

**ECONOMIC POTENTIALITIES OF SOME WILD FLORA
IN DAKAHLIYA PROVINCE, EGYPT**

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ABSTRACT

Ten species growing naturally in Dakahliya province were selected to evaluate their economic potentialities. These species are *Cyperus difformis* L., *Cyperus capitatus* Vand., *Schoenoplectus litoralis* (Schard.) Palla., *Sesbania sericea* (Willd.) Link, *Bidens pilosa* L., *Mentha longifolia* (L.) Huds., *Paspalidium geminatum* (Forssk.) Stapf, *Digitaria sanguinalis* (L.) Scop., *Leptochloa fusca* (L.) Kunth. and *Calligonum polygonoides* L. Moisture, total ash, crude fiber, total lipid content, crude protein, glucose, sucrose, total soluble sugars, polysaccharides and nutritive value together with some macro and micro- elements were estimated. The highest values of crude proteins, total lipids and nutritive value were estimated in *Mentha longifolia* while the highest total carbohydrates were recorded in *Cyperus difformis*. The elementary analysis in ash contents of the studied plants indicated that sodium, potassium and calcium were the main cations detected. Regarding the chromatographic analyses of the amino and fatty acids, the results obtained show no variation between different studied species in both number and types of the amino and fatty acids. Analysis of the amino and fatty acids revealed the presence of seventeen amino acids as well as the presence of ten fatty acids.

Keywords: Amino acids Carbohydrates, Elements Nutritive, Fatty acids, Nile Delta, Nutritive value, Wild plants.

INTRODUCTION

There are an excessive global demands for food, forage and agro-industrial raw materials. The Nile Delta region flourished by many weeds. Among the common wild flora of Dakahliya region, the authors chose ten species to evaluate their chemical constituents. The genera of these plants have attracted the attention of workers in many countries. [El-Habashy (1988)] studied the flavonoid compound contents in *Cyperus* spp. [Boulos (1995) and Shaltout et al. (2005)] reported that *Cyperus* species are of economic importance to be used as food and medicinal plants. In genus *Bidens*, polyacetylene, flavonoides, methoxylates flavone glucosides and chalcone ester glucosides were reported [Wang et al., (1997); Brandao et al., (1998) and De Tommasi et al., 1998]. *Mentha longifolia* is widely used in herbal medicine and the production of essential oil [Van Wyk et al., (1997) and Mimica et al., 2003]. Vendramini et al. (1999) studied fibers, proteins and minerals in genus *Paspalidium*. Forage yield, crude protein, minerals, starch, ash, lipids were studied in genus *Digitaria* by [Shy et al. (1995), Santana & Mc Dowell (1996); Shatters & West (1996) and Malik et al., (1986)] reported that *Leptochloa fusca* was used as a fodder. *Calligonum polygonoides* is naturally growing shrub, it plays an important role in sand stabilization.

From the above screening of literature, one can expect the prime importance of individuals belonging to these genera. The present study is a contribution to the previous investigation. It was undertaken to evaluate the nutritive and economic potentialities of the following wild taxa in the Nile Delta: *Cyperus difformis*, *Cyperus capitatus*, *Schoenoplectus litoralis*, *Sesbania sericea*, *Bidens pilosa*, *Mentha longifolia*, *Paspalidium geminatum*, *Digitaria sanguinalis*, *Leptochloa fusca* and *Calligonum polygonoides*.

MATERIALS AND METHODS

During the years 2006- 2007, several field trips were organized to Dakahliya Province for collecting the samples of the concerned plants. The shoot system of each species was cleaned, air dried in shade and ground to fine powder and preserved in a well stopped bottles. For chemical analyses, triplicate samples from shoot of each species were used.

The moisture content was determined and calculated as percent moisture content according to [Ward & Johnson (1962)]. The total ash, total lipid as well as crude fiber contents were determined according to [AOAC (1990)]. The total nitrogen was determined by the conventional semi-micromodification of Kjeldahl method of [Pirie (1955)]. Crude protein was calculated by multiplying the total nitrogen by the factor 6.25 [AOAC (1990)]. Estimation of total soluble sugars was according to [Southgat (1991)], glucose was determined according to [Feteris (1965)], sucrose was determined according to [Handle (1968)] and polysaccharides were estimated according to [Thayumanavan & Sadasivan (1984)]. The nutritive value was estimated according to [USDA (1975) and Indrayan *et al.* (2005)]. The elements were measured using flame photometer and atomic absorption spectrometer according to [Allen *et al.*, (1974)].

