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PHYTOCHEMISTRY OF THE *ADANSONIA DIGITATA* SEEDS

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ABSTRACT

Seeds of *Adansonia digitata* L. (Famly Leguminosae) obtained from the local market of the holy city of Makkah were subjected to chemical analyses. The macro - and micronutrients were calculated. Their yield of fatty acids and amino acids were also estimated.

INTRODUCTION

A comprehensive review of *Adansonia digitata* (baobab) has been introduced and recorded [1] , in which indicated the food value of the fruit and leaves. In addition, it has been found that baobab is a source of many useful products which include drugs, dyes and fibres. Recently, the aqueous extract of the bark of *A. digitata* in Nigeria has proved to have an antisickling activity [2].

The root bark has been used in Indian medicine as an antipyretic, febrifuge, astringent in diarrhoea and dysentry and as a substitute for *Cinchona species* [3]. The biological and medicinal properties of *A. digitata* started to become evident when the pulp emulsion was administered to rats elucidating an anti-inflammatory, analgesic and antipyretic effects [4] and even to possess an immunostimulant factor [5] . Its bioactivity property was also demonstrated by **Tuani et al.** [6] which was further proved to have an antibacterial and antifungal activities [7,8].

This initiated a further insight on the *A. digitata* seed starting with its phytochemical composition as a starting point to its further use in nutrition, medicine and / or in the pharmaceutical industry.

MATERIALS AND METHODS

Material :

Adansonia digitata L. fruits (family Leguminosae) were collected from the local market of Makkah . The pulp was scraped out and seperated from the seeds and fibres. The seeds subjected to chemical analysis. The moisture content, dry matter, crude protein, oil, digestable carbohydrate in addition to the potassium, sodium, phosphorus, calcium and magnesium were estimated according to the **AOAC** [9] procedures . In addition, the fatty acids levels were estimated using an HP GC 5890 with a capillary column (FFAP 30m x 0.32 mm x 0.25μm) coated by polyethylene glycol. The column oven temperature 7°C / min from 50°C to 240°C, the detector temperature was 260°C with gass flow rate of N_2 = 33, H_2 = 30 and air = 330 cm /sec according to reported procedure (**Aura et al.**) [10] . The amino acids levels were analysed on a Beckman HPLC according to the **AOAC** procedure [9].

RESULTS AND DISCUSSION

About 70% of all food for human consumption comes directly from seeds. It is not surprising, therefore, that there is a wealth of literature concerned with the chemical , strutural and nutritional composition of seeds. Most of our knowledge of the chemical composition of seeds is for cultivated species since they comprise such a large share of our food source and also provide a great many raw matrerials for industry. Information on seeds of wild species and wild progenitors of our cultivated crops is relativiely scarce. But with increasing interest in new food sources and in improved genetic diversity within domesticated lines, the seeds of wild plants are now receiving more attention.

The results of the *A. digitata* seed chemistry are tabulated in tables (1, 2 and 3) . The nutritional value of the edible fruit of *A. digitata* as previously calculated by several authors [11,12] indicate that their values are near to those calculated in the seeds (Table 1). **Odetokun** [13] found that potassium and sodium to be the most abundant elements in the seed yet the calcium was the most abundant in our analyses. The nutritive value of the *A. digitata* seeds contained in the previous analysis of **Addy and Eteshola** [14] was much higher than the estimations in table (1) in the crude protein and oil contents while similar in the digestable carbohydrate.

The proximate oil content estimated by **Odetokun** [13] was 17.51% which is higher than the estimated oil content in the present analysis (12.3%) and which were both lower than the 35% estimated by **Nordeide et al.** [15] in the leaves. The oil in the present analysis contained seven fatty acids (Table 2 and Fig. 1) of which lenoleic acid constituted 49.58% of the oil while lenolenic acid was only in 1.27% of the oil, yet

Odetokun [13] found eight fatty acids and Ramesh found five fatty acids only in the *A. digitata* root bark.

Analysis of the fatty acids shown in table 2 indicate a desirable property for its use as a cooking oil due to its high content of linoleic acid and low linolenic acid content. This triunsaturated fatty acid oxidizes readily during food storage to produce off-flavors. This property coincides excellently with sunflower and maize oil which are widely used domestically.

Although variations in the amount of oil and fatty acid composition in any one species are due to genetic, seasonal and geographical factors. Yet, it is interesting to note that other members of the family *Leguminosae* (*Arachis hypogaea* and *Glycine max*) do not yield the 14 : 0 and 16 : 0 fatty acids . The biological role of the chain length , degree of unsaturation, double - bond location and geometric bond orientation of fatty acids have been major foci of nutrition research for the better part of this century .

Lipid nutrition research has always attempted to elucidate the relationship between dietary fatty acids and the development of atherosclerosis and cancer. Yet, differences in stereospecific fatty acid location should be an important consideration in the design and interpretation of lipid nutrition [16]. However, the relationship between fatty acid metabolism and stereospecific location is also influenced by dietary calcium levels, because large-chained saturated fatty acids form calcium soaps that are 10-20 times less soluble than the calcium salts of oleic and linoleic acids [16].

