Study the Essential Oil of the species *OriganumVulgare* L. in two Environmentally Divergent Locations of the Syrian Coast

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Abstract: *The essential oil of the species Origanum vulgare L. was studied in two environmentally divergent areas (Khirbat al-Sanasil, Ain Liloun). Its quantity and quality and the effect of sea-level rise on essential oil properties were determined. It was found that the best percentage of essential oil was recorded at Ain Liloun site, where the percentage of essential oil was (1.8 ml / 100 g), while in Khirbat al-Sanasil it was (0.9 ml / 100 g).*

Chemical composition was studied using gas chromatography GC / MS, where it was found that the main compounds are phenolic compounds. The location of Ain Liloun was characterized by a higher percentage of carvacrol by (61.02%) and thymol (11.25%) compared to the site of Khirbat Al-sanasil where the proportion of carvacrol was (48.21%) and thymol attained (9.02%).

Keywords: *Origanum vulgare L., Essential oil, gas chromatography GC / MS.*

I. INTRODUCTION

Medicinal plants occupy an important place in agricultural and industrial production, where their medicinal value is contained by many metabolites. A number of medicinal and aromatic plant species is estimated about (800-1000 species), most of which grow wild in different environments [1].

The oral family (Lamiaceae) is one of the largest flowering plant species [2], comprising about 280 genera and more than 6,700 species spread throughout the world [3]. But it is mainly distributed in the Mediterranean and South Africa [4].

Plants of this family are characterized by their volatile essential oils because of the presence of glandular hair secretions of these oils in the stem and leaves. The oral family is called as this because the calyx consists of five orally conjunctivated sepals, and the corolla consists of five double-lip petals.

Plants in this family are herbaceous or dendritic. Leaves are simple opposite atria. Stem is a square-sectioned. Flower is hermaphrodite. The ovary is upper, deeply divided into four compartments due to the formation of a false barrier [5].

cliffs and mountain areas where they grow in shady coniferous forests and some species live at low altitudes [8].

This species withstands low temperatures in winter, but prefers high heat and long light periods as in summer. [9]

The essential oil of *Origanum vulgare* L. characterizes by its strong aroma, is extracted from dried or fresh leaves and flowering peaks. It is also characterizes by its active compounds, the most important of which are flavonoids and phenolic compounds that have gained anti-bacterial, fungal and viral properties [10]. In the forefront of these compounds is thymolalkarvacrol [11] that affect as an anti-genetic mutations and recent studies indicate its role in the treatment of cancer as this plant has been used in the treatment of digestive and respiratory problems and arthritis and treatment of hormonal disorders [12], [13], [14].

Essential oil is influenced by several factors affecting its quantity and quality, such as climatic, topographic, and vegetative factors [15].

Altitude of sea level leads to lower temperatures as the life cycle of plants and the ability of seeds to germinate, seedlings and sprouts to grow gradually decreases when we rise above sea level. Also the slope of the soil surface affects vegetation, where the sloping surface easily loses rain water. Sloping affects the degree of exposure to solar radiation. It has been found in some areas that flat lands get almost twice as much solar energy as the vertical slopes, which has the greatest impact on soil temperature and, of course, vegetation. [16].

The species *Organium vulgare* L. considers one of the widespread wild plants in Syria. It has an ecological, economic and pharmacological value, Therefore, the present research aims to study the variations in the

II. MATERIALS AND METHODS

A.) Plant Material:

Samples of the species *O.vulgare* L. were collected in the period of vegetative growth between May and October 2018 from the following sites (Figure 1):
The first site: **Ain Liloun**, it belongs to Al-Muzayra'a. It is about (600 m) above sea level. The annual rainfall is 1200 mm, its soil is rocky, characterized by the cultivation of apples and cherries.
The second site: **Khirbat Al-sanasil**, it belongs to Banias city, has an altitude of about 200 m above sea level. The annual rainfall is 600 mm, its soil is red, characterized by olive cultivation.

Leaves and flowers of this family are used in the treatment of various diseases: blood activator, antispasmodic, anti-inflammatory, and have a role in the treatment of respiratory disorders. They are also grown as ornamental plants [6].

