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PHYTOCHEMICAL STUDIES ON *Chrozophora tinctoria* (L.) RAF. GROWING NATURALLY IN SOUTH SINAI

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ABSTRACT

The present study deals with phytochemical investigations on *Chrozophora tinctoria* (L.) Raf. of the family Euphorbiaceae which grows naturally in South Sinai, especially at two habitats at Km 125 in Dahab Sharm El- Sheikh road and at Km 28 in Taba Noweibaa road away from Noweibaa. It comprised some investigations of sugars, amino acids and lipids as follows:

1- The investigation of the free and combined sugars, by using HPLC, of different plant organs (stem, leaves and seeds) revealed, the presence of arabinose, ribose, fructose, glucose and raffinose in the free form, beside sucrose in the combined form.
2- The investigation of free and protein amino acids, using amino acid analyzer, showed that stem, leaves and seeds contain 10 amino acids in the free form, beside 16 in the protein fraction at the two studied habitats with different ratios.
3- The GLC analysis of the hydrocarbons and sterols revealed that the the two studied habitats contained 10 hydrocarbons and 4 sterols, while the GLC analysis of fatty acids revealed that materials from plant stems, leaves and seeds contained 12 kinds of fatty acids with different ratios.

Key words *:Chrozophora tinctoria, euphorbiaceae, phytochemical analysis.*

1. INTRODUCTION

Chrozophora tinctoria (L.) Raf. (=*Croton tinctorius* L. = *Chrozophora obliqua* (Vahl) A. Juss. ex Spreng = *Chrozophora verbascifolia* (Willd) A. Juss. ex Spreng = *Chrozophora hierosolymitana* Spreng), of family Euphorbiaceae (Spurge family) is one of the most common plants. It grows in the Oases of the Libyan desert, Isthmic desert, the Red Sea, Gebel Elba and in Sinai proper (Täckholm, 1974 and Boulos, 1995).

Euphorbiaceae is a large family of about 7950 species of almost cosmopolitan distribution, mainly of the tropics, but extending into the temperate region of the Northern and Southern Hemispheres.

Euphorbiaceae is one of the families which contains alkaloids of various structures. Alkaloids, when present are usually of the pyridine, indole, quinoline, tropane or aporphine types (Trease and Evans, 1972).

Concerning the genus *Chrozophora*; it is only mentioned that *C. hierosolymitana* Spreng. contains an unknown alkaloid in the over ground herb. (Williaman and Hui-Linli 1970).

Chrozophora rottleri, is emetic, cathertic and animals avoid it, while *C. plicata* is used in leprosy (Chopra, 1958), the leaves are used as depurative, the seeds as purgative and ashes of roots in cough for children (Chopra *et al.*, 1956), the root is mentioned to be used in urinary tract infection as diuretic and lithinotropic(Abd- El Hameed and Said, 1969).

The juice of *C. tinctoria* is used in warts and excrescences of the anus and the fruits in myrmecia, in the form of cataplasm (Hartwell, 1969).

Hasan *et al.*, (1980) showed that *C. plicata* yielded linoleate rich seed oils.

Dogra and Sinha(1982) stated that, during maturation of leaves of *Chrozophora rottleri*, the phenolic contents decreased from 0.81% in the leaf bud to 0.10% in the matured leaf.

Chrozophora indica contains palmitic, arachidic, oleic, linoleic and linolenic acids as the most fatty acid components(Kapoor *et al.*, 1986).

Mossa *et al.*, (1987) reported that *Chrozophora plicata* contains

fatty acids and the seeds contain oils. *Euphorbia dracunculoides* contains β-sitosterol, stearic acid and palmitic acid. It contains daphnetin and quercetin. *E. peplis* contains quercetin, hyperoside, kaempferol, sitosterol, oleoresin, neutral and acid saponins. *E. helioscopia* contains euphoscopins A and B saponin (phasin), hydrocarbons and resin. *Phyllanthus maderaspatensis* (Family, Euphorbiaceae), yields a white fibrous mucilage from the defatted seeds, which on hydrolysis with $2NH_2SO_4$ yields galactose, arabinose, rhamnose and aldobionic acid. The fatty acid composition revealed the presence of myristic, palmitic, stearic, oleic, linoleic and linolenic acids, β-sitosterol, a reddish brown colouring matter called maderin and an essential oil also has been isolated from the seeds.

