EPH - International Journal of Applied Science
ISSN (Online): 2208-2182
Volume 06 Issue 02-June, 2020

DOI: https://doi.org/10.53555/eijas.v6i2.100

IDENTIFICATION AND DETERMINATION THE PHENOLIC COMPOUNDS AND FATTY ACIDS OF LEAVES AND FRUITS OF SOME MEDICINAL PLANTS (JUNIPERUS PHOENICEA AND ARBUTUS PAVARII) GROWING AT AL - JABAL AL - AKHDER REGION (LIBYA)

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Abstract:-

Phenolics and fatty acids of some medicinal plants (Juniperus phoenicea and Arbutus pavarii) growing at Al - Jabal Al - Akhder region (Libya) was carried out on the fruits and leaves. The analysis were applied on selected plants. The data showed high content of phenolic compounds in most of the studied leaves comparing with fruits ones, the higher levels were recorded for the compound of 3,5,Di caffeoly guinic acid in the A.pavarii leaves (0.1325 mg/g). The contents of saturated fatty acids recorded high levels in leaves of J. phoenicea (0.157mg/g), while the low levels were recorded in leaves of A.pavarii (0.079 mg/g), for the mono un saturated fatty acids the high concentrations recorded in leaves of A.pavarii (0.065mg/g), on the other side the low concentration was recorded in leaves of J. phoenicea (0.025mg/g). Whereas fruits of A.pavarii don't contain on mono un-saturated fatty acids. While the high contents of poly un-saturated fatty acids were recorded in fruits of J. phoenicea (0.045mg/g) and the low contents recorded in leaves of J. phoenicea (0.014mg/g). Whereas fruits of A.pavarii don't contain on poly un-saturated fatty acids. Generally the olic acid recorded high values of un-saturated fatty acids in leaves of A.pavarii (0.065mg/g).

Keywords: - *Phenolic compounds, fatty acids, Juniperus phoenicea, Arbutus pavarii, Al - Jabal Al - Akhder and Libya*

INTRODUCTION

In Libya there are about 1,825 vascular plant species, of which 134 are endemic. About 450 species are reported to be of medicinal value (1). Some important plant families are Apiaceae, Asteraceae, Lamiaceae, Poaceae, Fabaceae, Brassicaceae and Abiaceae. Medicinal plants are distributed all over the country especially in the Al-Jabel Al-Akhdar, Ghadames, Gharian, Awbari and Tarhona regions (2). More than 100 species are extensively used by Bedouins and local people in folk medicine drinks, or chewed fresh or dry. They are used to cure dermal diseases, viral or bacterial infections, insect or animal bites, burns and sometimes to treat hair problems. These medicinal plants are very well documented in different floras (3and 4), many species of medicinal plants such as *Cupressus sempervirens L., Pinus halepensis Mill., Juniperus phoenicea L., Quercus coccifera L., Asperula arvensis L., Tribulus longipetalus Viv., Veronica cymbalaria Bodard and Vahlia dichotoma* (Murray) Kuntze are threatened because of over-harvesting and diversion of forest land to agriculture (5and 6). *Juniperus phoenicea* and *Arbutus pavarii* are on of used plants in Al -Jabal Al - Akhdar region as a medicinal plants. *Arbutus pavarii* L is an evergreen shrub or a small tree that belongs to the Ericaceae family and endemic species in El-Jabal El-Akhdar, Libya. It is used in honey production, as food due, as ornament trees and in medicine for treatment of gastritis, renal infections and cancer aliments (7). The plant specis is recorded among of the endemic medicinal species (8). *Juniperus phoenicea* L It is a small tree, native to the northern lands bordering the Mediterranean Sea from Portugal to Palestine.

It is also native to North Africa found in Libya, Algeria, Morocco and Canary Islands (9). This plant species is a conspicuous constituent of the vegetation of the Mediterranean basin, particularly in Al-Jabel Al-Akhdar region.

MATERIALS AND METHODS

Plants samples were collected from Al-Gabel Al –Kadar Region during winter-spring 2015 Seasons. Leaves and fruits of every species of Plant were separated and washed with distilled water several times, then dried in open air. The collected samples were identified and kept in Seliphium herbarium, Botany Department, Faculty of Science, and Omar Al Mokhtar University.

Phenolic compounds content (PC):

Total phenolic was estimated using the colorimetric method based on Folin-Ciocalteu reagent (10) where "100, 200, 300, 400, 500µl" of methanolic extract of leaves and fruirs of selection plant were diluted by 2ml of distilled water and mixed with "600µl" of Folin-Ciocalteu reagent the mixture was allowed to stand for 5 min. and then 2ml of 20% Na_2CO_3 78 was added and kept at boiling water bath for 1 minute after cooling the blue colour formed measured at wave length 765 nm by UV-visible spectrophotometer. Quantification was done with respect to stander calibration curve of Pyrogallol the results were expressed as pyrogallol "µg/ml".

