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Study of Some Potential Wild Plants as a Biofuel Source

Ahmed N. M. El-Atla[1*]
[1]Desert Research Center, Environment and Arid Land Agriculture Division, Egypt

ABSTRACT: In this study, three of Egyptian *Artemisia monosperma* and two *Tetraena simplex* plants genotypes were selected from sinai, Egypt and used to cold pressing method for extract crude oil from *Artemisia monosperma* and Tetraena simplex dry plants., the obtained results couldbe summarized as the following:- the genotypes to north Sinai under study produced about 28% of crude oil by weight per kg of the dry Artemisia plant. But with regard to, estimation of fatty acids concentration in Artemisia plant of north Sinai so that to the fatty acids (FAA) and also are the genotypes to South Sinai under study produced crude oil by weight per kg of the dry *Tetraena simplex* plant. But with regard to, estimation of fatty acids concentration in Artemisia plant of north Sinai so that to seven to fatty acids (FAA) so that to the results showed that the genotypes were different in concentrations of fatty acids to *Artemisia monosperma* plant. So, genotype No. 2 (G. 2) showed a highest concentrations of sample, as 2.73% capric acid, 4.42% Palmitic acid, 5.32% Lauric acid, 39.19% Heneicosanoic acid and also the results showed that the genotypes were different in concentrations of fatty acids to *Tetraena simplex* plant, so showed a highest concentrations of sample (G2) 7.34% Stearic acid and 2.9 Oleic, than also to (G1).64 Stearic acid and .49 Oleic.

Keywords: FAA, *Artemisia monosperma*, Fatty acids, Biofuel, Tetraena simplex.

CASE REPORT

***Corresponding Author:**
Ahmed N. M. El-Atla
Desert Research Center, Environment and Arid Land Agriculture Division, Egypt

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1. INTRODUCTION

The genus *Artemisia L.*, Belongs to the Asteraceae family, comprises around 500 type to herbs growing mostly of Beaches of North Africa and parts of Asia. It has been classified into three sections: Absinthium DC, *Artemisia L.*, Dracunculus Besser, Seriphidium Besser and Tridentatae,there is still with out agreement about the global treatment to the genus The plant Artemisia is used in desert areas as a source of wood for setting fire to cooking as an alternative to fossil fuels and also as a material to feed animals on it as it is included in the pharmaceutical industries [4]. Tetraena simplex is a plant that grows in arid areas as pets, it spreads in the early summer and begins flowering at the end of the summer, it is stored in its leaves and it is anti-bacterial and known in medicine for its importance as an anti-poisoning and diarrhea as well as an antioxidant, it belongs to the family Zygophyllaceae [9] these In a real and serious way, given that the *Artemisia monosperma* plant is tolerant to drought and grows naturally in poor and extremely dry lands, and what has been discovered of its importance in the biofuel industry requires a plan to convert it into a planted plant [3]. The sustainable conservation of the threatened plants requires evaluating the genetic diversity of different populations in different habitats to elucidate the genetic differences between related species and populations of each species. Accordingly, the present study was conducted to achieve the following: - Measuring the concentration of fatty acids in to *Artemisia monosperma* and *Tetraena simplex* samples.

2. MATERIALS AND METHODS

The present study was carried out in the laboratory of Biotechnology to Cairo University Research Park (CURP).

2. A- Biochemical analysis:

2. A.1- Plant Materials:

Three samples (as replicates) of *Artemisia monosperma* and *Tetraena simplex* from each genotype were taken to assessment of the physical and chemical properties for *Artemisia monosperma* and Tetraena simplex under study.

2. A.2- Chemicals:

All chemicals, solvents and standards were purchased from Sigma-Aldrich-Fluka (Taufkirchen, Germany) or Merck (Darmstadt, Germany).

2. A.3-Estimation of the fatty acids concentration in *Artemisia monosperma* and *Zygophyllum Simplex* parts:

Esterification of free fatty acids using sulfuric acids, catalyst in the presence of triglycerides [15] Modification of the oil to its ethyl esters was made using 2% H2SO4 as catalyst in the presence of dry ethyl alcohol in excess. The chromatographic analysis was made using Hewlett Packard Model 6890 Chromatograph and parts of plant material were finely grounded in amill and were then extracted with n-hexane/isopropanol (3:2 v/v) .The lipid extracts were centrifuged at 10,000 rpm for 5 min and filtered; the solvent was then removed on a rotary evaporator at 40 C. The extracted lipids were stored under -25 C until further analysis.

