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CHEMICAL COMPOSITION OF *Anabasis articulat* (FORSSK.) GROWING IN EGYPT .

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ABSTRACT

The preliminary phytochemical screening of *Anabasis articulata* (collected from north Sinai at El- Quesyma and Matruh at Om El- Raham) showed that it contained sterols, flavonoids, tannins, chlorides, sulphates, saponins, alkaloids, glycosides and / or carbohydrates.

The paper chromatographic investigation revealed the presence of glucose, fructose and ribose as free sugars and sucrose, glucose, a rabinose a nd xylose as combined sugars at the two studied habitats.

The free amino acids aspartic acid, theronine, serine, glutamic, proline, glycine, methionine, isolucine, leucine, tyrosine,phenylalanine histidine and lysine were detected chromatographically in the two studied habitats. The data of amino acid analyzer show that the protein hydrolysate of *Anabasis articulata* contained aspartic acid, thereonine, serine, glutamic, proline, glycine, alanine, valine, methionine, isolucine, leucine, tyrosine, phenylalanine, histidine, lysine and ammonia in the two studied habitats with different ranges of concentration. Proline was detected in high concentration 21.2 and 28.6% in El- Quesyma and Matruh, respectively.

The fundamental chemical properties of *Anabasis articulata* collected from the two studied habitats were determined. It was obvious from the obtained GLC results that the unsaponified matter of the plant contained 10 hydrocarbon and 3 sterol with different range of concentration at the two studied habitats.

GLC chromatogrames of the saponified matter revealed the presence of (12 and 13) saturated fatty acids and (8 and 9) unsaturated fatty acids with different range of concentration at El- Quesyma and Matruh respectively.

Concerning the active constituents it was found that the percentages of total flavonoids, total alkaloids and total tannins were higher in El- Quesyma than those in Matruh while total saponins was higher in Matruh than that in El- Quesyma habitats.

Keywords: phytochemical- *Anabasis*- amino acids- fatty acids- carbohydrates.

INTRODUCTION

The family Chenopodiaceae contains numerous species which vary greatly in their chemical constituents and uses. It contains Alkaloids, flavonoid, proteins and amino acids.

Genus *Anabasis* have been reported to contain alkaloids, saponins, steroles, proteins amino acids, tannins and flavonoids.

Anabasis articulata. Branches erect. Leaves reduced to short capsulrs. Flowers opposite, solitary. Wings of fruit perianth (perigonium) 5, striate sinuate,large, yellow or rose, rotate. In sandy deserts.

Different alkaloids isolated from family chenopodiaceae as well as N-methyltyramine and hordinine (Manske,1968).

Flavonoids of different species were investigated and isolated as well as chrysin, chrysoeriol and isorhamnetin(Alam, *et al* 1990).

The anticholinesterase activities of the methiodides and hydrochlorides of anabasine, lupinine, anabasamine and methyl aphyllinate (isolated from *Anabasis.aphylla*) are presented. All alkaloids were reversible inhibitors of 2 types of cholinesterase (acetylcholinesterase and butyrylcholinesterase) Tilyabaev and Abduvakhabor (1998).

MATERIALS AND METHODS

Anabasis articulata was collected from the two natural habitats, El-Quesyma (north Sinai) and Om El- Raham (Matruh),in spring 2002. The fresh plants were collected, cleaned and dried in an oven at 60° C for 48 hours and ground to fine powder, then kept in tight containers for the following investigations:

2.1 Preliminary phytochemical screening:

About 50g of air dried powderd plant material were extracted with about 50 ml of 80% ethyl alcohol for 6 hours, then filtered. The residue was then washed several times with warm alcohol. And the combined alcohol filtrates were concentrated under reduced pressure at 50° C, then used for the following:

Tests for tannins according to Balbaa (1986), sterols according to Fieser and Fieser (1959) and Salkowski reaction's according to Brieskorn and Klinger- Hand Polonius (1961), flavonoids according to Wall *et al*, (1954), carbohydrates and / or glycosides using Moloch's and Fehling reagents according to Harper, (1975), saponins according to Wall *et al*, (1954), chlorides and sulphates according to (A.O.A.C. 1970), and alkaloids according to Jenkins *et al*, (1957).

2-2 Investigation of carbohydrates:

The free and combined carbohydrates were determined according to Chaplin and Kennedy, (1994).Using paper chromatographic techniques.

2-3 Investigation of amino acids:

The free and protein - amino acids were investigated according to Pellet and Young (1980).

2-4 Investigation of the lipids:

The lipids were extracted and estimated according to the A.O.A.C. (1970).Using Gas liquid chromatography (GLC).