The clinical, biochemical and pathological effects of the fresh shoots of *C. plicata* on Nubian goats and Desert sheep were investigated, where they died at various times after dosing with 10, 5. 1 and 0.5 g/Kg of *C. plicata* (Galal and Adam, 1988).

Chrozophora plicata contains one phenolic component namely 2,3-dihydroxy benzoic acid, O-protocatechuic acid, which as previously reported, occurs in plants of the Euphorbiaceae family, beside two free sugars; galactose and glucose (Ahmed, 1991).

The latex of *Euphorbia hirta* contains linositol, pyrogallic and catechuic tannins and an alkaloid xanthorhamnine. Taxerol, friedelin, β-sitosterol, myricyl alcohol, ellagic acid and hentriacontane have been isolated from the stem extracts. A number of amino acids and ellagic , gallic, chlorogenic and caffeic acids has been reported as occurring with the flavonoids kaempferol, qyercitol, and quercitin in the plant. Also hydrogen cyanide and a triterpenoid were reported to be present in the herb (Lwu, 1993).

Mohamed *et al.*, (1994) stated that *C. obliqua* is used for its hypoglycaemic properties in traditional medicine. They isolated 3 novel dolabellane diterpene glycosides and one new dolabellane diterpene from the aerial parts of the plant. Mohamed *et al.*, (1995) isolated fourteen novel dolabellane diterpenoids from the aerial parts of *Chrozophora obliqua*, which were naturally acylated at the C-16 hydroxyl group with 3-hydroxy-3-methylglutaric acid.

Suparna *et al.*, (1999) isolated a phenolic acid, sinapic from *C. rottleri* leaf extracts.

Our phytochemical studies aimed to investigate the main

chemical constituents of *Chrozophora tinctoria* organs (stem, leaves and seeds), specially carbohydrates, protiens and lipids at two selected habitats in South Sinai.

2. MATERIALS AND METHODS

Chrozophora tinctoria (L.) Raf. was collected during winter in the year 2000 from two natural habitats, Taba-Noweibaa Road at km 28 away from Noweibaa Fig.(1) and Dahab-Sharm El- Sheikh Road at km 125 away from Sharm El- Sheikh Fig.(2), dried in an oven at 70°C for 48 hours, ground to fine powder, then reserved for analysis.

2.1. Preliminary phytochemical screening

The *C. tinctoria* were achieved for: testing the volatile oils (Balbaa *et al.*, 1981), tannins (Balbaa, 1986), sterols and terpens (Brieskorn and Klinger-Hand, 1961), flavonoids and phenolics (Wall *et al.*, 1954), alkaloids (Woo *et al.*, 1977), carbohydrates and/or glycosides (Balbaa, 1986), saponins (Balbaa, 1986), chlorides and sulphates (A.O.A.C.1970) and test for resins (Fahmy, 1923).

2.2.Investigation of free and hydrolysed combined sugars

Identification of the free and combined sugars was analyzed by using high performance liquid chromatography (HPLC) method according to Chaplin and Kennedy (1994) under the following conditions: where each sugar solution was injected onto HPLC (Hewlett Packard series 1050 with pump HP series 1050). The sample was passed at a flow rate of 0.8 ml/min. through 300 mmx7.8mm aminex carbohydrate HPx 87°C column at 85°C. The eluting buffer was 70/30 acetonitrite/water (v/v). The refractive index of the separated sugar was detected using HP 1047A detector.

2.3.Investigation of free and protein-amino acids (Quantitively)

Analysis of amino acids was carried out using amino acid analyzer instrument according to the method described by Steven *et al.*, (1989). LKB alpha plus high performance amino acid analyzer LKB biochrom,. LTD England was used for this purpose. Retention times and areas were determined using Hewlett Packard 3390 recording Integrator. A special designed programme calculated the

concentration of each amino acid GM/16GM, nitrogen.