Fatty acids (Gas Liquid Chromatographic Analysis):

Five gram of powdered extracted for 30 minutes with 20ml mixture of chloroform and methanol (2:1) and filtered. The marc (remained powdered) re extracted three times as mentioned (chloroform/ methanol). Combine the extracts and washed with distilled water. The extracted layer was concentrated to residue (11).

The analysis of fatty acids was carried out by shinadzu-8A GLC, in Faculty of Science, Alexandria University, Egypt.

RESULTS AND DISCUSSION

Phenolic compounds:

Different types of phenolic compounds were detected, the results were given in Tables (1 & 2) and shown in Figures (1&2). The phenolic compounds and their concentration were fluctuated in the studied plants as following:

***Arbutus pavarii*:** The concentrations of phenolic compounds in leaves and fruits of *Arbutus pavarii* were as following:

***Arbutus pavarii* leaves**: Chlorogeneic acid (0.0179 mg/g), 3, 4-Dicaffeoly guinic acid (0.1022mg/g), 3,5-Dicaffeoly guinic acid (0.1325 mg/g), and 4,5-Dicaffeoly guinic acid (0.0205 mg/g).

***Arbutus pavarii* fruits :** Chlorogeneic acid (0.0000026 mg/g),3,4-Di-caffeoly guinic acid (0.00344 mg/g), 3,5-Dicaffeoly guinic acid (0.00572 mg/g), 4,5-Dicaffeoly guinic acid (0.00419 mg/g), 2,5-dihydroxy Benzoic acid (0.00000365 mg/g), Cinnamic acid (0.00000696 mg/g), Galic acid (0.000014 mg/g) and Geraniol (0.00000314 mg/g).

***Juniperus phoenicea*:** The concentrations of phenolic compounds in leaves and fruits of *Juniperus phoenicea* recorded as following:

***Juniperus phoenicea* leaves:** 4, 5-Dicaffeoly guinic acid (0.003047 mg/g), Cinnamic acid (0.00000696 mg/g), Galic acid (0.0161 mg/g) Geraniol (0.000644 mg/g), Phloridzin (0.00000297 mg/g), Quercetin (0.02033 mg/g) and Catecin (0.0424 mg/g).

***Juniperus phoenicea* fruits**: 3, 4-Dicaffeoly guinic acid (0.00115 mg/g), Galic acid (0.0000975 mg/g and Catecin (0.0424 mg/g).

Table (1): Phenolic compounds in *Arbutus pavarii* (leaves and fruits):

Plants Phenolic compounds mg/g	*A.pavarii*	
	leaves	Fruits
Chlorogeneic acid	0.0179	0.0000026
Caffeic acid	_	_
3,4-Dicaffeoly guinic acid	0.1022	0.00344
3,5-Dicaffeoly guinic acid	0.1325	0.00572
4,5-Dicaffeoly guinic acid	0.0205	0.00419
2,5-dihydroxy Benzoic acid	_	0.00000365
Cinnamic acid	_	0.00000696
Galic acid	_	0.000014
Geraniol	_	0.00000314
Tanic acid	_	_
Phloridzin	_	_
Quercetin	_	_

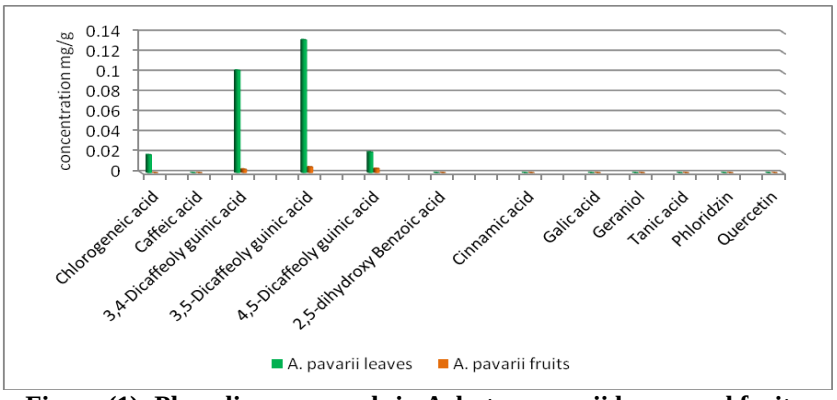

Figure (1): Phenolic compounds in Arbutus pavarii leaves and fruits.