The identification and quantitative determination of amino acid composition was carried out using Amino Acid Analyzer (Model, 119C1) according to [Moore & Stein (1985)], while analysis constituents of fatty acids was carried out through their methyle esters adopting the GLC technique [Guenther (1972)].

The stastical treatments applied here were according to [Snedecor & Cochran (1968)].

RESULTS

Determination of chemical constituents of the selected plant species

Examination of results obtained from the determination of the chemical constituents in the selected plant species (Table 1 & Fig. 1) showed that, *Mentha longifolia* contained a relatively high percentage of total lipid (3.14%), total nitrogen (3.14%) and crude protein (21.31%). The high amounts of sucrose (22.80 mg/g dry wt.), polysaccharides (294.69 mg/g dry wt.) and total carbohydrates (379.66 mg/g dry wt.) were recorded in *Cyperus difformis* while the high amounts of ash (15.88%) and total soluble sugars (66.04 mg/g dry wt.) were detected in *Digitaria Sanguinalis*. The highest percentage of moisture content (9.80 %) was recorded in *Paspalidium geminatum* and the lowest value (5.14%) was in *Calligonum polygonoides*. The highest value of crude fiber content (38.56%) was recorded in *Cyperus capitatus* while the lowest content (18.78%) was recorded in *Sesbania sericea*.

Table (1). Mean values of the different constituents in the selected plant species .

Species	Moisture content (%)	Dry matter (%)	Total ash (%)	Total lipid (%)	Crude fiber (%)	Crude protein (%)	Total nitrogen (%)	Carbohydrates (mg/g dry wt.)				Nutritive value (Cal/100g)	
								Total soluble sugar	Glucose	Sucrose	Polysaccharides		Total carbohydrates
<i>Cyperus capitatus</i>	6.30	93.70	11.48	2.22	38.56	6.75	1.08	34.25	4.56	5.04	245.36	289.21	162.66
<i>Cyperus difformis</i>	6.14	93.86	14.26	1.06	20.50	9.00	1.44	58.45	3.72	22.80	294.69	379.66	197.42
<i>Schoenoplectus litoralis</i>	7.80	92.20	10.02	1.43	30.68	5.13	0.82	58.33	6.70	12.07	250.05	327.15	164.23
<i>Sesbania sericea</i>	5.44	94.56	7.15	0.95	18.78	11.88	1.90	53.12	4.05	18.63	270.33	346.13	194.51
<i>Bidens pilosa</i>	6.04	93.96	13.36	2.62	20.19	7.25	1.16	55.23	2.23	9.44	255.32	322.22	181.46
<i>Mentha longifolia</i>	6.94	93.06	10.46	3.14	26.50	21.31	3.41	43.66	6.32	20.23	210.96	281.17	225.98
<i>Digitaria sanguinalis</i>	8.74	91.26	15.86	1.28	25.49	7.75	1.24	66.04	1.01	6.30	232.14	305.49	164.72
<i>Leptochloa fusca</i>	8.18	91.82	11.62	0.99	21.50	8.06	1.29	47.46	3.55	10.94	241.89	303.84	162.67
<i>Paspalidium geminatum</i>	9.80	90.20	14.04	1.31	32.11	7.63	1.22	50.77	1.66	5.67	280.67	338.77	177.83
<i>Calligonum polygonoides</i>	5.14	94.86	9.23	0.52	35.24	7.38	1.18	35.64	5.20	6.22	201.43	248.49	133.60