2.4.Investigation of lipids

2.4.1.Physical and chemical properties of lipids

The odour, colour, physical nature and solubility in some organic solvents of the lipid were studied. Fundamental chemical properties of lipids were determined, including acid value (A.V.), ester value (E.V.), saponification value (S.V.) according to the method described by (Farag, 1995) and iodine value (I.V.) according to (James, 1995).

2.4.2.Identification of unsaponifiable matter by GLC

The methyl esters of unsaponifiable compounds were prepared as described by (Farag *et al.*, 1986) and subjected to GLC analysis. The chromatographic conditions used for isothermal analysis were: column: OV 17 methylphenylsilicone (1.5x4mm.) with initial temperature 70°C, rate was 10 ml/min. and final temperature 270°C. The injector (N_2 carrier) at 250°C and detector (flame ionization) at 300°C. Gas flow rate for N_2, H_2 and air was 30, 33 and 330 ml/min. with chart speed 0.4 cm/min.

2.4.3.Identification of fatty acids by GLC

Fatty acids of standards and samples were converted to methyl esters using the method described by (Vogel, 1975). The chromatographic conditions used for isothermal analysis were: column: Sp 2310, 55% cyanopropylsilicone. (1.5x4mm). Initial temperature was 70°C with rate 5 ml/min., final temperature was 190°C, final time was 25 min. The injector (N_2 carrier) at 250°C and detector (flame ionization) at 300°C. The gas flow rate of N_2, H_2 and air were 30, 33 and 330 ml/min., respectively and the chart speed was 0.4cm/min.

3. RESULTS AND DISCUSSION

3.1.Preliminary phytochemical screening

It is obvious from(Table 1) that, *Chrozophora tinctoria* contained tannins, flavonoids and phenolics, as well as alkaloids, sterols, carbohydrates and/or glycosides, reducing sugars, chlorides and

sulphates, but no volatile oils nor saponins were detected in the two studied habitats.

3.2.Investigation of the free and hydrolysed combined sugars by using HPLC

3.2.1.Free sugars

The obtained HPLC chromatograms of free sugars of *Chrozophora tinctoria* stem, leaves and seeds revealed the presence of arabinose, ribose, fructose, glucose and raffinose in stem and seed samples at the two habitats with different ratios beside two unknown sugars as free sugars (Table 2). While leaves contained arabinose, fructose, glucose and raffinose beside two unknown sugars. Arabinose was the major detected one as free sugars for stems (26.23%) at Taba and (33.01%) for seeds at Dahab habitat, while ribose was the highest sugar detected from free sugars with percentage of (25.37 and 24.44%) for seeds and stem at Taba and Dahab habitat, respectively. For plant leaves, glucose represented the major detected free sugar at Taba and Dahab habitats with ratios of (38.03 and 24.45%), respectively. The chromatographic investigation of free sugar of *Chrozophora plicata* (whole plant) revealed the presence of sucrose, raffinose and glucose (Nosseir *et al.*, 1991).

3.2.2.Combined sugars

HPLC chromatograms of combined sugars of *C. tinctoria* revealed the presence of arabinose, ribose, fructose, glucose, sucrose and raffinose beside some unknown sugars in plant stem and seeds at Taba habitat and plant stem, leaves and seeds in Dahab habitat, while plant leaves at Taba region contained all the above mentioned sugars except ribose with different ratios.

Arabinose was detected as the highest sugar from the combined sugars in plant stems with percentages of (22.04 and 15.06%) at Taba and Dahab habitats, respectively (Table 3). For plant leaves, glucose represents the highest ratio of combined sugars with percentages (21.08 and 15.00%) at Taba and Dahab habitat, respectively. Also glucose was the highest sugar for plant seeds at Taba habitat with percentage of (14.90%). While fructose represented the major detected sugar arising from combined fraction with percentage of (15.28%) for plant seeds at Dahab habitat.

Chrozophora plicata contained glucose, sorbose and xylose as combined sugars by using GLC techniques (Ahmed, 1991).

