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Phytochemical Study of *Adansonia digitata* L Family Bombacaceae Cultivated in Egypt

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ABSTRACT

Phytochemical screening of the leaves of *Adansonia digitata* revealed the presence of flavonoids, tannins and sterols while the ripe fruit pulp was rich in carbohydrates, flavonoids and sterols. The polysaccharide content from the leaves (20%) and ripe fruit pulp (40%) were prepared, hydrolysed and analyzed qualitatively and quantitatively by GLC technique. Eleven sugars were identified in the mucilage hydrolysate of the leaves and nine sugars in the pectin hydrolysate of the pulp with rhamnose and glucose being the major, respectively. GLC analysis of the unsaponifiable matter as well as FAME of leaves, fruit pulp and seeds were conducted with significant differences. Also, analysis of the total proteins, total essential and non-essential amino acids content of the leaves, fruit pulp and seeds, were undertaken.

Key words: *Adansonia digitata*, Bombacaceae polysaccharide, lipoidal matter, proteins, essential, non essential amino acids

INTRODUCTION

Adansonia; A small genus of trees and shrubs, belongs to family *Bombacaceae*, comprising about 10 species of which some are indigenous to tropical Africa, Madagascar and Australia, including the will known African "Baobab" (Adansonia digitata L.) (Eggli, 2002). *Adansonia digitata* L.(Baobab) is one of the most important food plants, providing fruits, berries, nuts, seeds and leaves present in Ferlo (Diop *et al.*, 2006). In addition, it has an exceedingly wide range of medicinal and traditional uses with numerous applications, including treatment of symptoms of infectious diseases (Gebauer *et al.*, 2002). The fruit consists of (14 to 28%) of pulp with a low moisture content, acidic, starchy, rich in vitamin C, calcium and magnesium, so it is used as a traditional juice. The seeds are eaten fresh or dried and can also be roasted into a powder for use as a coffee substitute. The roasted seeds are very nutritious, rich in proteins and fats (Moctar *et al.*, 2006).

Adansonia digitata L. is the only species from this genus that has been grown in Egypt especially in Aswan. Due to its economic importance, the authors tried to acclimatize and cultivate the plant in the Agricultural Experimental Station of the National Research Center (NRC) at Nubareya, western Egypt. Conflicting reports were traced for African plants but nothing was reported about the chemistry and the biology of the Egyptian species. Therefore, the objective of this study was to investigate the phytochemical constituents of the Egyptian tree for instance, polysaccharides, lipoidal matter, protein and amino acids contents were undertaken for the leaves, fruit pulp and seeds.This is the first report about these constituents in this plant.

MATERIALS and METHODS

Plant material

Samples of *Adansonia digitata* L. leaves and fruits were collected from Plant Island, Aswan , September 2009. The plant

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was kindly authenticated by Dr. Mohammed El-Gebaly, Department of Botany, National Research Centre (NRC) and by Mrs. Tereez Labib, Consultant of Plant Taxonomy at the Ministry of Agriculture and Director of Orman Botanical Garden, Giza, Egypt. The fruits were crushed to obtain powdered pulp and seeds. Seeds and leaves were grinded into suitable size.

Reference materials

Reference standards of carbohydrates, sterols, hydrocarbons, fatty acids and amino acids were obtained from the Department of Pharmacognosy, Faculty of Pharmacy, Cairo University.

Methods

Phytochemical screening tests

The air-dried powdered leaves, fruit pulps and seeds of *Adansonia digitata* L. were, separately subjected to the following preliminary phytochemical screening tests according to the reported procedures. Carbohydrates and /or glycosides (Molisch, 1886), sterols and /or triterpenes (Salkowski, 1872; Liebermann and Burchard, 1890), tannins (Trease and Evans, 1978), (Balbaa *et al.*, 1981), flavonoids, free and combined (Seikel, 1962), anthraquinones, free and combined (Borntrager, 1880), (Wallis, 1967), alkaloids and / or nitrogenous compounds (Balbaa *et al.*, 1981), saponins (Wall *et al.*, 1954) and coumarins (Lepper, 1960).