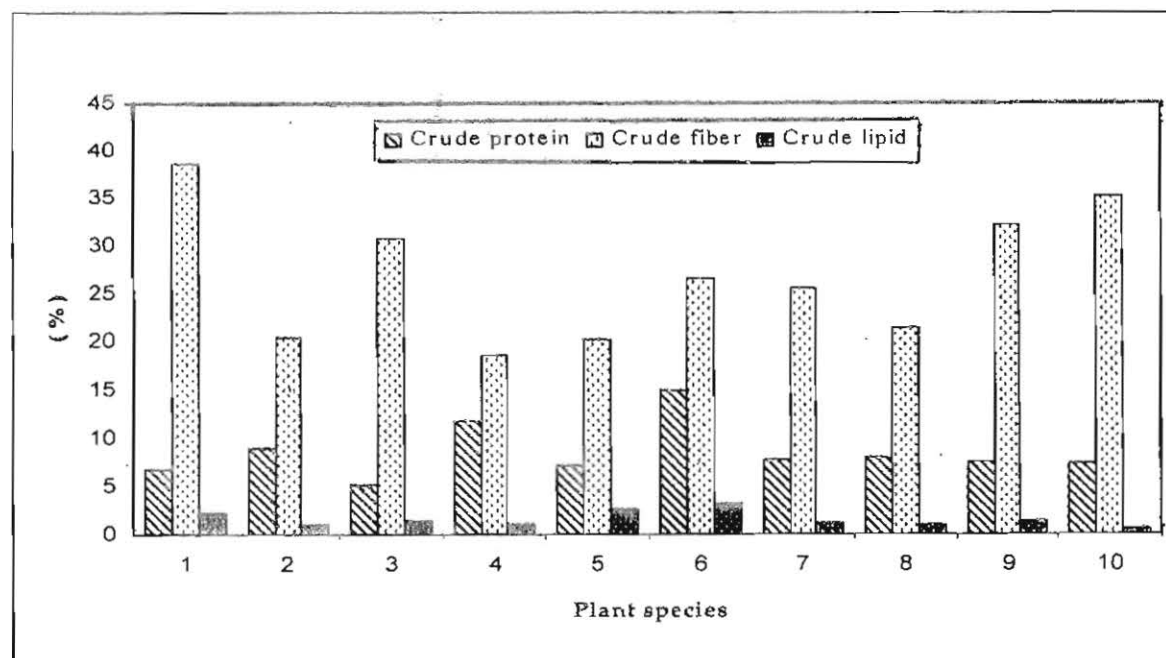


Fig. (1) : Crude protein, crude fiber and crude lipid contents of the selected species.

(1) *Cyperus capitatus*
 (4) *Sesbania sericea*
 (7) *Digitaria sanguinalis*
 (10) *Calligonum polygonoides*

(2) *Cyperus difformis*
 (5) *Bidens pilosa*
 (8) *Leptochloa fusca*

(3) *Schoenoplectus litoralis*
 (6) *Mentha longifolia*
 (9) *Paspalidium geminatum*

The hierarchical cluster analysis of the selected species according to the similarity index of their different phytochemical parameters showed the presence of five groups : group A comprises four species namely: *Schoenoplectus litoralis*, *Bidens pilosa*, *Sesbania sericea* and *Paspalidium geminatum*; group B comprises one species (*Cyperus difformis*); group C comprise one species (*Mentha longifolia*); group D comprises one species (*Calligonum polygonoides*) and group E comprises three species namely: *Cyperus capitatus*, *Digitaria sanguinalis* and *Leptochloa fusca* (Fig.2).

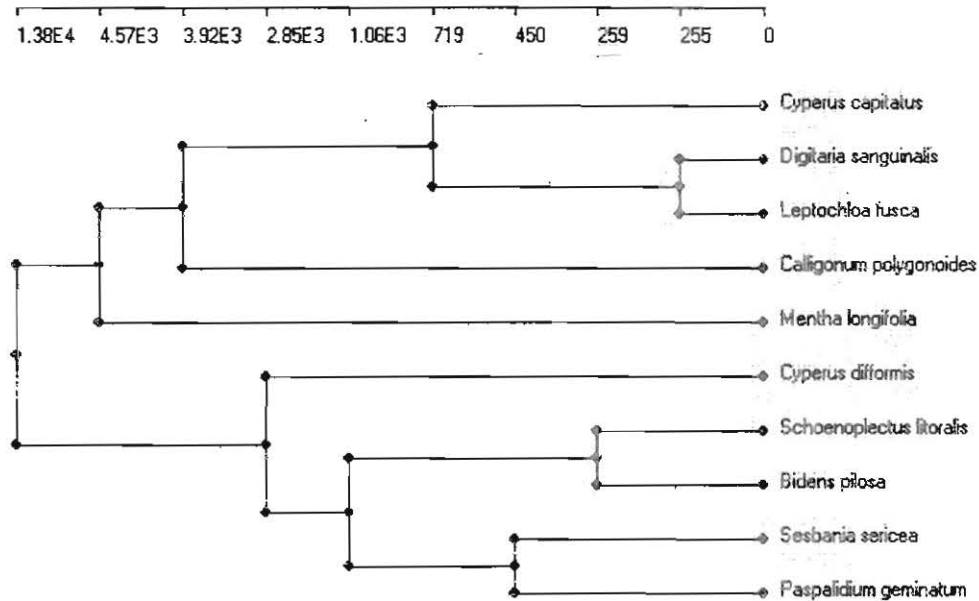


Fig. (2): Hierarchical cluster analysis of the selected species according to phytochemical analysis .