Table (1): Preliminary phytochemical screening of *C. tinctoria.*

Test	Result	Test	Result
Volatile oils	-	Carbohydrates and/or glycosides	+
Tannins	+	Redusing sugars	+
Flavonoides & phenolics	+	Chlorides	+
Alkaloids	+	Sulphates	+
Sterols	+	Resins	-
Saponins	-		

+ = Positive. - = Negative.

Table (2): Free sugars of *C. tinctoria* **at the two studied habitats using HPLC.**

Sugar	RT	Relative %					
		Stem		Leaves		Seeds	
		T.	D.	T.	D.	T.	D.
Unknown	2.10	19.12	13.36	27.26	18.08	13.09	12.46
Unknown	2.50	-	18.32	-	23.26	14.60	10.03
Arabinose	6.65	26.23	22.06	20.60	17.03	20.12	33.01
Ribose	2.75	21.14	24.44	-	-	25.37	25.06
Fructose	3.40	6.71	2.62	9.71	10.34	4.58	2.79
Glucose	3.65	18.53	15.36	38.03	24.45	14.90	12.50
Raffinose	10.35	8.24	3.83	4.38	6.83	7.32	4.14

T. = Taba D. = Dahab.

3.3.Investigation of free and protein-amino acids using amino acid analyzer

3.3.1.Free amino acids

The investigation of free amino acids (Table 4) showed that *C. tinctoria* stems contained ten free amino acids at Taba habitat, while plant stems at Dahab, plant leaves and seeds at Dahab and Taba habitats contained nine free amino acids with different ratios. Proline was the highest free amino acid in plant leaves (25.97 and 34.81%) at Taba and Dahab habitats, respectively and in plant seeds (24.00%) at Taba habitat. Glutamic acid was the highest amino acid in plant stems (27.01 and 29.61%) at Taba and Dahab habitats and also it was the highest one in plant seeds (32.18%) at Dahab habitats. Methionine was the lowest detected free amino acid in leaves (1.36%) at Taba and

in plant stems (3.51%) at Dahab habitat. While tryptophane represented the lowest one in plant stem (2.38%) at Taba habitat and for plant leaves and seeds (1.67 and 3.98%), respectively at Dahab habitat. The presence of proline with high amount, may be due to the increase in soil salinity and drought in Dahab than Taba habitat. In (1992) Ali and Sawaf, reported that salinity inhibits the transmission reactions, then glutamic acid accumulated and transformed to other nitrogenous compounds such as proline.

Table (3): Combined sugars of *C. tinctoria* at the two studied habitats using HPLC.

Sugar	RT	Relative %					
		Stem		Leaves		Seeds	
		T.	D.	T.	D.	T.	D.
Unknown	2.15	28.03	22.21	-	24.11	20.30	19.06
Unknown	2.40	-	18.32	-	20.01	-	16.11
Arabinose	2.65	22.04	15.06	19.05	12.23	11.66	10.05
Ribose	2.75	18.12	11.04	-	8.02	10.70	15.03
Fructose	3.40	6.72	14.15	13.36	11.06	10.69	15.28
Glucose	3.65	13.46	11.03	21.08	15.00	14.90	12.29
Sucrose	6.90	3.05	2.33	3.08	2.12	7.98	3.07
Unknown	7.30	-	3.40	23.13	4.42	6.70	3.68
Unknown	8.00	6.31	-	15.26	-	13.60	-
Raffinose	10.35	2.23	2.44	5.02	3.01	3.44	5.42

T. = Taba. D. = Dahab.

The separated free amino acids of *Chrozophora plicata* using the system n-butanol : acetic acid : water (4: 1: 5) were : histidine, lysine, glycine, threonine, tyrosine, methionine and valine (Nosseir *et al*, 1991).

3.3.2.Protein-amino acids

Protein-amino acids of *C. tinctoria* in the two studied areas, were achieved using amino acid analyzer (after protein hydrolysis) and the obtained results are presented in Table (5). *C. tinctoria* stems and seeds at Taba habitat contained sixteen amino acids, (except the plant stem, leaves and seeds at Dahab habitat and plant leaves at Taba habitat which contained fifteen amino acids). with different ranges of concentration.

Table (4): Free amino acids of *C. tinctoria* at the two studied habitats using amino acid analyzer techniques.