Investigation of polysaccharide content (Laidlow, 1949, *The National Formulary*, 1975).

One hundred grams of powdered leaves and fruit pulp were extracted separately by cold extraction method (C.E.M.). Each extract was precipitated to obtain its polysaccharide content. Each precipitate was purified, submitted to gel formation test, hydrolysed and analyzed using GLC method using **HP 6890**.

Investigation of lipoidal matter content

The residue of the petroleum ether extract (1.0g) for each of (leaf, fruit pulp and seeds) produced from the continuous extraction apparatus (Soxhlet apparatus) was saponified according to reported methods (Tsuda *et al.*, 1960), (Finar, 1967).

Both the unsaponifiable and saponifiable fractions were extracted and analysed using GLC-MS (Agilent Technologies 6890 N (Networ GC system).

Investigation of total protein and total amino acid content (Ma and Zuazage, 1942)

Determination of the total protein contents for leaves, fruit pulp and seeds was carried out by micro-Kjeldahl method using boric acid modification as described by Ma and Zuazage (1942) using Gerhardt distillation apparatus.

Apparatus

GLC analysis of Polysaccharide contents

Using **HP 6890)** with the following conditions:

Column: ZB-1701, 30 m X 0.25m X0.25 µm, Stationary phase:14% cyanopropyl phenyl methyl, Carrier gas: Helium (with Flow rate: 1.2ml/min, Pressure: 10.6 psi and Velocity: 41cm/ sec), Injector chamber temperature: 250 °C, Back inlet with(Split ratio: 1:10, Split flow: 11.9 ml/min. Total flow: 18.7 ml/min, Gas saver flow: 120 ml/min and Saver time: 20 min,) Oven with (150°c as Initial temp., 2 min as

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initial time, 7°c/min. rate and 200°c as a final temp., 20 min.as a final time)and FID Detector (Temp. 270 °C, air flow 450 ml/min. and H_2 flow 40 ml/min.).

GLC analysis of the lipoidal matter contents

(Agilent Technologies 6890 N (Networ GC system)) with the following conditions: **Unsaponifiable Matter:** Column, capillary column of fused silica, 30m length, 320µm D and 0.25µm thickness; Stationary phase, HP-5 Phenyl Methyl Siloxane; Carrier gas, Helium at 30 ml/min, Nitogen at 30 ml/min, Air 300 ml/ min, Ramps, 8°c/ min.Final temp. 280°c, Final time 20 min; Oven, Initial temp. 70°c at initial time 1 min.; Injector temperature, 280 °C; Detector Temp., 300°c; Detector, FID.

Fatty Acid Methyl Esters: Column, Capillary column of fused silica, 30m length, 320µm D and 0.25µm thickness; Stationary phase, HP-5 Phenyl Methyl Siloxane; Carrier gas, Helium at 30 ml/min, Nitogen at 30 ml/min, Air 300 ml/ min, Ramps, 8°c/ min.

Final temp. 220°c, Final time 20 min; Oven, Initial temp. 70°c at initial time 2 min., Injector temperature, 250 °C; Detector Temp., 280°c; Detector, FID.

Amino acid analyzer (LC 300 amino acid analyzer, Eppendorf- Germany) with the following condition: Flow rate: 0.2ml /min, pressure of buffer form 0 to 50 bar, pressure of reagent from 0- 150 bar and reaction temperature 123°C.

RESULTS and DISCUSSION

Phytochemical screening

Preliminary phytochemical screening revealed that the dried powdered leaves, fruit pulp and seeds of *Adansonia digitata* L. contain, carbohydrates and/or glycosides, sterols and/or triterpenes, flavonoids (free and combined) and coumarins; while anthraquinones, alkaloids and saponins being absent, while tannins was present only in leaves.

Investigation of the polysaccharide content

Precipitation and purification of polysaccharide content of the leaves and fruit pulp of *Adansonia digitata* L. yielded mucilage (20%) and pectin (40%), respectively.