Elementary analysis of the studied species

The elementary analysis of the selected plant species are presented in Table (2) and Fig. (3). Sodium concentration showed a wide range of variation , its values ranged from 12.80 mg/g dry weight in *Bidens pilosa* to 86.40 mg/g dry weight in *Leptochloa fusca* .Potassium concentration varied from 3.75 mg/g dry weight in *Bidens pilosa* to 13.13 mg/g dry weight in *Calligonum polygonoides*. *Mentha longifolia* attained the highest value of calcium (5.65 mg/g dry weight) and magnesium

Table (2). Elemental composition (mg/g dry weight) of the ash of the different selected species.

Species	Macro-elements				Micro-elements					
	Na ⁺	K ⁺	Ca ⁺⁺	Mg ⁺⁺	Fe ⁺⁺	Mn ⁺⁺	Zn ⁺⁺	Cu ⁺⁺	Pb ⁺⁺	Cd ⁺⁺
<i>Cyperus capitatus</i>	36.8	10.18	2.22	3.72	0.20	0.03	0.02	0.04	0.0050	0.0012
<i>Cyperus difformis</i>	40.00	5.63	2.68	6.22	0.58	0.15	0.05	0.06	0.0004	0.0018
<i>Schoenoplectus litoralis</i>	70.40	6.03	2.23	4.26	0.19	0.15	0.03	0.04	0.0040	0.0012
<i>Sesbania sericea</i>	17.60	4.69	2.56	3.62	0.35	0.03	0.04	0.04	0.0570	0.0010
<i>Bidens pilosa</i>	12.80	3.75	2.25	6.54	0.45	0.06	0.08	0.17	0.0050	0.0012
<i>Mentha longifolia</i>	14.40	7.50	5.65	6.84	0.55	0.06	0.06	0.06	0.0008	0.0010
<i>Digitaria sanguinalis</i>	14.40	10.18	1.14	3.98	1.07	0.08	0.06	0.05	0.0022	0.0010
<i>Leptochlon fusca</i>	86.40	4.42	2.02	4.18	0.24	0.08	0.03	0.03	0.0012	0.0012
<i>Paspalidium geminatum</i>	40.00	11.39	4.22	3.24	0.50	0.15	0.05	0.04	0.0056	0.0004
<i>Calligonum comosum</i>	30.40	13.13	4.11	5.82	0.17	0.05	0.02	0.04	0.0050	0.0018

