Acid content of the dichloromethane extract of *Ephedra alata* leaves

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ملخص: لقد تمّ دراسة الأحماض الموجودة في أوراق العلندة التي تنمو في الصحراء الجزائرية بواسطة كروماتوغرافيا الغاز مطياف الكتلة وقد تمّ تحديد أربعة عشر حمض في مستخلص ثنائي كلوروميثان من العلندة فكانت الأحماض الرئيسية :(GC-MS)
, (2.17%)-حمض البروبانويك 2فنيل3- , مثيل-(7.60%) , حمض البنزويك 2 -حمـــض البروبانويـــك (18.19%)

كلمات دالة: العلندة , ثنائي كلوروميثان , حمض ,(GC-MS)

RÉSUMÉ : Le contenu d'acides des feuilles *de l'alata d'éphèdre* accroissant dans le désert algérien a été étudié par chromatographie gazeuse/spectrométrie de masse. Quatorze acides ont été identifiés dans l'extrait de dichlorométhane. Les acides principaux étaient : acide 3-phenyl 2-Propenoique, (18.19%), acide benzoïque (7.60%), acide l -3-phenyl-methy 2-Propenoique,-, (2.17%), acide alpha.-hydrox, benzène -acétique, (1.43%) , acide diis 1.2- benzène - dicarboxylique (1.41%) , acide Hexadecanoique -(1.21%) , acide éthyl ester 4-hydroxy -benzoïque, -, (1.17%) et acide benzène - propanoique (1.15%).

MOTS-CLÉS: Ephedra alata; Ephedraceae; Dichloromethane; GC-MS; acides.

ABSTRACT: The acids profile of the leaves of *Ephedra alata* growing in Algerian desert was studied by capillary gas chromatography-mass spectrometry (GC-MS). Fourteen acids were identified in the Dichloromethane extract. The main acids were: 2-Propenoic acid, 3-phenyl (18.19%), Benzoic acid (7.60%), 2-Propenoic acid, 3-phenyl-, methyl (2.17%), Benzene-acetic acid, .alpha.-hydrox (1.43%) , Benzene-dicarboxylic acid, diis 1.2- (1.41%) , Hexadecanoic -acid (1.21%) , Benzoic acid, 4-hydroxy-, ethyl ester (1.17%) and Benzene-propanoic acid (1.15%).

KEYWORDS: Ephedra alata; Ephedraceae; Dichloromethane; GC-MS; acids.

1. Introduction

Ephedra is the only genus in the Ephedraceae family. It comprises 50–65 species. It is widely distributed in temperate areas of Eurasia, northern Africa, southwestern North America, and western South America. Generally, it is often abundant in dry and open habitats such as deserts, rocky slopes, grasslands, and maritime areas with a Mediterranean climate. *Ephedra* is famous for its long history of medicinal use due particularly to the presence in many alkaloids such as ephedrine. The medical use of *Ephedra* dates back to at least 2700 B.C., when the Chinese used (*Ephedra sinica* Stapf) to treat asthma, cough, and bronchitis [1-3].

Ephedra alata is a perennial shrub, stiff, yellow-green, densely branched, 40–100 cm tall and often wider than high [4]. The *Ephedra* plant is strongly aromatic, with a bitter taste. The dried stem is the part of the shrub generally used for its therapeutic effects. It is available in bulk herb, capsules, and hydro-alcoholic extract and is often found in weight loss and energy formulas. *Ephedra* is approved for diseases of the respiratory tract with mild broncho-spasms. It is commonly used as a bronchodilator and anti-asthmatic. It has been used in traditional Chinese medicine for 5,000 years

to treat allergies, bronchial asthma, chills, colds, coughs, edema, fever, flu, headaches, and nasal congestion. *Ephedra* has been used as a natural product source of many constituents including: alkaloids, tannins, saponins, proanthocyanidins, phenolic acids, flavonoids and essential oils. Plants-derived polyphenols are of great importance for their potential antioxidant and antimicrobial properties [5-6].

2. Experimental

2.1. Plant material

The leaves of *Ephedra alata* were collected in Mars 2011 from Ouargla outskirts, Algeria. The plant is identified by Pr.Chahma Abdelmadjid and dried under shade before being grounded.

2.2. Extraction

400 g of the leaves of *Ephedra alata* were macerated four times for 24 hours with 70% EtOH solution. The hydro-alcoholic solutions were concentrated under reduced pressure and the residue was dissolved in water and kept in a cold place overnight. After filtration, the aqueous solution was successively extracted with CH_2Cl_2, EtOAc and *n*-BuOH for three times for each solvent, then the extracts were concentrated. The residues obtained by CH_2Cl_2 were dissolved in Hexane and subjected to GC/MS analysis [7].

2.3. Gas Chromatography-Mass Spectrometry

The Dichloromethane extract was dissolved in Hexane and injected into a GC-MS apparatus (Hewlett Packard Model 5890 series) equipped with a mass selective detector (mass HP 5972). Experimental conditions for capillary GC-MS analysis were developed under the following conditions. Capillary column HP5-MS, 30 m x 0.32 mm (i.d.), detector temperature 300°C, injector temperature 280 °C .

3. Results and Discussion

We analyzed the Dichloromethane composition of leaves from *Ephedra alata.* 14 compounds were identified namely: Hexanoic acid (**1**), Benzoic acid (**2**), Nonanoic acid (**3**), Benzenepropanoic acid (**4**), 3-phenyl-methyl, 2-Propenoic acid (**5**), 3-phenyl, 2-Propenoic acid, (**6**), bis(trimethylsil), ethanedioic acid, (**7**), ethyl esther, 4-hydroxy-Benzoic acid (**8**), Benzeneacetic acid, alphahydrox (**9**), Hexadecanoic acid (**10**), Benzenedicarboxylic acid, mono (11), Eicosenoic acid, methyl ester (**12**), Octadecanoic acid (**13**), 1,2- Benzenedicarboxylic acid, diis (**14**) (Table.1, Fig .1). The results revealed that the plant is not only famous for its alkaloids but it involves many other important constituents which may be useful in curing diseases after being tested biologically.