The analysed seeds had a proximate crude protein content of 17.2% (Table 1) which was lower than that estimated by **Odetokun** [13] which he found to be 21.42% and which was even lower than the 37% found in the leaves by **Nordeide et al.** [15]. The baobab tree (*Adansonia digitata*) *is a true legume* **Obizoba and Amaechi** [17] and because leguminous seeds are of a very considerable agricultural importance they have understandably received a great deal of attention. The amino acid composition of some legume storage proteins have a similar yield and pattern to that recorded in the present analysis .

An important common characteristic is the comparatively high level of the amides asparagine and glutamine and of arginine, a very low content of cysteine and methionine, non- detectable levels of tryptophane and an adequate content of lysine (Table 3 Fig. 2). Although **Odetokun** [13] recorded proline and valine, yet we were unable to detect any proline while valine was found at a level of 6.33 g/16g nitrogen . The seed also varied from the leaves where lysine was found to be the limiting amino acid [15] .

It is noteworthy to indicate that, although the percentage of amino acids differ between the seeds and those of the leaves (**Yazzie et al.**) [18] yet the results indicate that seeds of *A. digitata* can serve no less than the leaves as a significant protein and mineral source for most of the populations in Africa for whom it is a staple food and for other ethnic populations. The importance of such plants could be considered when we visualize the fact that Saudi Arabia drylands constitute more than 75% of the total landmass. Thus the use of indigenous species for human and animal food and some commercial potentials in the food, perfumery and drug industries becomes a must.

Table (1): Chemical composition of the *Adansonia digitata* seeds.

Nutrients	Average percent composition
Macronutrients	
Crude protein	17.2
Oil	12.3
Digestable carbohydrates	23.4
Fibre	43.4
Dry matter	94.9
Ash	3.7
Moisture	5.1
Micronutrients	
Potassium	3.0
Sodium	2.2
Phosphorus	0.72
Calcium	11.5 meq/L
Magnesium	2.5 meq/L

Table (2) : The fatty acid chromatogram and composition of the *Adansonia digitata* seeds.

Fatty acids	Percentage
14 : 0	13.62
16 : 0	13.80
16 : 1	6.51
18 : 0	3.84
18 : 1	11.27
18 : 2	49.58
18 : 3	1.27

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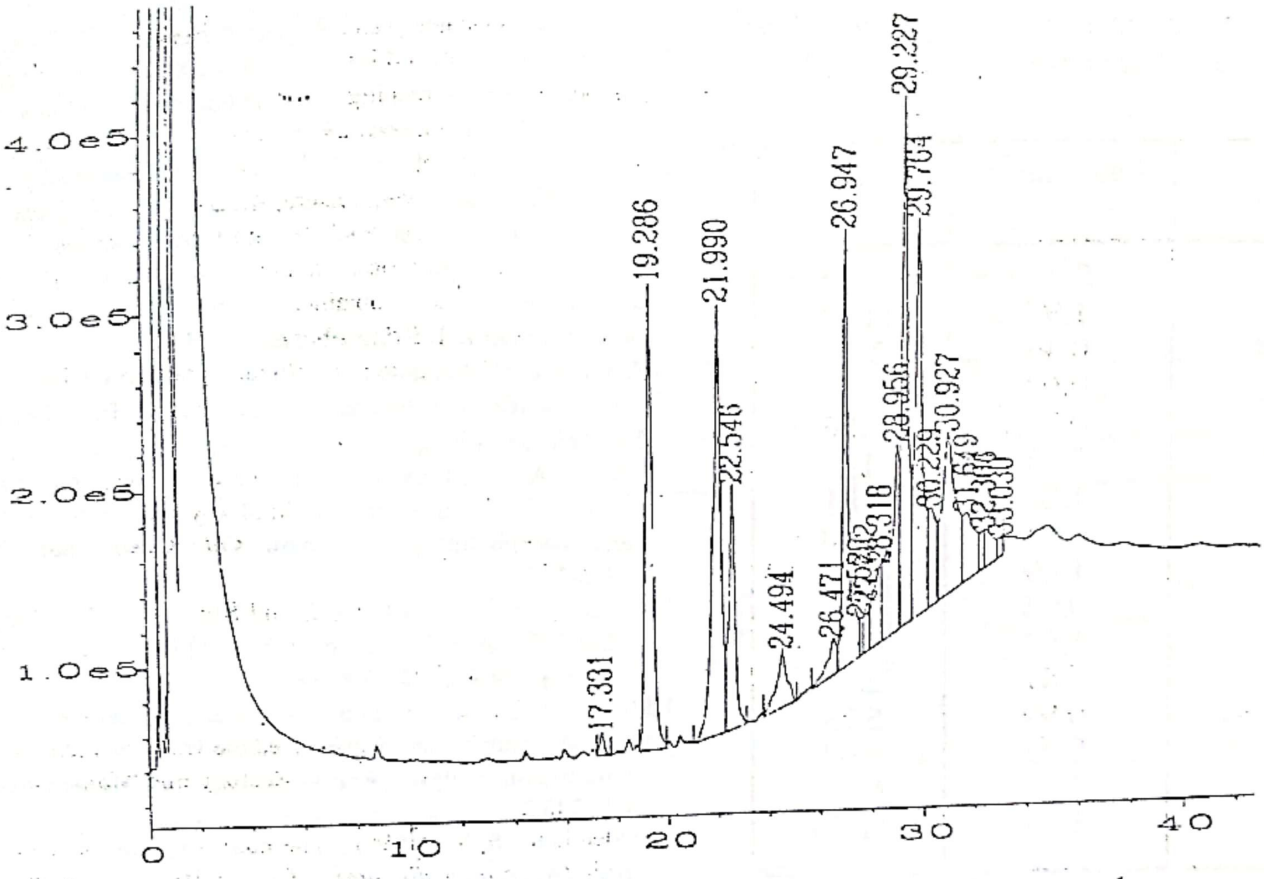