The species *Origanum vulgare* L. belongs to the oral family Lamiaceae and perennial herbaceous aromatic herbs, woody base, stem is leg, leaves are quite simple edge, flowers are red and rarely white in color, spherical fruits contain oval seeds. It is spread in the Mediterranean, Siberia and Iran [7].

It grows in semi-humid and semi-arid climatic environments. Most of the species are found in rocky quantity and quality of essential oil of the species *Origanum vulgare* L. in environmentally differentiated sites using gas chromatography GC / MS.

Figure (1): The species *Origanum vulgare* L.

B.) Used devices and materials:

1. Gas chromatography coupled with mass spectrometry GC / MS.
2. Clevenger device.
3.Rotary evaporator.
4. Solvents and used materials: Hexane, 300g of *O. vulgare* L. leaves, Sodium sulfate and distilled water.

C.) The used method:

After collecting the samples, samples were thoroughly cleaned of dust and suspended impurities, dried in the shade in a well-ventilated place, grinded and stored in sealed glass containers.

The essential oil was extracted by the steam distillation method using the Clevenger device. A quantity of 300 g leaves was placed in a 5000 ml flask and then enough distilled water was added until the entire sample was submerged.

Extraction was done at 95 ° C for 7 hours, then the essential oil was separated from the aqueous extract using 100 ml of hexane in several batches using a separation funnel.

The surface layer was isolated and dried with anhydrous sodium sulfate. The extract was concentrated using a rotary evaporator at 40 ° C to 5 ml. The solution was left until the solvent was completely evaporated. The oil was then weighed and the percentage was calculated. then kept in a sealed dark tube at 4 ° C. The chemical composition of the oil was determined using a GC \ MC device with mass spectrometry (figure 2) [17].

Figure (2): GC-MS device

III. RESULTS and DISCUSSION

Results showed that the highest percentage of essential oil was (1.8%) in Ain Liloun followed by Khirbat Al-sanasil (0.9%) (Table 1).

Results in table (2) showed variations between the plant content of these sites in terms of chemical compounds.

Table (1): Data of the studied sites.

The site	The height	essential oil percentage	the annual rainfall during 2018
Ain Liloun	600 m	1.8%	1180mm
Khirbat Al-sanasil	200 m	0.9%	718.5mm

Table (2): Chemical compounds of essential oil of the species *O.vulgare* L. in the studied sites

number	RI	The compound	Khirbat Al-sanasil	Ain Liloun
1	4.034	α-pinene	6.32	5.20
2	6.352	thymol	9.02	11.25
3	6.458	carvacrol	48.21	61.02
4	8.032	linalool	9.26	4.24
5	9.352	sabinene	6.17	1.33
6	9.457	β-pinene	8.48	3.85
7	10.065	α-terpinene	5.12	5.63
8	15.963	α-terpineol	6.98	2.36
9	17.584	carvone	-	1.98
10	20.620	thymol acetate	-	2.11
11	21.225	carvacrol acetate	0.34	0.78
12	25.223	β-bisabolene	-	0.25

Results showed that the number of compounds resulting from the analysis of essential oil at the site of Ain Liloun attained (12 compounds), while the number of compounds produced at the site of Khirbat Al-sanasil reached to (9 chemical compounds). It is evident the effect of rainfall on the productivity of essential oil as the limited amount of water available to the plant reduces the activity of the plant and thus affects the essential oil, which is a byproduct of secondary metabolism. This is consistent with re. [18].

