrients, specially carbohydrate, crude fiber, and micronutrients especially Vitamin C.

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