Fig. (1) : Chromatogram of the fatty acids of the *Adansonia digritata* seeds

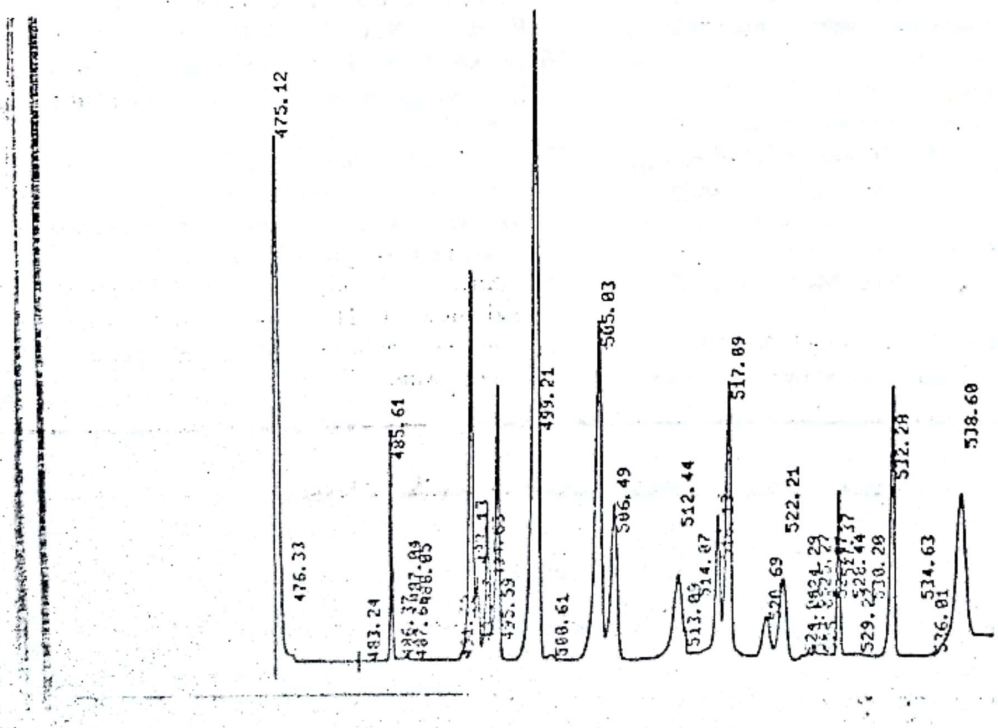

Fig. (2) : The amino acids composition of the *Adansonia digritata* seeds.

Table (3): The amino acid composition of protein from the *Adansonia digritata* seeds.

Amino acid	Percentage	g/16 g nitrogen
Cysteine	0.33	1.90
Asparagine	1.97	11.45
Methionine	0.46	2.67
Threonine	0.62	3.60
Serine	0.96	5.58
Glutamine	5.43	31.56
Glycine	1.00	5.81
Alanine	0.93	5.40
Valine	1.09	6.33
Isoleucine	0.94	5.46
Leucine	1.67	9.70
Tyrosine	0.47	2.73
Phyenylanine	0.99	5.73
Histidine	0.52	3.02
Lysine	1.09	6.33
Arginine	1.97	11.45

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المحتويات الكيميائية النباتية لحبوب ادانسونيا ديجيتاتا

صالح على محمد بازيد

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فى هذا البحث تم جمع حبوب نبات ادانسونيا ديجيتاتا من الأسواق المحلية فى مكة المكرمة وقدرت المحتويات الغذائية فيها .

هذا وقد تم تقدير معطيات الأحماض الدهنية والأحماض الامينية فى الحبوب.