GLC analysis of polysaccharide hydrolysate of leaves (Table 1) revealed the identification of eleven sugars with rhamnose as the major one (56.8 %) followed by galactose (10.3 %), while, the hyrolysate of the fruit pulp (Table 2) revealed the identification of nine sugars with glucose as the major one (53.2 %) followed by arabinose (21.2 %).

Table (1): GLC analysis of polysaccharide hydrolysate of leaves of *Adansonia digitata* L.

	Name	Retention time	Relative area %
1	Arabinose	7.545	11.476
2	Xylose	7.562	3.341
3	Ribose	7.817	0.902
4	Rhamnose	8.355	56.801
5	Mannitol	9.694	0.825
6	Sorbitol	9.812	0.397
7	Fructose	10.000	0.000
8	Galactose	10.718	10.315
9	Mannose	10.776	4. 124
10	Glucose	10.927	9.357
11	Galacturonic acid	11.791	0.982
12	Glucuronic acid	14.469	1.481

Table (2): GLC analysis of polysaccharide hydrolysate of fruit pulp of *Adansonia digitata* L.

	Name	Retention time	Relative area %
1	Arabinose	7.501	21.251
2	Xylose	7.567	1.411
3	Ribose	7.805	0.892
4	Rhamnose	8.339	2.891
5	Mannitol	9.716	0.000
6	Sorbitol	9.809	4.355
7	Fructose	10.000	0.000
8	Galactose	10.721	3.425
9	Mannose	10.780	2.135
10	Glucose	10.977	53.278
11	Galacturonic acid	11.816	10.324
12	Glucuronic acid	14.469	0.000

Investigation of the lipoidal matter content

a-GLC analysis of lipoidal matter of Leaves

GLC analysis of the unsaponifiable matter of leaves (Table 3) revealed the identification of 17 compounds representing (73.91 %) of the total compounds. The major compounds were n-tetracosane (C_{24} 15.05 %) and n-nonacosane (C_{29} 10.17 %). Four steroidal and one triterpenoidal compounds were identified representing (23.53 %) and (5.88%) respectively. Stigmasterol (9.77 %) and β–sitosterol (5.24 %) are the major steroidal compounds.

GLC analysis of FAME of leaves (Table 4) resulting in the identification of 10 compounds representing (90.90%) of the total matter. The major compounds were heptacosylic acid ($C_{27:0}$ 40.62 %) and palmitic acid ($C_{16:0}$ 27.91%). Six saturated fatty acids represent (60%) of the total identified compounds with heptacosylic acid ($C_{27:0}$) being the major one .Four unsaturated fatty acid represent (40%) of the total identified compounds with oleic acid ($C_{18:1}$) being the major one. Mono- , di-, tri-unsaturated fatty acids represent (20%), (10%) and (10%) respectively.

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Table (3): GLC analysis of the unsaponifiable matter of leaves *of Adansonia digitata* L.

Peak No.	Name	Retention time	*Relative Retention Time (RR_t)	Area %
1	n- hexadecane (C_{16})	16.108	0.677	1.095
2	n- octadecane (C_{18})	17.666	0.742	5.773
3	n- nonacosane (C_{19})	19.284	0.810	3.573
4	n- eicosane (C_{20})	19.688	0.827	8.466
5	n- docosane (C_{22})	21.939	0.922	2.179
6	n-tetracosane (C_{24})	23.804	1	15.051
7	Unknown	24.689	1.037	1.103
8	n-pentacosane (C_{25})	25.042	1.052	1.546
9	n- hexacosane (C_{26})	26.257	1.103	8.381
10	n- heptacosane (C_{27})	26.855	1.128	2.604
11	Unknown	27.294	1.147	2.893
12	n-octacosane (C_{28})	27.959	1.175	4.063
13	n-nonacosane (C_{29})	29.311	1.231	10.176
14	Unknown	29.873	1.255	1.801
15	n-triacontane (C_{30})	30.765	1.292	1.888
16	Cholesterol	31.357	1.317	1.614
17	Campasterol	31.963	1.343	1.230
18	Unknown	32.852	1.380	4.630
19	Stigmasterol	33.264	1.397	9.778
20	β- sitosterol	33.884	1.423	5.240
21	Unknown	34.844	1.464	4.639
22	β-amyrin	36.109	1.517	0.988
23	Unknown	37.901	1.592	1.277