Table (2): Phenolic compounds in Juniperus phoenicea (leaves and fruits)

Plants Phenolics compounds mg/g	*J. phoenicea*	
	leaves	fruits
Chlorogeneic aacid	_	_
Caffeic acid	_	_
3,4-Dicaffeoly guinic acid	_	0.00115
3,5-Dicaffeoly guinic acid	_	_
4,5-Dicaffeoly guinic acid	0.003047	_
2,5-dihydroxy Benzoic acid	_	_
Cinnamic acid	0.0000069	_
Galic acid	0.0161	0.0000975
Geraniol	0.000644	_
Tanic acid	_	_
Phloridzin	0.0000029	_
Quercetin	0.02033	_
Catecin	0.0424	0.0083

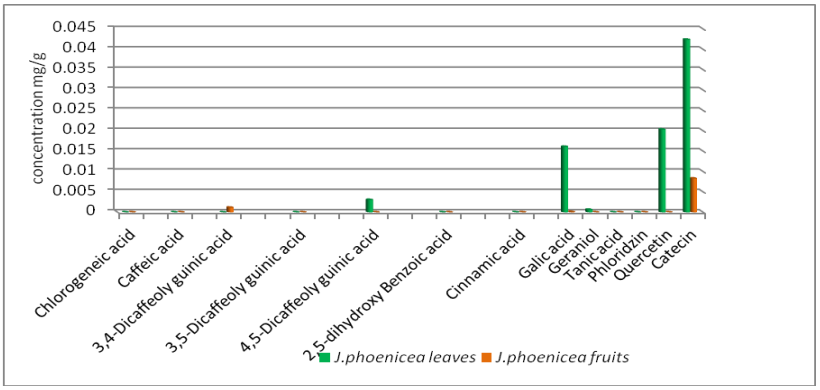

Figure (2): Phenolic compounds in Juniperus phoenicea leaves and fruits.

Fatty acids:

Total Saturated and Unsaturated fatty acids:

The total Saturated and Unsaturated fatty acids were detected, the results were given in Table (3) and shown in Figures (3 & 4).Their concentrations were fluctuated in the studied plants as following:

Arbutus pavarii: the concentrations of saturated fatty acids in *A.pavarii* leaves and fruits were as following: (0.079 and 0.153 mg/g) respectively, while the concentrations of unsaturated fatty acids in *A.pavarii* leaves and fruits were as following: Mono unSaturated fatty acid (0.065 and 0.000 mg/g) respectively, and poly Unsaturated fatty acid (0.034 and 0.000 mg/g), respectively.

***Juniperus phoenicea*:** the concentrations of saturated fatty acids in *J. phoenicea* leaves and fruits were as following: (0.157 and 0.121mg/g) respectively while the concentration of unsaturated fatty acid in *J. phoenice*a leaves and fruits were as following: Mono unsaturated fatty acid (0.025and 0.046 mg/g) respectively and poly unsaturated fatty acid (0.014 and 0.045mg/g), respectively.

Table (3): Total Saturated (T SFA) and Unsaturated (Un SFA)fatty acids:

Plants **T SFA & T UnSFA mg/g**		***A.pavarii***		***J.phoenicea***	
		Leaves	Fruits	Leaves	Fruits
SFA		0.079	0.153	0.157	0.121
Un SFA	**MU**	0.065	0.000	0.025	0.046
	PU	0.034	0.000	0.014	0.045

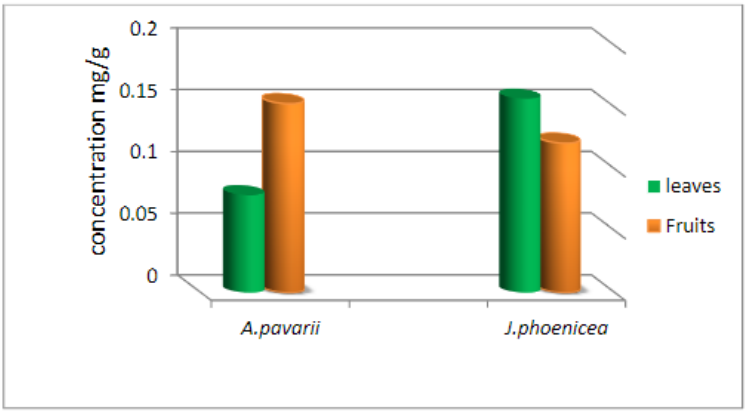

Figure (3): Total Saturated fatty acids content.