Fig 1: Artemisia monosperma plant of Sinai

Fig 2: Tetraena simplex plant in Naima Bay, Sharm El-Sheikh (G1)

Fig 3: Tetraena simplex plant from Wadi Ferran on the borders of Saint Catherine in South Sinai (G2)

Column description**:** Thermo TR- FAME (70 % Cyanpropyl Polysilphenylene Siloxane).

Capillary Column**:** 30m x 0.25 m m ID x 0.25 um film

Conditions**:**

Injector Temperature

260 deg °C., Detector Temperature: 280 deg °C., Detector: FID., Temperature Programming; Intial Rate (C/min) Temp(°C) Hold Time (minutes) - - 80 2.00 Ramp 4.0 200 5.00., Gases Flow Rate (ml /min) N2 1.5 ml/min., H2 35 ml/min. Air 350 ml/min. vity (Mg/h). Fatty acid in the lipid extracts were converted into methyl esters by means of 2% sulphuric acid (v/v) in methanol. The fatty acid methyl esters were extracted with n-hexane. The methyl esters were then separated and quantified by gas chromatography and flame-ionization detection coupled to a CLASS GC 10

software computer software. Chromatography was performed with capillary column (0.25 mm in diameter, Permabound 25, Macherey-Nagel, Germany) using nitrogen as a carrier gas (flow rate 0.8 ml/min.). The temperatures of the column, detector and injection valve were130-220, 240 and 280 °C, respectively. Identification of the individual methyl esters was performed by frequent comparison with authentic standard mixtures that were analysed under the same conditions. Retention time for studied Artemisia species was determined as 3.34 min - A. armeniaca, 3.81 min - A. incana, 9.47 min - A. tournefortiana, 17.40 min - A. haussknechtii, 1.41 min - A. scoparia. Chromatographic analysis and quantification of lipid soluble vitamins and sterols. The extracted lipids of plant material were dissolved in acetonitrile/methanol (75/25 v/v) and were injected 50 µL to HPLC UV detector (SPD-10AVP) instrument (Shimadzu, Kyota Japan). A Supelcosil LC18 (250 x 4.6 mm, 5 µm, Sigma,USA) column was used. The mobile phase was acetonitrile/methanol (75/25,v/v) and the elution was performed at a flow-rate of 1 ml/min the temperature of analytical column was kept at 40 °C.

3. RESULTS AND DESICCATION

Because *Artemisia monosperma* is a multipurpose plant and recognized as asource energy to people life of desert, also it used in veterinary purposes and therapy of many human diseases as traditional folk medicine in African and Asian countries.

3.1. Chemical properties of Artemisia monosperma plant as an ideal biofuels:

These factors can be modulated by impacting on the diameter of the restriction die located at the meal discharge and by screw rotation speed (the lower the speed and the smaller the restriction opening, the higher the yield) [15] applied continued to the fatty acid synthesis for *Artemisia* species to use were fixed by GC and HPLC techniques., so that the results to the fatty acid analysis showed that to *Artemisia* species possess high saturated fatty acid compositions, so the constant fatty acids in the *Artemisia* species were found to be palmitic acid, stearic acid, palmitoleic acid, oleic acid, linoleic acid, eicosadienoic acid and docosadienoic acid, and also that to El Sayed A. M. *et al.*, (2017) identification and quality control to *Artemisia monosperma* for used to HPLC technique, so that to its good trophic value indicated of a high protein 8.4%, low fat 4.2% and cognizable vitamin A and E contents. Squalene 32.5% and linoleic acid 26.5% were detected as major lipoids.

Table 1: Main ± Standard deviation (SD) of the estimated unsaturated fatty acids to three *Artemisia monosperma* genotypes of north Sinai

Genotypes / Fatty acids*	G1***	G2	G3	Average	Max
Tridecylic 23:0**	±3.73%	0	±3.58%	2.43	0.73
Meristic 14:0	±2.56%	0	±1.38%	1.31	0.56
Palmitic 16:0	±3.15%	±4.42%		2.52	0.42
Capric 6:0		±2.73%		2.73	0.73
Lauric 12:0	±1.06%	±5.32%	±2.08%	2.82	0.32
Pentadecylic15:0		0	0.78%	0.78	0.78
Heneicosanoic21:0		±39.19%		9.19	9.19
Pelargonic 9:0		7.57%		0.57	0.57
Isocaproic 6:0		0	0.49%	0.49	0.49
Average	0.80	4.5	0.63%	0.97	0.42

*Detection method According to: Fatty acids Gas Lquid Chromatography Trace GC Ultra Thermo Scientific. ** Lipid Number *** Number of the genotyp