* (RR_t): Retention time relative to n-tetracosane

Table (4): GLC analysis of FAME of *Leaves of Adansonia digitata L.*

Peak No.	Name	Retention time	*Relative Retention Time (RR_t)	Area %
1	Myristic acid (C_{14})	12.134	0.803	2.198
2	Palmitic acid ($C_{16\,0}$)	15.120	1	27.918
3	Palmatulonic acid ($C_{16\,1}$)	15.337	1.014	3.114
4	Margaric acid ($C_{17\,0}$)	16.928	1.120	3.976
5	Stearic acid ($C_{18\,0}$)	18.182	1.203	5.627
6	Oleic acid ($C_{18\,1}$)	18.657	1.234	4.492
7	Linoleic acid ($C_{18\,2}$)	20.173	1.334	2.935
8	Linolenic acid ($C_{18:3}$)	21.173	1.400	3.429
9	Unknown	24.455	1.617	3.725
10	Cerotic acid ($C_{26\,0}$)	30.872	2.042	1.954
11	Heptacosylic Acid ($C_{27\,0}$)	31.354	2.074	40.625

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b- GLC analysis of lipoidal matter of fruit pulp

GLC analysis of the unsaponifiable matter of fruit pulp (Table 5) revealed the identification of 25 compounds representing (75.76%) of the total compounds. The major compounds were β–sitosterol (16.34337%) and n- Heneicosane (C_{21}) (15.55765%). Four steroidal and two triterpenoidal compounds were identified representing (16%) and (8%) respectively. β–sitosterol (16.34337%) was the major steroidal one.

GLC analysis of FAME of fruit pulp (Table 6) resulting in the identification of 10 compounds representing (83.33%) of the total compounds. The major compounds were palmitic acid ($C_{16:0}$ 47.27 %) and oleic acid ($C_{18:1}$ 19.74%).Five saturated fatty acids represent (50%) of the total identified compounds with palmitic acid ($C_{16:0}$) being the major one .Five unsaturated fatty acid represent (50%) of the total identified compounds with oleic acid ($C_{18:1}$) being the major unsaturated one. Mono- , di-, tri- and poly- unsaturated fatty acids represent (20%), (10%), (10%) and (10%) respectively.

Table (5): GLC analysis of the unsaponifiable matter of fruit pulp *of Adansonia digitata* L.

Peak No.	Name	Retention time	*(RRT)	Area %
1	n-Decane (C_{10})	4.342	0.128	1.280
2	n-Undecane (C_{11})	5.239	0.154	0.871
3	Unknown	6.171	0.182	0.808
4	n- Dodecane	6.746	0.199	1.534
5	n-Pentadecane (C_{15})	11.671	0.345	4.834
6	Unknown	15.050	0.458	0.736
7	n- Hexadecane (C_{16})	15.558	0.460	0.450
8	n- Heptadecane (C_{17})	16.038	0.474	0.718
9	n- Octadecane (C_{18})	16.864	0.498	0.605
10	n- Nonacosane (C_{19})	17.838	0.527	11.118
11	n- Eicosane (C_{20})	18.530	0.547	1.747
12	n- Heneicosane (C_{21})	19.864	0.587	15.557
13	Unknown	20.792	0.615	0.959
14	n- Docosane (C_{22})	21.169	0.626	0.998
15	n- Tricosane (C_{23})	21.930	0.648	3.560
16	n-Tetracosane (C_{24})	23.154	0.684	1.390
17	n-Pentacosane (C_{25})	23.683	0.700	1.969
18	Unknown	24.087	0.712	1.551
19	n- Hexacosane (C_{26})	24.999	0.739	2.019
20	Unknown	25.867	0.764	3.663
21	n- Heptacosane (C_{27})	26.784	0.792	4.280
22	n-Octacosane (C_{28})	27.849	0.823	0.988
23	Unknown	28.228	0.834	1.552
24	n-Nonacosane (C_{29})	29.017	0.858	3.659
25	n-Triacontane (C_{30})	29.608	0.875	1.594
26	Cholesterol	29.899	0.884	2.819
27	Campasterol	31.682	0.936	2.631
28	Stigmasterol	32.329	0.956	3.129
29	β- sitosterol	33.823	1	16.343
30	Unknown	34.437	1.018	2.927
31	Unknown	35.353	1.045	2.819
32	β -amyrin	36.144	1.068	0.555
33	α -amyrin	36.866	1.089	0.323

*(RR_t): Retention time relative to β- sitosterol

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Table (6): GLC analysis of FAME of fruit pulp *of Adansonia digitata* L.