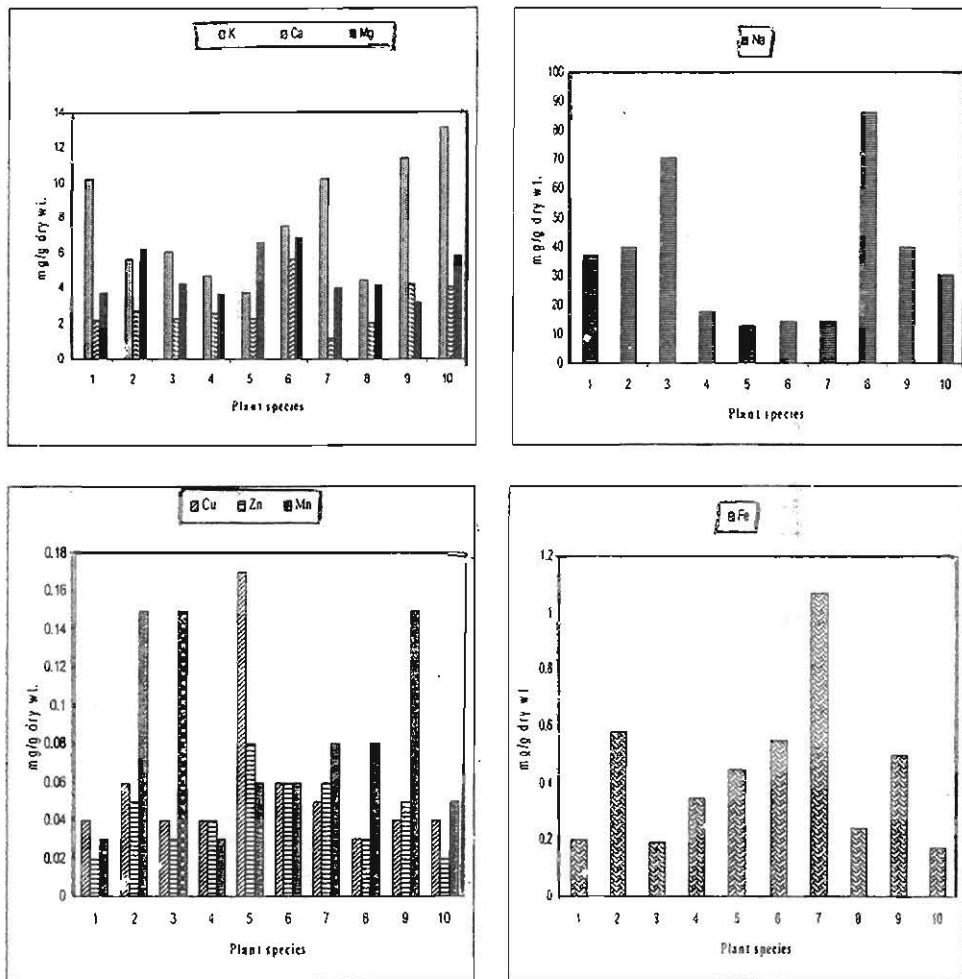


Fig. (3) : The elementary analysis of the selected plant species .

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|-------------------------------------|------------------------------|-------------------------------------|
| (1) <i>Cyperus capitatus</i> | (2) <i>Cyperus difformis</i> | (3) <i>Schoenoplectus litoralis</i> |
| (4) <i>Sesbania sericea</i> | (5) <i>Bidens pilosa</i> | (6) <i>Mentha longifolia</i> |
| (7) <i>Digitaria sanguinalis</i> | (8) <i>Leptochloa fusca</i> | (9) <i>Paspalidium geminatum</i> |
| (10) <i>Calligonum polygonoides</i> | | |

(6.84 mg/g dry weight). The highest of iron (1.14 mg/g dry weight) is recorded in *Digitaria sanguinalis*. The concentration of manganese ranged from 0.03 mg/g dry weight in both *Cyperus capitatus* and *Sesbania sericea* to 0.15 mg/g dry weight in both *Cyperus difformis* and *Schoenoplectus litoralis*. The maximum values of zinc and copper were recorded in *Bidens pilosa* (0.08 and 0.17 mg/g dry weight respectively). The lead and cadmium ion concentration were very low in all studied species. Requirements for most minerals are not constant but are affected by a number of dietary and physiological factors that affect either absorption or metabolic demand [NRC (1970)].

Analysis of fatty acids of the selected species

The percentages of saturated and unsaturated fatty acids were estimated and given in Table (3). The highest amounts of lauric (4.74%), myristic (4.03%) palmitic (47.39%) and heptadecanoic (3.32%) acids were recorded in *Schoenoplectus litoralis*. While, in *Cyperus capitatus* the lowest values of myristic (1.17%), palmitic (13.90%), palmitoleic (0.64%) and heptadecanoic (0.32%) acids and also the highest amount of oleic acid (35.17%) were recorded. The high percentage of stearic (8.86%) and arachidic (3.80%) acids were estimated in *Digitaria sanguinalis*. The highest percentage of saturated fatty acids (67.30%) and the lowest percentage of unsaturated fatty acids (32.70%) were recorded in *Schoenoplectus litoralis* while the highest percentage of unsaturated fatty acids (76.31%) and the lowest percentage of saturated fatty acids (23.69%) were found in *Calligonum polygonoides*.

The hierachial cluster analysis of the selected species according to the similarity index of their fatty acids concentrations showed the presence of five groups : group A comprises one species (*Sesbania sericea*); group B comprises two species namely: *Schoenoplectus litoralis* and *Digitaria sanguinalis*; group C comprises one species (*Mentha longifolia*); group D comprises two species namely: *Bidens pilosa* and *Paspalidium geminatum* and group E comprises four species namely: *Cyperus capitatus*, *Cyperus difformis*, *Leptochloa fusca* and *Calligonum polygonoides* (Fig.4).

Table (3) :Results of the G.L.C investigation of the fatty acids(%)of the selected species .

Species	Lauric	Myristic	Palmitic	Palmitoleic	Heptadecanoic	Stearic	Oleic	Linoleic	Linolenic	Arachidic	Total Saturated	Total Unsaturated
<i>Cyperus capitatus</i>	1.33	1.17	13.90	0.64	0.32	8.49	35.17	33.70	3.99	1.20	26.50	73.51
<i>Cyperus difformis</i>	0.76	1.72	19.06	4.07	2.07	4.77	22.30	41.03	2.86	0.48	28.84	71.16
<i>Schoenoplectus litoralis</i>	4.74	4.03	47.39	2.37	3.32	6.40	9.24	10.66	10.43	1.42	67.30	32.70
<i>Sesbania sericea</i>	1.19	1.79	35.69	2.14	1.61	8.57	15.47	27.48	4.50	1.07	49.91	50.09
<i>Bilens pilosa</i>	1.24	2.19	20.05	2.19	0.73	6.16	22.07	32.53	12.03	0.82	31.18	68.82
<i>Mentha longifolia</i>	1.24	1.54	25.47	1.39	1.16	3.72	9.49	18.58	34.15	3.25	36.39	63.61
<i>Digitaria sanguinalis</i>	2.93	2.93	43.89	0.66	1.32	8.86	11.41	16.17	8.05	3.80	63.72	36.28
<i>Leptochloa fusca</i>	2.01	1.81	20.45	1.50	1.00	6.52	23.86	39.10	3.01	0.75	32.53	67.47
<i>Paspalidium geminatum</i>	2.78	3.12	20.82	1.74	1.09	7.91	20.30	30.97	8.68	2.60	38.32	61.68
<i>Calligonum polygonoides</i>	1.07	1.24	15.64	3.07	0.54	4.94	26.04	45.22	1.98	0.27	23.69	76.31