The results showed that to table (1) high volume Palmitic acid 4.42 to G 2 and Respectively**,** volume Lauric acid G1(1.06), G2(5.32) and G3(2.08) and also less volume Palmitic acid 3.15 to G 2, perhabes volume high Meristic acid 2.56 to G 1 but also less volume Meristic acid 1.38 to G3. In the world knows the *Artemisia to herba-alba* oil and called scheih oil [10] has been thoroughly investigated and the diversity to oil structure from plants grown to various countries and even those for various places to the same country have led for the many oil- dependent chemo types assigned to the plant **[**10] and any way that to the oil was largely reported to be composed to mono terpenoids, mainly oxygenated, such as 1,8-cineole, chrysanthenone, chrysanthenol (and its acetate), camphor as the major components [13, 12] and also to the fatty acid structures, vitamin, sterol contents and flavonoid constituents to five Turkish Artemisia species were determined by GC and HPLC technique so found that to the results to the fatty acid analysis showed that Artemisia species possess high saturated fatty acid compositions [15]. The plant litter accumulation may

cause indirect chemical effects mediated to the release to allelochemicals in to the environment after its decomposition [18, 2]. This process could be considered an allelopathic strategy for pioneer species in controlling intra- and interspecific competition and structuring plant communities [6, 7].

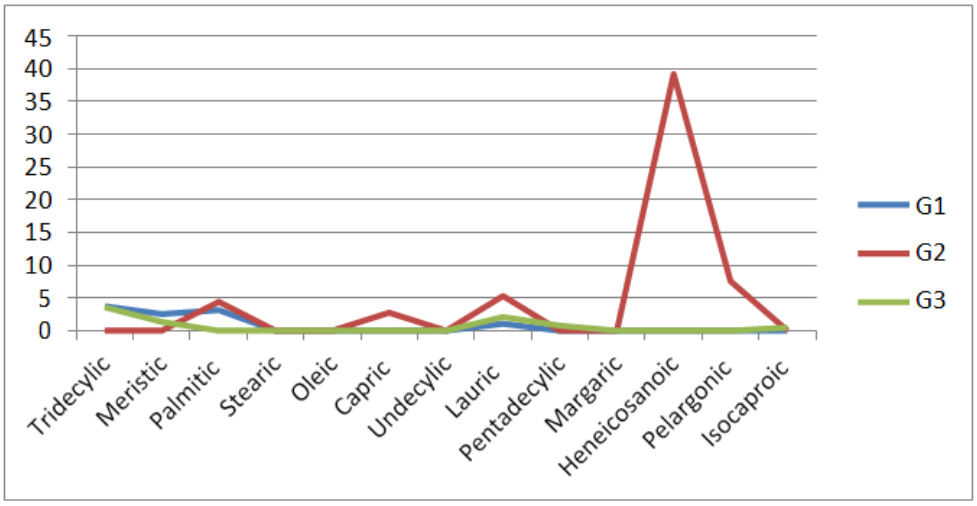

Figure 4: Fate acids volume deferents to Artemisia extract

The results of the present study showed that Artemisia plant contained high saturated fatty acid compositions and Heneicosanoic acid, the major polyunsaturated fatty acid., so the Palmitoleic acid and Meristic acid were found as monounsaturated fatty acids in all *Artemisia* plant studied. *Artemisia monosperm*a contained high levels of monounsaturated fatty acid (4.42±) 0.28% and (2.56±) 0.36%, respectively. Lauric acid were dominant polyunsaturated fatty acids in the *Artemisia monosperm*a studied. Isocaproic acid was absent or present at low levels in the studied *Artemisia monosperm*a, except for *Artemisia monosperm*a in which Isocaproic acid content was found to be 0.49±. [3] determined palmitic acid is major saturated fatty acid and Lauric acid is major unsaturated fatty acids in the studied Three *Artemisia monosperm*a, and also are **[**14**]** investigated total phenolics, flavanoids, saponins, alkaloids andterpenoids to the leaves of two desert plants belonging to family Asteraceae *Artemisia jaudica* and *Artemisia monosperma* of the Egyptian.,so the results revealed that the nutritional leaves of *A. monosperma* and *A. jaudica* are good source of energy, dietary fiber, proteins, carbohydrates and fats**.**

Table 2: Main ± Standard deviation (SD) of the estimated unsaturated fatty acids to two *Tetraena simplex* genotypes of South Sinai

Genotypes / Fatty acids*	**G1*** **	**G2**	**Average**	**Max**
Meristic 14:0	0	.0145	.00725	.00725
Palmitic 16:0	0	.0003	.00015	.0003
Stearic 18:0	.64	7.34	3.99	7.34
Oleic 18:1	.49	2.9	1.69	2.9
Lauric 12:0	0	.0057	.00285	.0057
Pentadecylic15:0	.07	20	.135	.2
Margaric17:0	0035	.0091	.0063	.0091
Average	17	1.49	83	1.49