Amino acid	Relative %					
	Stem		Leaves		Seeds	
	T.	D.	T.	D.	T.	D.
Arginine	17.06	20.13	24.52	22.98	15.29	14.70
Glutamic acid	27.01	29.61	19.08	16.29	20.12	32.18
Glysine	6.24	5.06	6.69	1.93	6.20	4.62
Isoleucine	4.63	-	6.98	-	7.12	-
Leucine	10.07	9.21	5.04	11.98	11.93	7.08
Methionine	3.54	3.51	1.36	2.73	5.06	4.81
Phenylalanine	8.02	6.32	6.32	2.80	-	5.29
Proline	15.41	13.11	25.97	34.81	24.00	18.06
Threonine	5.62	8.95	4.01	4.80	8.15	9.28
Tryptophane	2.38	4.06	-	1.67	2.13	3.98

T. = Taba D. = Dahab.

It is obvious from Table (5) that, proline was the highest separated amino acid (after protein hydrolysis) in the stem (19.50%), leaves (20.30%) and seeds (30.46%) at Taba habitat and in leaves (29.50%) and seeds (32.50%) of the *C. tinctoria* at Dahab habitat. Meanwhile, glutamic acid was the highest separated amino acid in protein fraction in stems (19.00%) of the plant at Dahab habitat. Methionine was the lowest detected amino acid in stems (0.96%) and leaves (0.85%) at Taba habitat. While in plant seeds at Taba habitat, cysteine (0.93%) and isoleucine (0.93%) were of the lowest concentrations detected amino acids. At Dahab habitat, the lowest percentages of free amino acids were, tyrosine (1.14%) in plant stems, phenylalanine (1.08%) in leaves and cysteine (1.08%) in plant seeds.

It is obvious from this study that this species can adapt itself to grow under the severe desert conditions by accumulation of nitrogenous compounds and protein. Such aspects help the plant to tolerate soil moisture stress as well as climatic drought (Kamara, 1983).

3.4.Investigation of lipids

3.4.1.Physical and chemical properties of lipids

C. tinctoria lipids were dark green in colour, solid, having a faint odour and disagreeable taste. They are soluble in diethylether,

petroleum ether, aceton, benzene, chloroform and warm methyl and ethyl alcohol. It is obvious from Table (6) that, the acid, iodine, ester and saponification values at Dahab habitat were slightly higher than those at Taba habitat.

Table (5): Protein amino acids of *C. tinctoria* (dry matter) at the two studied habitats using amino acid analyzer techniques.

Amino acid	Relative %					
	Stem		Leaves		Seeds	
	T.	D.	T.	D.	T.	D.
Essential amino acids:						
Arginine	1.92	1.70	1.12	1.13	2.75	2.27
Histidine	14.05	17.24	13.04	12.06	7.03	10.65
Isoleucine	1.79	-	1.13	-	0.93	-
Leucine	15.30	18.60	19.30	15.00	11.07	12.30
Methionine	0.96	1.89	0.85	1.28	1.42	1.70
Phenylalanine	2.50	2.31	1.92	1.08	3.75	2.43
Theronine	1.11	1.17	1.20	1.15	1.90	1.39
Valine	14.01	11.88	18.60	18.50	13.43	9.60
Non-essential amino acids:						
Alanine	2.36	1.54	1.14	1.11	2.33	1.83
Aspartic acid	1.52	1.23	1.42	1.21	2.40	2.27
Cysteine	1.06	1.41	-	-	0.93	1.08
Glutamic acid	17.60	19.01	16.50	14.60	15.92	16.80
Glycine	1.21	2.31	1.13	1.09	1.10	1.22
Proline	19.50	16.50	20.30	29.50	30.46	32.50
Serine	2.28	2.07	1.16	1.13	2.83	2.65
Tyrosine	2.80	1.14	1.19	1.16	1.73	1.30

T. = Taba D. = Dahab.

3.4.2.Investigation of unsaponifiable matter by GLC

GLC analysis of the unsaponifiable matter of *C. tinctoria* is

Table (6): Acid, iodine, ester and saponification values of lipids of *C.tinctoria* in the two habitats.