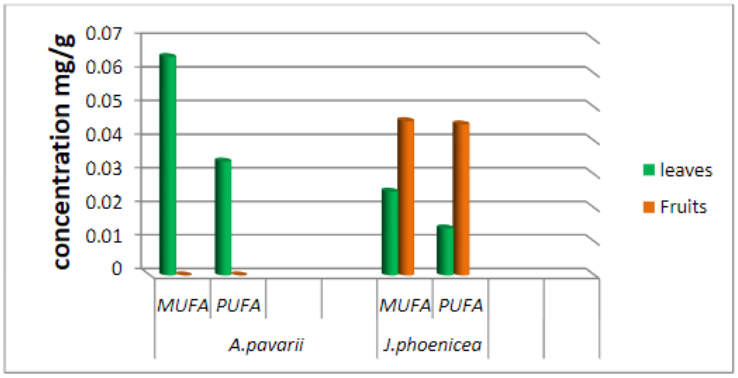

Figure (4): Total Un-Saturated (Monounsaturated and polyunsaturated) fatty acids.

Saturated fatty acids:

The results of saturated fatty acids are given in Table (4) and shown in Figures (5&6):

In the *Arbutus pavarii:* The concentrations of saturated fatty acids in leaves and fruits of *Arbutus pavarii* were recorded as following:

Arbutus pavarii leaves hexadecanoic contained (0.034 mg/g) and octadecanoic (0.045 mg/g), while in fruits were butanoic (0.003 mg/g), octanoic (0.007 mg/g), decanoic (0.005 mg/g), tridecanoic (0.073 mg/g) and pentadecanoic (0.011 mg/g).

On the other side in ***Juniperus phoenicea*:** The concentrations of saturated fatty acids in leaves and fruits of *Juniperus phoenicea* were: In leaves, the hexanoic (0.001 mg/g), octanoic (0.002 mg/g), decanoic (0.005 mg/g), undecanoic (0.008 mg/g), dodecanoic (0.029 mg/g), tridecanoic (0.011 mg/g), tetradecanoic (0.014 mg/g), pentadecanoic (0.031mg/g), hexadecanoic (0.015 mg/g), octadecanoic (0.021mg/g), and eicosanoic (0.020 mg/g) while fruits, decanoic (0.001 mg/g), undecanoic (0.001 mg/g), decanoic (0.005 mg/g), tetradecanoic (0.011 mg/g), hexadecanoic (0.035 mg/g) and octadecanoic (0.068 mg/g).

The high concentration of saturated fatty acid was recorded for Tridecanoic (0.073mg/g) in fruits of *A.pavarii*, while the low concentration was recorded for decanoic and undecanoic (0.001 mg/g) in fruits of *juniperus pheonicea*.

Again, those data about the type of fatty acids mainly the first ones, because no data were recorded for fatty acids for the studied plants of area under investigation.

Table (4): Saturated fatty acid content in studied plants (leaves and fruits).

Plants / Fatty acids mg/g	*A.pavarii*		*J.phoenicea*	
	leaves	**fruits**	**leaves**	**fruits**
Butanoic	_	0.003	_	_
Hexanoic	_	_	0.001	_
Octanoic	_	0.007	0.002	_
Decanoic	_	0.005	0.005	0.001
Undecanoic	_	_	0.008	0.001
Dodecanoic	_	_	0.029	0.005
Tridecanoic	_	0.073	0.011	
Tetradecanoic	_	_	0.014	0.011
pentadecanoic	_	0.011	0.031	_
Hexadecanoic	0.034	_	0.015	0.035
Heptadecanoic	_	_	_	_
Octadecanoic	0.045	0.054	0.021	0.068
Eicosanoic	_	_	0.020	_
Henei Docosanoic	_	_	_	_
Docosanoic	_	_	_	_
Tricosanoic	_	_	_	_
Tetracosanoic	_	_	_	_

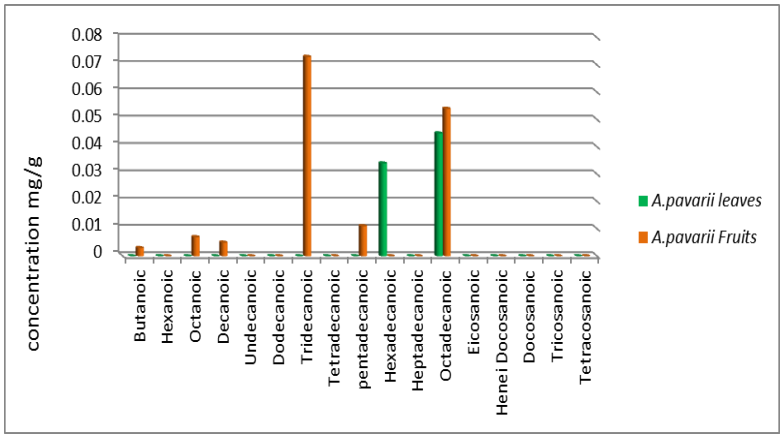

Figure (5): Saturated fatty acids content in *A. pavarii* leaves and fruits.