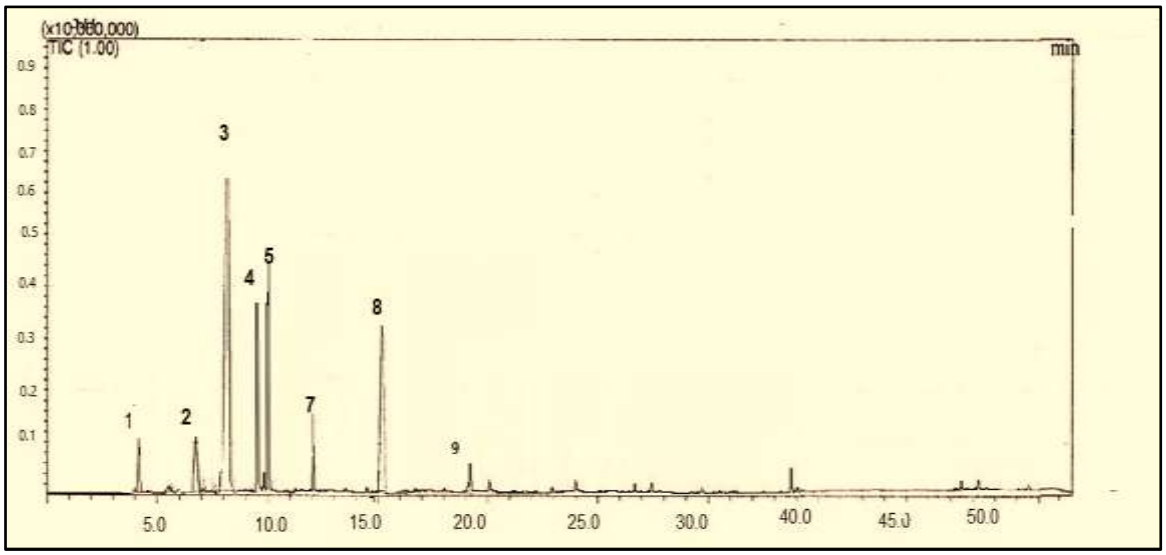

Figure (3): The essential oil chromatography at Khirbat Al-sanasil site

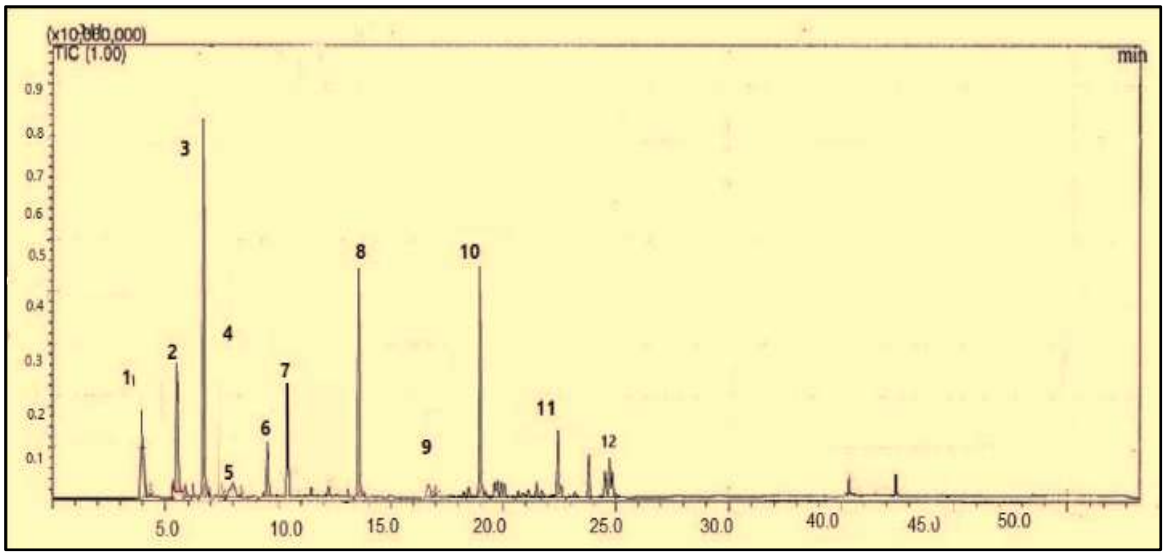

Figure (4): The essential oil chromatography at Ain Liloun site

Results showed that the percentage of the compound carvacrol is the highest among the compounds in both sites, where its rate in Ain Liloun attained (61.02%), while in Khirbat Al-sanasil reached to (48.21%), followed by thymol, where in Ain Liloun, it was (11.25%), while in Khirbat Al-sanasil , it was (9.02%). This is consistent with re. [19]. Where it was observed that the dominance of carvacrol on the composition of essential oil, and obtained the highest peak approval of (49.8%) compared to (31.5%) of thymol.