*Detection method According to: Fatty acids Gas Lquid Chromatography Trace GC Ultra Thermo Scientific. ** Lipid Number *** Number of the genotype\ (G 1) Sample from Naima Bay ; (G2) A sample from Wadi Ferran

The results showed that to table (2) high volume Stearic acid 7.34 to G 2 and Stearic acid .64 to G 1 and also that to Oleic acid 2.9 of G 2 and Oleic acid .49 of G 1,and also that to .2 Pentadecylic to G2,.07 to G1, and also that to [15] estimated to study their levels to the acclimate responses to Zygophyllum Species plants under their natural drought conditions ,so results that are able to tolerate following desiccation for photosynthetically active states to a short interval in time, the other is the dessication avoiding group; annual or biennial plant (*Zygophyllum simplex*), which possess an afflicted water-storing organ, efficient water

conduction within the plant body and/or a combination to these features and it was also found compounds total phenols, ascorbic acid, hydrogen peroxide and malondialdehyde., while are [4] using the fatty acid estimation technique to Zygophyllum fabago, so results are found in Zygophyllum to Palmitic acid, Linoleic acid, Oleic acid, Stearic acid, Arachidic acid and Behenic acid.

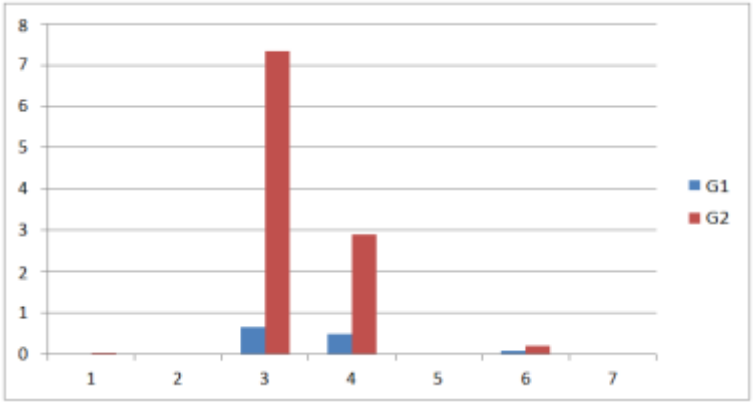

Figure 5: *Teraena simplex* The fatty acids are in order from 1-7(Meristic, Palmitic, Stearic, Oleic, Lauric, Pentadecylic and Margaric). (G 1) Sample from Naima Bay; (G2) A sample from Wadi Ferran

The fatty acids compositions were determined in the two Egyptian *Teraena simplex* genotypes for their importance In the Figure 5.

It was concluded from the previous results in Tables 2 and 3 that the results of the study achieved tangible results in discovering a new plants for biofuel compared to the jatropha plant as a model for biofuel plants, as shown in the following table 3:

Table 3: Fatty acid composition of Jatropha seed oil, Artemisia sp. and *Teraena simplex*

Fatty acid (%)	Artemisia sp	Teraena simplex	Jatropha as template (%)	Ref.
Miristic 14:0	2.56%	-	0.0 – 0.1	[7]
Palmitic 16:0	4.42%	-	14.1 – 15.3	7]
Stearic 18:0	-	7.34%	3.7 – 9.8	[7]
Oleic 18:1	-	2.9%	34.3 – 45.8	[7]
Lauric 18:2	5.32%	-	18-2	[7]
Capric 6:0	2.73%	-	3.25-0.23	[1]

In the previous table, the percentage of Miristic acid was higher than the European index of jatropha by 2.56 for *Artemisia* sp, while the index of Jatropha was 0.0 - 0.1, While Lauric acid was observed in Artemisia by (5.32) compared to Lauric (18-2) in Jatropha according to the EU standard number [7]., also, in the plant Teraena simplex, especially in Wadi Ferran, high percentages of Stearic and Oleic acids were observed by(7.34, 2.9%), respectively, while the European index of [7] for Jatropha was (3.7 - 9.8) for Stearic acid and also (34.3 - 45.8) for Oleic acid [7], and also in the plant Artemisia Capric acid by 2.73, while in the index it was 3.25-0.23 for Jatropha plant [1]., therefore, we conclude from the above that the Artemisia plant, due to its spread in dry and semi-dry desert areas, is the best to use for the production of biofuels due to its spread and lack of competition with food and traditional crops for water sources, as well as its dense spread and its tolerance to climate change, so I recommended its use for the production of biofuels

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