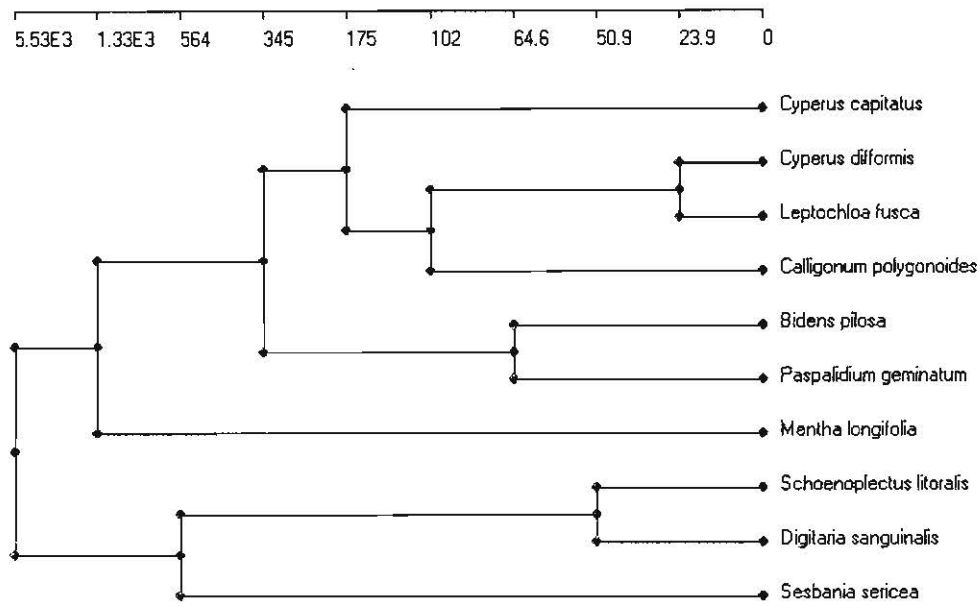


Fig. (4): Hierarchical cluster analysis of the selected species according to fatty acids.

Analysis of amino acids of the studied species

The quantitative analysis of amino acids of the investigated plants is presented in Table (4). The highest amounts of threonine (6.54 g/100 g protein), serine (6.24 g/100 g protein), glutamic acid (11.42 g/100 g protein), glycine (7.82 g/100 g protein), valine (8.76 g/100 g protein), methionine (0.74 g/100 g protein), tyrosine (4.99 g/100 g protein), phenylalanine (8.03 g/100 g protein), histidine (3.52 g/100 g protein), lysine (7.50 g/100 g protein) and arginine (8.81 g/100 g protein)were detected in *Mentha longifolia*. The highest total amounts of amino acids were recorded in *Mentha longifolia* (93.77 g/100 g protein) followed by *Sesbania sericea* (76.49 g/100 g protein), *Cyperus difformis* (52.37 g/100 g protein) and *Leptochloa fusca* (50.20 g/100 g protein) while the lowest amount (19.47 g/100 g protein) was found in *Schoenoplectus litoralis*.

Table (4). Amino acids investigation (G.A./100 g protein) of the selected plants.