Item (mg%)	Taba			Dahab		
	Stem	Leaves	Seeds	Stem	Leaves	Seeds
Acid value (A.V.)	3.01	4.23	2.97	3.97	4.40	3.14
Iodine value (I.V.)	80.32	91.07	73.56	84.53	94.56	79.06
Ester value (E.V.)	121.05	124.31	116.12	124.90	126.23	120.20
Saponification value (S.V.)	124.06	128.54	119.09	128.87	130.63	123.34

represented in Table (7). Tetradecane was the major hydrocarbon with percentages of 12.13 and 14.73% in plant leaves at Taba and Dahab habitats, respectively. Triacontane was the major hydrocarbon for plant seeds (19.32%) and plant stems (27.0%) at Taba and Dahab habitats, respectively. Meanwhile tricosane was the highest percentage for plant stems (22.12%) and octadecane (21.03%) for plant seeds at Taba and Dahab habitats, respectively. Stigmasterol was the highest percentage of sterol detected in plant stems (10.98%), plant seeds (16.25%) at Taba habitat and plant stems (4.20%) at Dahab habitat (Table 7). While β-sitosterol was the highest one in leaves of the plant (18.09 and 14.40%) at Taba and Dahab habitats, respectively.

In (1991) Ahmed reported that the unsaponifiable matter components of *Chrozophora plicata* was composed of 41.44% hydrocarbons and 58.56% sterol compounds.

Cholesterol is a sterol occurring widely in animal tissues and also in some higher plants and algae. The wide occurrence of cholesterol in plants has been discovered recently (Trease and Evans, 1999).

Boulos in (1983) reported that, leaves of *Euphorbia peplus* belonging to family Euphorbiaceae contained β- sitosterol, stigmasterol, campasterol, cholesterol. This confirms our results in Table (7).

3.4.3.Investigation of fatty acids by GLC

the GLC analysis of the saponifiable matter of *C. tinctoria* is presented in (Table 8). Myristic acid was major fatty acid at Dahab habitat, it reached to (34.88, 29.94 and 31.10%) in plant stems, leaves

and seeds, respectively. At Taba habitat, margaric acid was the major one in plant stems and leaves with percentages of 29.16 and 34.17%, respectively, while myristic acid was the highest percentages of fatty

Table (7):GLC of hydrocarbons and sterols of *C.tinctoria* at the two studied habitats.

Number of carbon atoms	Name	Relative percentage %					
		Stem		Leaves		Seeds	
		T.	D.	T.	D.	T.	D.
Hydrocarbons							
10	Decane	2.09	1.79	3.02	7.12	3.45	-
12	Dodecane	18.21	20.63	11.80	9.81	0.41	0.33
14	Tetradecane	3.69	3.39	12.13	14.73	5.10	6.01
-	Unknown	1.31	-	4.70	2.65	1.01	0.99
18	Octadecane	14.21	6.68	0.73	3.21	15.91	21.03
20	Eicosane	6.20	-	6.17	2.07	0.29	0.20
23	Tricosane	22.12	8.12	5.18	4.36	4.73	3.12
26	Hexacosane	0.66	3.15	10.14	7.02	3.10	3.15
-	Unknown	1.36	-	-	7.12	0.45	0.31
-	Unknown	0.99	2.12	3.01	-	5.12	-
29	Squalene	14.48	20.13	5.12	14.08	9.12	12.73
30	Triacontane	-	27.00	5.06	10.15	19.12	10.15
32	Dotricontane	-	-	-	1.13	0.93	1.60
Sterols:							
27	Cholesterol	3.12	0.93	1.01	2.10	7.31	7.42
27	Campesterol	0.58	_	10.80	-	-	15.12
27	Stigmasterol	10.98	4.20	3.03	-	16.25	10.10
27	β-sitosterol	-	1.03	18.09	14.40	5.39	6.10
-	Unknown	-	0.83	-	0.11	2.11	1.62

acids in plant seeds (27.39%). Capric acid was the lowest fatty acid at Dahab habitat detected in plant stems, leaves and seeds with percentages of (0.06, 0.06 and 0.58%), respectively and also in plant seeds (0.34%) at Taba habitat. Arachidonic acid (0.80%) was the lowest detected fatty acid in plant stem, while caprylic acid (0.54%) in plant leaves at Taba habitat.