Peak No.	Name	Retention time	*Relative Retention time (RR_t)	Area %
1	Lauric acid (C_{12})	10.737	0.7172	1.710
2	Myristic acid (C_{14})	12.192	0.8144	4.004
3	Palmitic acid($C_{16\,0}$)	14.970	1	47.279
4	Palmatulonic acid($C_{16\,1}$)	16.402	1.0956	1.336
5	Margaric acid ($C_{17\,0}$)	16.991	1.1350	1.383
6	Stearic acid ($C_{18\,0}$)	17.899	1.1956	6.325
7	Oleic acid ($C_{18\,1}$)	18.492	1.2350	19.745
8	Linoleic acid ($C_{18\,2}$)	19.541	1.3050	6.459
9	Unknown	19.932	1.3314	1.231
10	Linolenic acid ($C_{18\,3}$)	20.810	1.3907	5.471
11	Unknown	21.724	1.451	1.213
12	Arachidonic acid($C_{20\,4}$)	23.579	1.575	3.838

* RR_t: Retention time relative to Palmitic acid = 1

c- GLC analysis of lipoidal matter of seeds:

GLC analysis of the unsaponifiable matter of seeds (Table 7) revealed the identification of 21compounds representing (70%) of the total matter. The major compound was n-tetracosane (C_{24} 60.455%). Three steroidal and two triterpenoidal compounds were identified representing (14.29%) and (9.5%) respectively of the total identified compounds. Stigmasterol (1.56 %) was the major sterol.

GLC analysis of FAME of seeds (Table 8) resulting in the identification of 10 compounds representing (83.33%) of the total matter. The major compounds were palmitic acid ($C_{16\,0}$ 38.54 %) and oleic acid ($C_{18\,1}$ 33.28 %).Five saturated Fatty acids represent (50%) of the total identified compounds, palmitic acid ($C_{16\,0}$ 38.54 %) and stearic acids ($C_{18\,0}$7.06 %) are the major. While, five unsaturated fatty acid represent (50%) of the total identified compounds. Mono- , di-, tri- unsaturated fatty acids represent (20%), (10%), (10%) and (10%), respectively. Oleic acid ($C_{18\,1}$ 33.28 %) and linoleic acid ($C_{18\,2}$ 4.32 %) are the major.

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Table (7): GLC analysis of the unsaponifiable matter of seeds of *Adansonia digitata* L.

Peak No.	Name	Retention time	Relative Retention Time (RRT)	Area %
1	Unknown	6.800	0.282	0.225
2	n-Pentadecane (C_{15})	14.236	0.591	0.439
3	Unknown	15.071	0.626	0.767
4	n- Hexadecane (C_{16})	15.629	0.649	2.069
5	n- Heptadecane (C_{17})	16.769	0.696	1.013
6	n- Octadecane (C_{18})	17.692	0.734	4.045
7	n- Nonacosane (C_{19})	18.802	0.780	3.092
8	n- Eicosane (C_{20})	19.756	0.820	8.303
9	n- Heneicosane (C_{21})	20.826	0.864	1.597
10	Unknown	21.249	0.882	1.411
11	n- Docosane (C_{22})	22.014	0.914	2.543
12	n- Tricosane (C_{23})	23.309	0.967	1.057
13	n-Tetracosane (C_{24})	24.094	1	60.455
14	n-Pentacosane (C_{25})	25.086	1.041	3.135
15	n- Hexacosane (C_{26})	26.249	1.089	1.004
16	n- Heptacosane (C_{27})	26.859	1.115	0.539
17	Unknown	27.208	1.131	0.978
18	Unknown	27.928	1.159	0.433
19	n-Octacosane (C_{28})	28.307	1.175	0.541
20	n-Nonacosane (C_{29})	29.208	1.212	1.122
21	Unknown	29.665	1.231	0.777
22	n-Triacontane (C_{30})	30.702	1.274	0.398
23	Unknown	31.347	1.301	0.577
24	Campasterol	31.932	1.325	0.305
25	Unknown	32.724	1.358	0.448
26	Stigmasterol	33.118	1.375	1.560
27	Unknown	33.768	1.402	0.360
28	β- sitosterol	34.723	1.441	0.418
29	β-amyrin	36.093	1.498	0.210
30	α -amyrin	36.793	1.527	0.166