Amino acids	<i>Cyperus capitatus</i>	<i>Cyperus difformis</i>	<i>Schoenoplectus litoralis</i>	<i>Sesbania sericea</i>	<i>Bidens pilosa</i>	<i>Mentha longifolia</i>	<i>Digitaria sanguinalis</i>	<i>Leptochloa fusca</i>	<i>Paspalidium geminatum</i>	<i>Calligonum Polygonoides</i>
1- Aspartic acid	4.40	10.44	3.27	12.21	4.64	8.95	5.46	10.60	6.75	4.72
2- Threonine	1.43	2.08	0.78	2.58	1.26	6.54	1.85	1.92	1.41	1.21
3- Serine	1.39	2.10	0.82	2.66	1.74	6.42	1.68	2.11	1.40	1.31
4- Glutamic acid	4.72	7.20	3.06	10.51	7.20	11.42	8.12	7.71	5.15	5.44
5- Proline	2.06	5.91	2.05	8.63	5.14	1.54	2.73	2.94	4.92	2.89
6- Glycine	1.80	2.86	0.89	3.45	1.97	7.82	2.00	2.55	2.41	1.66
7- Alanine	2.53	3.29	1.13	4.69	1.92	1.56	2.48	2.89	2.31	2.33
8- Cystine	0.06	0.06	0.01	0.04	0.05	0.12	0.06	0.16	0.03	0.03
9- Valine	2.06	1.05	1.06	5.00	1.92	8.76	2.50	2.48	2.55	2.04
10- Methionine	0.16	0.05	0.12	0.15	0.12	0.74	0.14	0.22	0.13	0.14
11- Isoleucine	3.42	3.75	1.34	5.63	2.14	5.29	3.81	3.08	2.72	2.52
12- Leucine	3.59	3.59	1.33	6.27	2.19	1.76	3.25	3.28	2.63	2.99
13- Tyrosine	1.28	1.23	0.63	1.88	1.05	4.99	1.21	1.86	1.19	0.97
14- Phenylalanine	2.25	2.13	0.90	3.70	1.56	8.03	1.94	2.49	2.05	1.83
15- Histidine	1.33	1.08	0.49	1.03	1.21	3.52	0.96	1.04	1.09	0.85
16- Lysine	2.14	3.00	0.74	3.09	2.27	7.50	2.09	2.32	2.01	1.85
17- Arginine	2.19	2.55	0.85	4.97	1.67	8.81	2.17	2.55	1.97	2.69
Total	36.81	52.37	19.47	76.49	38.05	93.77	42.45	50.20	40.72	35.47

The hierarchical cluster analysis of the selected species according to the similarity index of their amino acids concentrations showed the presence of five groups : group A comprises one species (*Mentha longifolia*); group B comprises one species (*Sesbania sericea*); group C comprise one species (*Schoenoplectus litoralis*); group D comprises two species namely: *Cyperus difformis* and *Leptochloa fusca* and group E comprises five species namely: *Cyperus capitatus*, *Calligonum polygonoides*, *Bidens pilosa*, *Paspalidium geminatum* and *Digitaria sanguinalis* (Fig.5).

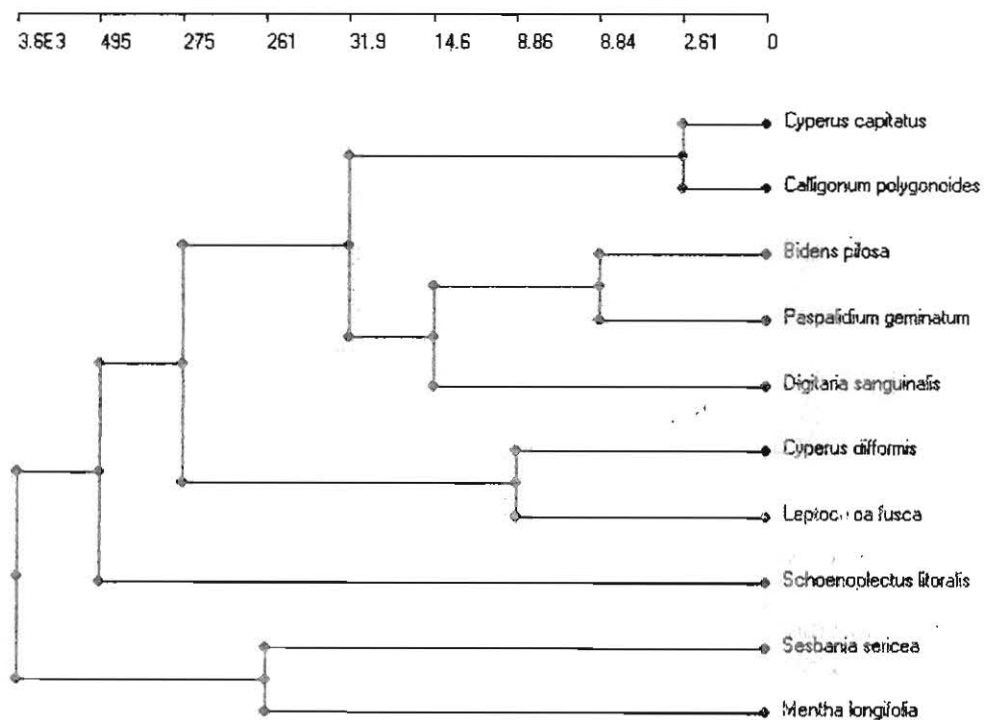


Fig. (5): Hierarchical cluster analysis of the selected species according to amino acids.