Re. [15] found that carvacrol was the primary compound of essential oil in the species O. vulgare, while the results of re. [20] showed that the most common compounds in oil are thymol and carvacrol, and that the main compound is thymol.

The percentage of α-terpinene in the two sites was close, where it was (5.63%) at Ain Liloun, while in Khirbat Al-sanasil, it was (5.12%). The compound β-bisabolene was the lowest in samples of Ain Liloun with value (0.25%), and it did not record in the other site.

While the α-pinene compound was higher in the samples of Khirbat Al-sanasil site by (6.32%) compared with Ain Lilounsite by (5.20%). The linalool compound in the site of Khirbat Al-sanasil was (9.26%) compared to the other site which was (4.24%) without significant differences. This agree with re. [21].

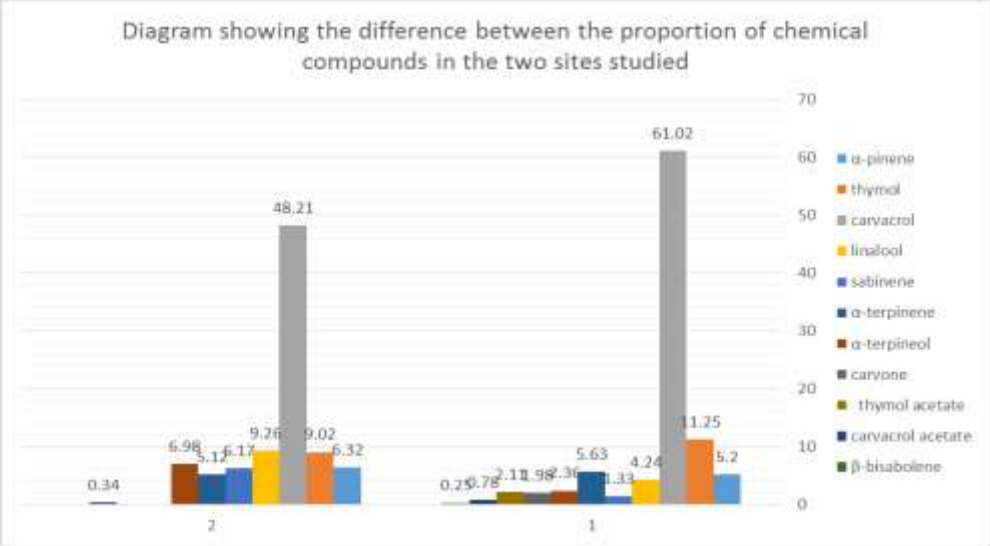

Figure (5): the differences between the proportion of chemical compounds in the two sites studied

IV. CONCLUSION

1- -The quantity of essential oil changes according to the height above sea level. Where it was the highest in Ain Liloun site with value of (1.8%), followed by 0.9% in Khirbat Al-sanasil site.

2- The chemical composition of *O.vulgare* L. oil varies according to the high from the sea level, where the site of Ain Lilounwas characterized by a higher percentage of carvacrol by 61.02% and thymol 11.25% compared to the site of Khirbat Al-sanasil where the proportion of carvacrol 48.21% and thymol 9.02%. β-bisabolene was the lowest at Ain Lilounsite by 0.25% and not recorded at the other site. The percentage of linalool compound was higher in Khirbat Al-sanasil by 9.26% compared to the other site 4.24%.

3- The main compound of the essential oil of the species *O.vulgare* L. is mainly carvacrol followed by thymol.

Because all above we advice to:

1- Conducting an analysis of the essential oil of species *O.vulgare* L. in several phenological stages and comparing its quantity and quality.

2- Conduct an analysis of the essential oil of other species of the genus *Origanum* and compare the differences between the quantity and quality of these species.

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