2-4-1 The fundamental chemical properties of the lipid fraction:

Acid value (A.V.), ester value (E.V.) and saponification value (S.V.) were determined according to Guenther (1972). Iodine value (I.V.) was estimated according to Mohamed and Amer (1965).

2-4-2 Investigation of fatty acids and unsaponifiable matter:

The extracted lipids of *Anabasis .articulata* were saponified and purified according to Nelson, *et al*, (1969)and Farag *et al*, (1986).

2-5 Active constituents:

2-5-1 Estimation of flavonoid content:

The total flavonoid (as luteolin) of *Anabasis articulata* at the two studied habitats were determined according to Karawya and Aboutable (1982).

2-5-2 Estimation of alkaloid content:

The total alkaloid of *Anabasis articulata* at the two localities were estimated according to Balbaa (1986) and Woo *et al* (1977).

2-5-3 Estimation of saponin content:

Saponin content of *Anabasis articulata* at the two studied habitats were estimated according to Balbaa (1986).

2-5-4 Estimation of tannins content :

The total tannins were determined according to Makkar and Goodchilde (1996).

RESULTS AND DiSUSSION

3-1 Preliminary phytochemical screening:

The preliminary phytochemical screening of *Anabasis articulata* collected from the two habitats, revealed the presence of sterols, flavonoids, tannins, chlorides, sulphates, saponins, carbohydrates and / or glycosides and alkaloids (Table 1).

3-2 Investigation of carbohydrates:

The obtained paper chromatograms used N-butanol :Acetic acid : water (4:1:5) of free sugars of *Anabasis articulata* at El – Quesyma and Matruh habitats revealed the presence of glucose, fructose and ribose . Meanwhile the paper chromatograms of combined sugars of *Anabasis articulata* at the two habitats revealed the presence of sucrose, glucose, arabinose and xylose (Table2).

3-3 Investigation of amino acids:

The obtained paper chromatograms N-butanol :Acetic acid : water (4:1:5) of free amino acids of *Anabasis articulata* at the two studied habitats are given in (Table 3),which revealed the presence of aspartic acid, theronine, serine, glutamic acid, proline, glycine, methionine, isoleucine, leucine, phenylalanine, histidine and lysine. The investigation of protein – amino acids of *Anabasis articulata* in the two studied areas, were achieved using amino acid analyzer and the obtained result are present in (Table 3). Data showed that *Anabasis articulata* contained fourteen amino acids with different ranges of concentrations in the two studied habitats. The highest one of the bound amino acids was proline (21.2 and 28.6 mg/100g) in El- Quesyma and Matruh habitats respectively .

The physiological significance of proline accumulation may be due to its role in osmoregulation (Barnett and Naylor, 1966) provision of both carbon

and nitrogen for post stress relief (Thompson *et al.*, 1966), or removal of ammonia (Henkel, 1964 and Abdel Basset, 1992).

The increase of proline in Matruh samples may be due to the increase of soil salinity in Matruh than that in El – Arish. (Ali and Sawaf 1992) reported that, salinity could be inhibit the transmission reactions and hence the glutamic acid is accumulated and transformed to other nitrogenous compounds such as proline.

3-4 Investigation of the lipids:

3-4-1 The fundamental chemical properties :

It was clear from (Table 4) that the extracted oil lipids of *Anabasis articulata* collected from the two habitats proved that acid, iodine, ester and saponification values were higher at El – Quesyma habitat than those at Matruh habitat.

3-4-2 Unsaponifiable matter:

The unsaponifiable matter (sterols and hydrocarbons) composition of *Anabasis articulata* was determined using GLC technique. The relative percentages of each component were calculated and recorded in (Table 5). From the obtained results, it was obvious that the plant at two habitats contained 10 hydrocarbon with 3 sterols, namely, cholesterol, β sitosterol and stigmasterol with different range of concentration.

3-4-3 Saponifiable fraction of the lipids:

The saponifiable content of *Anabasis articulata* were determined using GLC technique. The relative percentages of each component were calculated and recorded in (Table 6) which revealed the presence of (12 and 13) saturated fatty acids and (8 and 9) unsaturated fatty acids with different range of concentration at El –Quesyma and Matruh respectively.

It was clear from (Table 6) that Oleic acid represented the higher percentage of fatty acids (56.5 and 29.0 %) at El –Quesyma and Matruh habitats, respectively. Meanwhile the lowest one was enanthic acid 0.1% at El –Quesyma and caproic acid and arachidic acid 0.1% at Matruh habitat. On the other hand caproic and arachidic acids were absent at El –Quesyma habitat.