* (RR_t): Retention time relative to n-Tetracosane

Table (8): GLC analysis of FAME of *seeds of Adansonia digitata* L

Peak No.	Name	Retention time	*Relative Retention time (RR_t)	Area %
1	Lauric acid (C_{12})	10.737	0.717	1.710
2	Myristic acid (C_{14})	12.192	0.814	4.004
3	Palmitic acid($C_{16\,0}$)	14.970	1	47.279
4	Palmatulonic acid($C_{16\,1}$)	16.402	1.095	1.336
5	Margaric acid ($C_{17\,0}$)	16.991	1.135	1.383
6	Stearic acid ($C_{18\,0}$)	17.899	1.195	6.325
7	Oleic acid ($C_{18\,1}$)	18.492	1.235	19.745
8	Linoleic acid ($C_{18\,2}$)	19.541	1.305	6.459
9	Unknown	19.932	1.331	1.231
10	Linolenic acid ($C_{18\,3}$)	20.810	1.390	5.471
11	Unknown	21.724	1.451	1.213
12	Arachidonic acid($C_{20\,4}$)	23.579	1.575	3.838

* RR_t: Retention time relative to Palmitic acid = 1

Investigation of total protein and total amino acid content

The percentage of total protein in leaves, fruit pulp and seeds were found to be 9.625%, 2.125% and 12.688%, respectively. Analysis of total amino acids content revealed the identification of (7, 5 and 6) essential amino acids and (8, 7 and 8) non-essential amino acids for leaves, fruit pulp and seeds, respectively. Both leucine and phenylalanine were the major essential amino acids in leaves and seeds while leucine and threonine were the major in the fruit pulp. Alanine and glutamic acid were the major non-essential amino acids in the leaves while glutamic acid and alanine were major in both seeds and fruit pulp. Essential amino acids methionine was present only in leaves and absent in both pulp and seeds. In contrast histidine was absent only in pulp. Non-essential amino acid, tyrosine was found in both leaves and seeds and absent in fruit pulp.

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Table (9) Total amino acids content of leaves *of Adansonia digitata* L..

	Essential amino acids:	Retention time	Relative area %
1	Threonine	14.03	4.654
2	Methionine	35.22	0.824
3	Isoleucine	37.13	3.780
4	Leucine	38.18	10.125
5	Phenylalanine	42.80	5.682
6	Histidine	50.23	2.142
7	Lysine	53.60	3.009
	Non essential amino acids:		
1	Aspartic acid	10.83	11.229
2	Serine	15.28	7.115
3	Glutamic acid	16.73	13.607
4	Glycine	24.32	7.884
5	Alanine	25.25	15.305
6	Cystine	30.90	6.731
7	Tyrosine	41.33	3.098
8	Arginine*	62.78	3.009

Table (10): Total amino acids content of fruit pulp of *Adansonia digitata*

	Essential amino acids :	Retention time	Relative area %
1	Threonine	13.73	4.953
2	Isoleucine	36.92	3.111
3	Leucine	37.98	10.255
4	Phenylalanine	42.55	2.915
5	Lysine	53.60	4.694
	Non essential amino acids :		
1	Aspartic acid	10.53	12.928
2	Serine	14.97	10.574
3	Glutamic acid	16.28	19.611
4	Glycine	23.97	8.912
5	Alanine	24.88	16.528
6	Cystine	30.50	3.374
7	Arginine	61.78	2.135

Table (11) Total amino acids content of seeds *of Adansonia digitata* L.