Table 1: The acids of *Ephedra alata*

N°	compound	T_R	Area%	Ratio %
1	Hexanoic acid	5.71	0.91	4.991
2	Benzoic acid	7.83	7.60	41.790
3	Nonanoic acid	8.65	0.72	3.932
4	Benzenepropanoic acid	9.56	1.15	6.321
5	2-Propenoic acid, 3-phenyl-, methyl	10.19	2.17	11.918
6	2-Propenoic acid, 3-phenyl	11.12	18.19	100.000
7	Ethanedioic acid, bis(trimethylsil)	11.61	0.71	3.923
8	Benzoic acid, 4-hydroxy-, ethyl esther	12.33	1.17	6.437
9	Benzeneacetic acid, .alpha.-hydroxy	14.55	1.43	7.849
10	Hexadecanoic acid	20.27	1.21	6.654
11	Benzenedicarboxylic acid, mono	20.37	0.52	2.865
12	Eicosenoic acid, methyl ester	23.60	0.76	4.182
13	Octadecanoic acid	24.00	0.68	3.728
14	1,2-Benzenedicarboxylic acid, diis	31.17	1.41	7.755

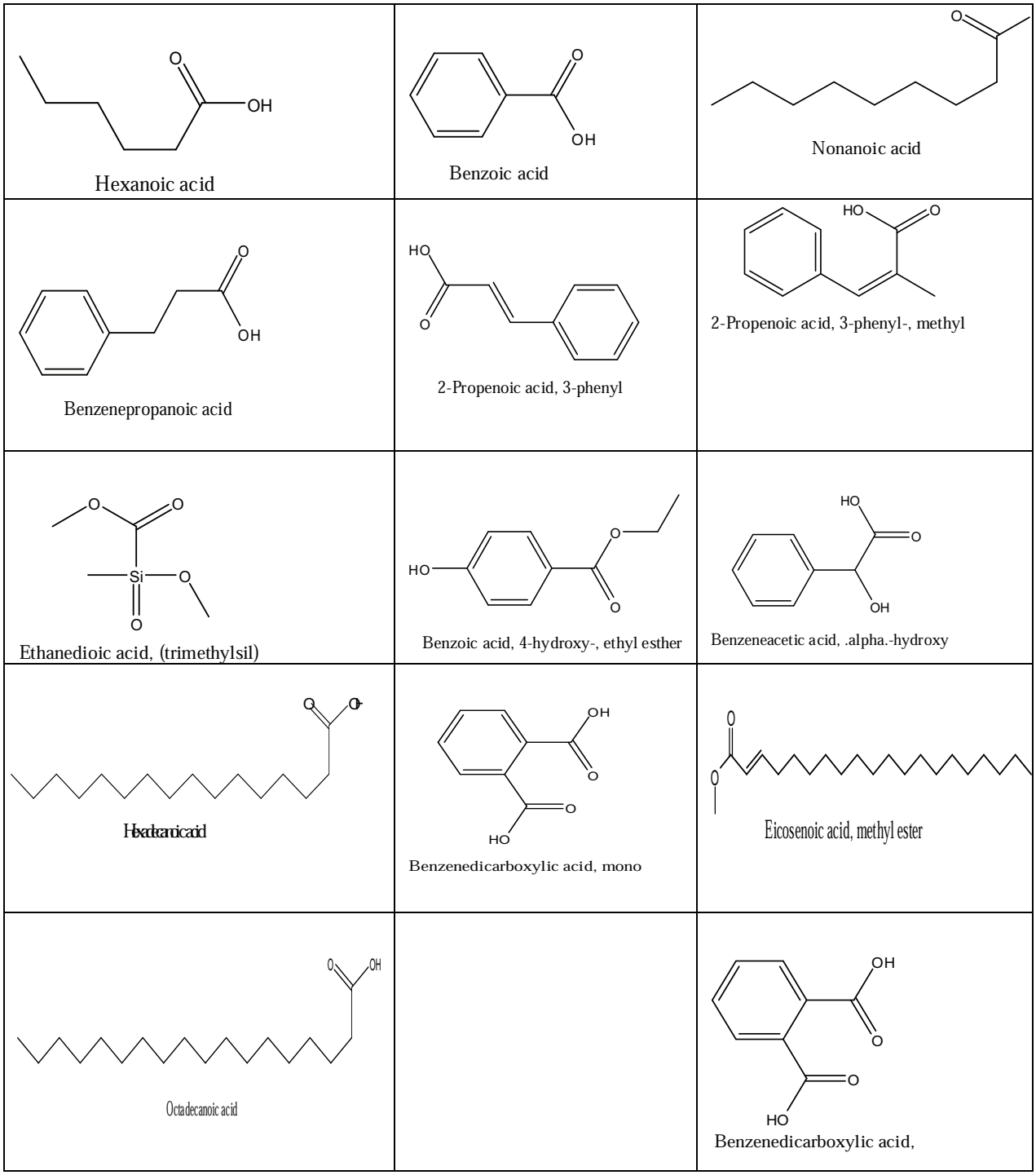

Fig .1: The acids of *Ephedra alata*

4. Conclusion

The aim of the present study was to investigate the acids profile of *Ephedra alata* by GC-MS. From this analysis, it has been revealed that the Dichloromethane extract of *Ephedra alata* involves 14 different acids.

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