DISCUSSION

The main aim of the present work was to investigate the economic potentiality of some weeds inhabiting the Nile Delta region. In Egypt, the seasonal decline in forage quality no doubts affects the nutritional status of range animals. The forage value of a plant is the result of palatability and voluntary intake by livestock, nutritive value (i.e. chemical composition and digestibility) and absence of toxicity which reduce the value of pasture and livestock intake.

Nutritional stress due to crude protein deficiency in mature natural grass has responsible for slow growth rate, low birth, low milk production and inefficient performance of animals [Kulich (1992)]. The selected species showed relatively high percentage of crude protein, these results are comparable with the study of [Zahran *et al.*, (1999) and Awad (2001)]. The total carbohydrates which provides the plant itself and animal by energy were represented by relative high values that are comparable with the study of [El-Shamy (1995)]. Dietary lipid increases the energy density of a diet and may increase energy intake by dairy livestock. However, feeding high lipid diets often results in decreased feed and energy intakes in dairy cattle [Palmquist (1994)]. The percentage of lipids in the present study is relatively low, this agree with [Zahran *et al.*, (1999)]. High crude fiber content indicates a high degree of lignification and thus reduced amounts of available energy [Nordfeldt *et al.*, (1961)]. The percentage of crude fiber in the selected species was similar to that reported by [El-Kady (1987) and Heneidy & Bidak (1996)]. The percentage of ash content of the selected species in the present study agree with the finding by [El-Halawany *et al.*, (2002) and Awad (2001)].

The studied species in the present work contain high concentration of sodium and copper. On the other hand, calcium, potassium, magnesium, iron and manganese showed low concentration to that reported by [El-Ghonemy *et al.*, (1977); El-Kady (1987); Sharaf El-Din (1998) and El-Halawany *et al.*, (2002)]. The analysis of fatty acids indicated that, the studied plants contain high contents of fatty acids. These results may confirmed with the results reported by [Salama (1989) and Baraka & El-Hady (1993)]. The protein content was extremely important in feed, although its value has been over

emphasized. Forage high in protein is used for energy and is required for repair and new growth of animal tissue, including such animal products as milk, tissues and hair [Thalen (1979)]. The present study indicates that, the studied plants are rich in protein and essential amino acids like lysine which is considered as a good candidate for food supply both as grain crop and as vegetable in developing countries [Sammour *et al.*, 1993]. The concentration of amino acids is relatively high as compared with those determined by [El-Shamy (1995) and El-Halawany *et al.*, (2002)].

From the present study, it may conclude that, the selected species may be :1) added to the non-conventional forage to be used as a rich green fodders for livestock in both summer and winter seasons, and 2) used as a raw materials for various uses in industrial and pharmaceutical purposes.

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الأهمية الاقتصادية لبعض النباتات النامية طبيعياً بمحافظة الدقهلية بمصر

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يهدف هذا البحث الى إجراء دراسات على المحتوى الكيماوى و الايضى لعشرة أنواع من النباتات التى تنمو طبيعياً بمنطقة دلتا النيل (محافظة الدقهلية) وهى : العجبر ، القطيف ، خب (ديس)، السيسان البرى ، شوك الحدائق ، حبق البحر ، النسيلة ، السفيرة ، هيش (قصبة) ، أرطه وذلك بغرض تقدير احتمالية ومدى أهميتها الاقتصادية.

وقد تم قياس كل من الرطوبة ، الرماد الكلى ، كمية الدهون ، كمية البروتين ، نسبة الالياف ، كمية النيتروجين ، كمية السكريات ، القيمة الغذائية فى هذه النباتات . كما تم أيضاً تقدير عناصر الصوديوم ، البوتاسيوم ، الكالسيوم ، الماغنسيوم ، الحديد ، المنجنيز ، الزنك ، النحاس ، الكاديوم ، الرصاص . كما تم التعرف على الاحماض الامينية والدهنية الموجودة فى هذه النباتات كما تم تقدير تركيز كل حمض منهم على حده.

وقد أوضحت نتائج الدراسة الفيتوكيميائية أن النباتات تحت الدراسة تحتوى على مواد عضوية وأخرى غير عضوية تؤهلها كنباتات أعلاف للحيوانات ، كما انه مع مزيد من الدراسة يمكن استخدامها فى مجالات العقاقير والطب والصناعة .