3-5 Active constituents:

The preliminary phytochemical screening of *Anabasis articulata* at the two habitats indicated that the plant contained flavonoids, alkaloids, tannins and saponins as active constituents.

3.5.1 Estimation of total flavonoids

the percentages of total flavonoids were determined spectrophotometerically and calculated as luteolin. Data presented in (Table 7) indicated that the percentages of total flavonoids of the plant was higher at El-Quesyma habitat than that at Matruh habitat.

The natural plants produce different kinds of natural secondary metabolites during their metabolism, where the nature and amounts of these compounds vary according to the environmental condition. Some of these compounds have an essential role in growth and development but the majority

of them are involved in chemical defense systems, which protect plants from herbivores and microbial infection (Michael, 1997).

A number of phenolic compounds have been identified in the surface waxes of leaves or fruits to prevent germination of hostile fungal spors. Plant phenolics are liable to interact with animals that eat plants throughout the whole process of food selection, eating and digestion. Isoflavonoids have long-term effects on grazing animals because of their oestrogenic properties. (Michael, 1997).

3.5.2. Estimation of total alkaloids:

Data presented in (Table 7) indicated that the percentage of total alkaloids of *Anabasis articulata* was higher at El- Quesyma than that at Matruh habitats.

Alkaloids are poisonous agents protecting the plant against insects and herbivores, so during growth and development of plants, alkaloids are used as defensive agents and concentrated near the surface regulatory growth factors and they are capable of supplying nitrogen on other elements to the plant (Balbaa, 1986).

3.5.3. Estimation of tannins:

The total tannins at the two habitats were illustrated in (Table 7). Data presented indicated that the percentages of total tannins of the plants was higher at El- Quesyma habitat than that Matruh habitat.

Tannins inhibit the growth of many fungi. Also play a role in protecting the plants against grazing animals as they cause increase of the excretion of saliva and thus decrease the palatability and rate of digestion in animals. (Michael, 1997).

3.5.4 Estimation of total saponins:

Data presented in (Table 7) indicated that the percentage of total saponins was higher at Matruh habitat than that at El- Quesyma habitat.
Saponins have a bitter acrid taste and they are sternutatory and irritating to the mucous membranes of eyes and nose. Also they are toxic to animals, so accumulation of them in plants are defensive against herbivores especially on the surface. (Balbaa, 1986).

Table (1): Preliminary phytochemical screening of *Anabasis articulata*.

Test	Result
Sterols	+
Flavonoids	+
Tannins	+
Chlorides	+
Sulphates	+
Saponins	+
Carbohydrates and/or glycosides	+
Alkaloids	+

Table (2): The separation of free and combined sugars of *Anabasis articulata* by using paper chromatographic.

Sugar name	Free sugars		Combined sugars	
	El- Quesyma	Matruh	El- Quesyma	Matruh
Glucose	+	+	+	+
Fructose	+	+	-	-
Ribose	+	+	-	-
Sucrose	-	-	+	+
Arabinose	-	-	+	+
Xylose	-	-	+	+

+=present -=absent

Table (3): Free and protein- amino acids of *Anabasis articulata* at the two habitats

Name of amino acid	Free amino acids		Mg/ 100g Protein amino acids	
	El- Quesyma	Matruh	El- Quesyma	Matruh
Aspartic acd	+	+	15.20	11.20
Theronine	+	+	3.00	3.40
Serine	+	+	6.30	6.20+
Glutamic acid	+	+	11.50	18.80+
Proline	+	+	21.20	28.60+
Glycine	+	+	2.70	1.20+
Alanine	-	-	12.30	13.10+
Cysteine	-	-	-	-
Valine	-	-	2.20	3.70
Methionine	+	+	2.80	5.50+
Isoleucine	+	+	7.70	0.50+
Leucine	+	+	8.10	2.40+
Tyrosine	+	-	1.40	0.26+
Phenylalanine	+	+	2.10	0.36+
Histidine	+	+	1.10	1.90+
Lysine	+	+	-	2.41+
Ammonia	-	-	2.30	-
Arginine	-	-	-	-

+=present -=absent

Table (4) : Acid, Ester, Saponification and Iodine values of lipid of *Anabasis articulata* at the two habitats.

Item	El- Quesyma	Matruh
Acid value	18.0	17.2
Iodine value	97.6	80.3
Ester value	152.0	142.2
Saponification value	170.0	159.4

Table (5): GLC of hydrocarbon and sterol of *Anabasis articulata* at two studied habitats.