Essential amino acids		Retention time	Relative area %
1	Threonine	13.90	2.480
2	Isoleucine	37,00	2.244
3	Leucine	38,05	7.179
4	Phenylalanine	42,63	4.166
5	Histidine	50,13	1.954
6	Lysine	53,47	3.973
Non essential amino acids			
1	Aspartic acid	10.72	8.206
2	Serine	15.17	5.848
3	Glutamic acid	16.53	20.942
4	Glycine	24.17	9.887
5	Alanine	5.07	19.841
6	Cystine	30.72	4.988
7	Tyrosine	41.20	1.630
8	Arginine*	61.78	6.661

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دراسة فيتوكيميائية على نبات أدانسونيا ديجيتاتا المنزرع فى مصر

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ينتمى جنس الأدانسونيا الى العائلة البومباكسية ويضم ١٠ انواع وتنتشر زراعته فى المناطق الأستوائية فى افريقيا – مدغشقر- استراليا ويشمل نبات الأدانسونيا ديجيتاتا المعروف باسم باوباب . ويستخدم نبات الادانسونيا ديجيتاتا كغذاء وفى الطب الشعبى كمضاد للالتهابات ومضاد للاكسده ومسكن و مضاد للسخونة .

تم اجراء مسح مرجعى على النبات المنزرع فى افريقيا ولا يوجد اى دراسة على النبات المنزرع فى مصر .

تشمل الدراسة الفيتوكيميائية :

١- **اجراء مسح كيميائى اولى :**

اوضح المسح الكيميائى الأولى وجود كربوهيدرات و/او جليكوزيدات – استيرولات او تربينات – فلافونيدات وكيومارين فى الأجزاء محل الدراسة بالاضافة الى وجود عصفيات فى الأوراق فقط وتم تحضير المستخلصات المتتابعة باستخدام المذيبات القطبية والغير قطبية .

٢- **دراسة المواد الكربوهيدراتية :** اسفر تعيين المحتوى الكربوهيدراتى عن وجود سكريات معقدة بنسبة ٢٠% فالاوراق و ٤٠% فى البالب وتم التعرف على نوعها وتحليلها عن طريق كروماتوجرافيا الغاز والتعرف على وجود ١١ سكر فالاوراق اعلاها سكر الرامنوز ووجود ٩ سكريات فى البالب اعلاها سكر الجلوكوز.

٣- **فحص المواد الدهنية:**

تم تجزئة المواد الدهنية لكل من الأوراق والبالب والبذور الى مواد متصبنة والمواد الغير قابلة للتصبن .قد تم تحليلها باستخدام كروماتوجرافيا الغاز واسفرت الدراسة عن التعرف على ١٧ و ٢٥ و٢١ مركب على التوالى فى الجزء الغير متصبن اعلاها ن- تتراكوزان فى كل من الاوراق والبذور و بيتاسيتوستيرول فى البلب. كما اسفرت دراسة الجزء المتصبن (الاحماض الدهنية) على التعرف على ٦ و٥ و٥ حامض دهنى مشبع على التوالى والتعرف على ٤ و٥ و٥ حامض دهنى غير مشبع على التوالى .حامض الهيبتاكوزيك وحامض البالمتيك وجد انهم الاعلى فى الاحماض المشبعة كما وجد حامض الاوليك الاعلى فى الاحماض الغير مشبعة .

٤- **دراسة المحتوى البروتينى والأحماض الامينية.**

اسفرت الدراسة على ان نسبة البروتين فى الاوراق والبالب والبذور هى ٩.٦٢٥، ٢.١٢٥ و ٦٨٨. ١٢ على التوالى اعلاها نسبة البذور .تم تحليل الاحماض الامينية والتعرف على عدد ١٥ و ١٢و١٤ حامض امينى فى الاجزاء محل الدراسة على التوالى. اثبت الدراسة وجود الميثيونين فى الاوراق فقط وعدم وجود الهيستيدين والتيروزين فالبالب