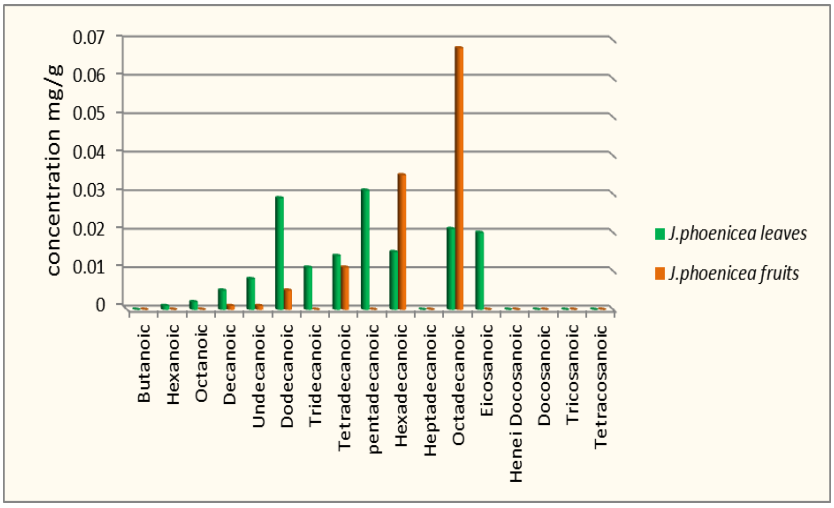

Figure (6): Saturated fatty acids content in *J.phoenicea* leaves and fruits.

Unsaturated fatty acids:

On the other side the concentrations of unsaturated fatty acids were recorded in Table (5) and Figure (7). The results can be shown as following:

In the *Arbutus pavarii*: The concentrations of unsaturated fatty acids in leaves and fruits of *Arbutus pavarii* were as following:

In *Arbutus pavarii* leaves: Oleic (0.065 mg/g) and ɣ-linoleic (0.034 mg/g), whereas in *Arbutus pavarii* fruits: No any unsaturated fatty acids was detected.

On the other side in *Juniperus phoenicea*: The concentrations of unsaturated fatty acids in leaves and fruits of *Juniperus phoenicea* were recorded as following:

In *Juniperus phoenicea* leaves: Myristoleic (0.010 mg/g), Oleic (0.015 mg/g) and ɣ-linoleic (0.014 mg/g).

***And Juniperus phoenicea* fruits**: Oleic (0.046 mg/g) and ɣ-linoleic (0.045 mg/g).

The high concentration of unsaturated fatty acid was recorded for Oleic (0.065mg/g) in leaves of *A.pavarii*, while the low concentration was recorded for Myristoleic (0.010mg/g), in leaves of *J.phoenicea*.

Table (5): Unsaturated fatty acids content in studied plants (leaves and fruits).

Plants / Fatty acids / mg/g		*A.pavarii*		*J.phoenicea*	
		leaves	fruits	Leaves	fruits
Monounsaturated fatty acid	Myristoleic	–	–	0.010	–
	Cis-10-Pentadecanoic	–	–	–	–
	9- Hexadecenoic	–	–	–	–
	Cis -10-Heptadecenoic	–	–	–	–
	Oleic	0.065	–	0.015	0.046
	Cis-11-Eicosenoic (Gadoleic)	–	–	–	–
	Cetolic	–	–	–	–
poly unsaturated fatty acid	γ-linoleic	0.034	–	0.014	0.045
	linoleic	–	–	–	–
	Cis-11-14-Eicosadienoic	–	–	–	–
	Cis-11,14,17-Eicosatrienoic	–	–	–	–
	Cis-8,11,14-Eicosatrienoic	–	–	–	–
	Arachidonoc	–	–	–	–
	Cis5,8,11,14,17-Eicosapentaenoic	–	–	–	–
	Cis-13,16-Docosadienoic	–	–	–	–
	Cis4,7,10,13,16,19Docosahexaenoic	–	–	–	–

Figure (7): Total un-saturated fatty acids content in studied plants (leaves and fruits)

CONCLUSION

According to the results which obtained in this study, we can be recommendation to apply these extracts on the pathogenic microorganism species. And using this study as a data base for the future studies on the herbal plants at Al-Jabal Al-Akhdar region.

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