Hydrocarbons and sterols	Concentration	
	El- Quesyma	Matruh
Dodecanoic	11.3	20.6
Tetradecanoic	1.9	5.8
Hexadecanoic	1.7	3.0
Octadecanoic	1.7	3.1
Eicosanoic	4.6	3.6
Docosanoic	8.0	5.5
Tetracosanoic	12.2	4.6
Hexacosanoic	10.1	12.2
Octacosanoic	12.1	4.2
Trianotanoic	5.3	6.2
Cholesterol	0.8	4.2
B- sitosterol	20.1	12.5
Stigmasterol	9.4	14.1

Table (6): GLC of fatty acid of *Anabasis articulata* at the two studied habitats.

Fatty acid	Concentration	
	El- Quesyma	Matruh
Caproic acid	-	0.1
Enanthic acid	0.1	0.4
Caprylic acid	0.3	0.2
Pelarogonic acid	0.9	1.6
Capric acid	0.5	1.1
Undecylic acid	1.8	3.1
Lauric acid	2.3	5.4
Tridecylic acid	0.9	1.6
Myristic acid	2.5	7.8
Pentadecanoic acid	0.5	2.5
Pentadecylic acid	1.2	0.6
Palmitic acid	9.4	22.6
Stearic acid	1.6	1.8
Oleic acid	56.5	29.0
Linoleic acid	2.6	3.8
Linolenic acid	8.1	0.8
Arachidic acid	-	0.1
Eicosenoic acid	2.7	1.3
Eicosadienoic acid	0.2	1.1
Eicosatienoic acid	1.5	2.8
Arachidonic acid	1.9	4.3
Brassidic acid	3.2	7.7

Table (7): Percentage of the active constituents of *Anabasis articulata* during the period of investigation at El- Quesyma and Matruh habitats:

Items	Matruh	El-Quesyma
Total tannins	11.5	17.1
Total flavonoids	1.48	1.56
Total alkaloids	0.33	0.66
Total saponins	0.43	0.40

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التركيب الكيميائي لنبات طرطير او عجرم (أناباسارتيكيولاتا) النامي بمصر

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مركز بحوث الصحراء.

يعتبر نبات (أناباسس أرتيكيولاتا) من الفصيلة الرمرامية التي تتميز بأنها غنية بالمواد الفعالة من فلافونيدات و تانينات و صابونين و قلويدات و ترجع الأهمية الطبية لهذه العائلة إلى وجود مواد تعمل على طرد الغازات و الديدان و معالجة اليرقان و علاج للربو و التشنجات كما يستخرج من الجذور السوك الخاص بالاسنان و لذلك فقد تم اختيار نبات اناباسس أرتيكيولاتا أحد انواع هذه الفصيلة المنتشر في منطقتي القصيمة و مطروح لدراسة مكونات النبات الكيميائية .

اتضح من المسح الكيميائي الأولي لنبات طر طير أو عجرم (أنابا سس ارتيكيولاتا) احتوائه على ستيرولات و فلافونيدات و تانينات و كلوريدات و كبريتات و صابونينات و قلويدات و سكريات و / أو جليكوسيدات.

تم التعرف على السكريات الحرة في النبات في المنطقتين باستعمال طرق التفريد الورقي فتبين وجود الجلوكوز و الفركتوز و الريبوز في كلا المنطقتين كما تبين وجود السكروز و الجلوكوز و الأرابينوز و الزيلوز كسكريات مرتبطة في كلا المنطقتين .

كما تم التعرف على الأحماض الأمينية الحرة التي يحتويها النبات بواسطة طرق التفريد الورقي والأحماض الأمينية الداخلة في تركيب البروتين و تقدير نسبتها المئوية عن طريق جهاز تحليل الأحماض الأمينية فتبين وجود حمض الأسبارتك و الثرونين و السيرين و حمض الجلوتاميك و البر ولين و الجليسين و الميثيونين و ايزوليوسين و هستدين_ فينيل الأنين _ ليسين _ فالين _ ليوسين و أمونيا .

كما تمت دراسة محتوى النبات من الدهون ودراسة خواصها الكيميائية ووجد أن النبات يحتوي على ١٠ هيدوكربون و٣ ستيرولات من كلا المنطقتين كما يحتوي النبات على ١٢ حامض دهني مشبع و٨ أحماض دهنية غير مشبعة في القصيمة و ١٣ حامض دهني مشبع و٩ أحماض دهنية غير مشبعة في مطروح

بدراسة المكونات الفعالة وجد أن :

الفلافونيدات و القلويدات و التانينات الكلية كانت أعلى في منطقة القصيمة عنها في منطقة مطروح بينما كانت الصابونينات الكلية أعلى في مطروح عنها في القصيمة .