Table (8): GLC of fatty acids of *C. tinctoria* at the two studied habitats.

Number of carbon atom	Name	Relative percentages %					
		Taba			Dahab		
		Stem	Leaves	Seeds	Stem	Leaves	Seeds
C:8	Caprylic	1.53	0.54	0.34	2.74	1.72	0.76
-	Unknown	0.61	0.92	1.88	0.88	0.72	1.05
-	Unknown	0.29	0.20	0.09	0.46	0.35	0.13
C:10	Capric	0.90	-	1.67	0.06	0.06	0.58
-	Unknown	0.03	0.73	-	1.17	1.42	0.03
C:12	Lauric	1.09	0.55	1.32	0.82	0.81	1.29
-	Unknown	1.33	0.59	1.73	0.41	1.02	1.19
-	Unknown	2.68	1.94	1.97	1.91	2.52	2.46
C:13	Tridecylic	6.40	5.04	7.21	4.50	6.38	-
C:14	Myristic	20.30	25.41	27.39	34.88	29.94	31.10
-	Unknown	1.55	0.66	1.81	0.22	0.57	1.48
C:16	Palmitic	7.72	-	3.91	-	5.01	1.98
C16:1	Palmitioli c	20.49	20.74	19.39	30.45	17.38	24.37
C:17	Margaric	29.16	34.27	25.12	19.43	28.59	28.67
C:18	Stearic	3.30	8.41	1.99	2.07	-	2.20
C18:1	Oleic	1.82	-	1.60	-	2.64	1.33
C18:2	Linoleic	-	-	0.94	-	0.86	-
C20:4	Arachidon ic	0.80	-	1.63	-	-	1.37

Nosseir *et al.*, (1991) stated that *Chrozophora plicata* was characterized by the presence of high concentrations of palmitic acid (27.83 %) and capric acid (27.61 %) which represented the major

Fig.(1): *Chrozophora tinctoria* **grown in Taba.**

Fig.(2): *Chrozophora tinctoria* **grown in Dahab.**

constituents of fatty acids.

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دراسات كيميائية على نبات نيلى *Chrozophora tinctoria* النامي طبيعيا بجنوب سيناء

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ملخص

تشتمل هذه الدراسة التعرف على بعض المكونات الكيمونباتية لنبات " كروزوفورا تنكتوريا" (نيلى Neeli) من العائلة السوسبية النامي طبيعيا بجنوب سيناء خاصة في منطقة الكيلو ١٢٥ طريق دهب–شرم الشيخ و الكيلو ٢٨ طريق طابا–نويبع بعداً عن نويبع.

لقد تمّ فحص السكريات و الأحماض الأمينية و الدهنية كالتالي:

١- أوضح التحليل الكروماتوجرافي للسكريات الحرة و المرتبطة باستخدام جهاز " HPLC" لسيقان و أوراق و بذور النبات تواجد أرابينوز, ريبوز, فركتوز ، جلوكوز, رافينوز في صورة حرة بالإضافة إلى السكروز في صورة مرتبطة.

٢- أوضح التحليل الكروماتوجرافي للأحماض الأمينية الحرة و المرتبطة الموجودة في صورة بروتينات باستخدام جهاز تحليل الأحماض الأمينية لسيقان وأوراق و بذور النبات احتواء الأجزاء المختلفة منه على ١٠ في صورة حرة, ١٦ في صورة مرتبطة في كلاً من منطقتي الدراسة بنسب مختلفة.

٣- أوضح التحليل الكروماتوجرافي للهيدروكربونات و الاستيرولات باستخدام " GLC" أن كلاً من منطقتي الدراسة تحتوي نباتاتها على ١٠ هيدروكربونات و ٤ استيرولات. كما تبين احتواء أجزاء النبات المختلفة من سيقان و أوراق و بذور على ١٢ حمض دهني بنسب مختلفة فى كل من المنطقتين تحت الدراسة.

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