Chemical Composition of Essential Oil Extracted from *Urtica pilulifera* and Evaluation Its Biological Activity

Shaza Sitrallah, Joumaa Merza

**Abstract**— The essential oil has been extracted from the aerial parts of *Urtica pilulifera* from *Urticacea* family collected in south west of Hama in Syria by hydro-distillation using Clavenger type apparatus. The composition, the qualitative and quantitative analysis of the essential oil was achieved and characterized by means of GC-MS and comparing with the references in the literature. A total of 45 compounds of the essential oil were characterized. The major compounds in the oil was dominated by four compounds representing the majority of the components: (-) Limonene (1.24%), 1,8-Cineole (8.20%), 3-Carene (3.76%), (+) Limonene (6.76%), Terpinene (2.41%), Vanillin (1.70%), Butyl acetate (3.23%), 1,2-Benzene dicarboxylic acid (13.50%), 7-Acetyl-6-ethyl-1,1,4,4-tetramethyltetralin (19.61%). The other compounds were mostly presented in low amounts. The biological effects of aromatic oil were studied on some pathogenic bacteria including: *Staphylococcus aureus*, *Escherichia coli*.

**Index Terms**— Biological effects, Clavenger, *Escherichia coli*, essential oil, GC-MS, hydro-distillation, *Staphylococcus aureus*, *Urticacea*, *Urtica pilulifera*.

### 1 INTRODUCTION

THE Urticaceae is a common family of plants which produces allergenic substances causing edema and inflammation in humans [1]. It is composed of over 48 genera and nearly 1300 species [2]. The main varieties identified under the Urtica species are Urtica dioica L., U. urens L., Urtica pilulifera L., U. cannabina L., U. membranacea Poiret, U. kiovensis Rogoff L. [2]. Urtica plant is useful for bladder disorder. Urtica pilulifera L. is a member of family Urticaceae. It is one of the most effective medicinal plant and widely used in folk remedy to treat hyperglycemia, hypertension and inflammation of some organs such as uvula and uterus, anemia, wound healing, as purifier and as toner tea and other ingredient as anhydrous lanolin and mint oil in preparation of wound–healing antimicrobial ointment [3-6]. Its extract reported as useful for bladder disorder and reduced postoperative blood loss, and prevented hemorrhagic and purulent inflammation following adenomectomy [7]. As a part of our study to characterize the chemical constituents of Syrian plants we have investigated the essential oil of *Urtica pilulifera* L. In the present communication we wish to report the extraction and studying the chemical composition of the essential oil of *Urtica pilulifera* and evaluate its biological activity.

### 2 TAXONOMIC DESCRIPTION OF EUPHORBIA URTICA PILULIFERA:

*Urtica pilulifera* Stinging nettle (*Urticacea*) are annual and perennial herbs, a plant with a square leg, its leaves are large serrated in the heart, its thickness and the leg are thick, thin hairs that carry in its bases a liquid composed of several chemicals, most important of which is histamine and formic acid. These capillaries are opened at their pointed tops once The small nettle flowers are colored in clusters that hang down, the seeds are dark yellow, and the two species that spread in the Arab environment are: the small nettle, up to 50 cm high, the large nettle, rising about one and a half meters and the leaves slightly larger than the nettle, but the two types are similar in their chemical components and therapeutic properties [8]. As for its whereabouts, it is found everywhere in the world, and the types of this plant spread in most of the Arab Mashreq countries. The whole herb, including roots and seeds, is harvested from the beginning of July until the beginning of September, and if only the roots are required to be harvested before flowering [9].

### 3 EXPERIMENTAL PROCEDURE:

#### 3.1 Plant Material

Aerial parts of *Urtica pilulifera*, were collected and dried in August 2017, from South-East of Hama, Syria. The plant was authenticated by the Atomic Agent in Syria. A voucher specimen of plant was deposited in the laboratory of chemistry of natural products, Department of chemistry, Faculty of sciences, AL Baath University, Homs, Syria.
3.2 Essential oils analysis
The analysis of the essential oil was performed with Shimadzu Bruker Ultra Shield 400MHz gas chromatograph with a capillary column DB5 (30m × 0.25μm) With an internal character (0.25μm). Temperature program was as follows: 3 min at 40°C, increased to 100°C at a rate of 5°C min, then, increased to 120°C at a rate of 5°C min and held at that temperature for 1 min, increased to 180°C at a rate of 6°C min, increased to 200°C at a rate of 20°C min, increased to 220°C at a rate of 30°C min, then increased to 280°C at a rate of 40°C min and held at that temperature for 1 min. Injection temperature was 230°C. Injection volume was 1.0 μL. Helium was used as a carrier gas (1 mL/min). the identification of the constituents was performed by comparing the spectra obtained with database of Wiley Spectral Library Collection and NSIT library database. Quantitative data were obtained from the electronic integration of the FID peak areas.

3.3 Extraction the essential oil
The extraction of essential oil was carried out by hydrodistillation using Clavenger type apparatus. 200 gr of Urtica pilulifera was boiled in water during 4 hours and the yield of essential oil was 1.42% (w/w). The essential oils obtained has brown pale color with characteristic odor. The oils were stored in a refrigerator until the analysis by GC-MS.

3.4 Evaluation the biological activity
The biological efficacy of the aromatic oil extracted from the Urtica pilulifera was studied in a manner of spreading the tablets to two bacteriostatic strains: Staphylococcus aureus, Escherichia coli. The lobster was highly effective on bacterium Effectiveness has been compared with gentamicin anti-inflammatory drug. Transfer (0.1) cm3 from the diluted bacterial suspension to the center of nutritious Nutrient agar and spread on the surface of the center in a homogeneous manner and incubated for 30 minutes at a temperature of 37 °C for the purpose of sowing. In the meantime, the tablets were filled with oil extract and active ingredients. The discs were prepared from the filter paper with a perforation of the leaves and a diameter of 5 mm. These tablets were treated with different concentrations of the oil extract (100%, 50%, 25%). The steroid tablets containing the nutrient medium are then sterilized with sterile concentrates. At this time, the Gentamicin filter paper is coated with a concentration of 500 μg/cm3. It is determined by the different concentrations of the oil extract and DMSO, all in one dish on the feeding medium and incubated at a temperature of (37) °C for a period of (16) hours.

4 RESULTS AND DISCUSSION
4.1 Volatile Chemical Composition
The figure 2 presents a typical chromatographic profile of essential oil from Urtica pilulifera by hydrodistillation (HD) using Clavenger type apparatus. The individual components of the oils were identified by GC/Mass, The Peaks identification and relative amounts of the various compounds present in the volatile fraction appear in Table 1. A total of 45 compounds. The oil was dominated by some compounds representing the majority of the components: (-) Limonene (1.24%), 1,8-Cineole (8.20%), 3-Carene (3.76%), (+) Limonene (6.76%), Terpinene (2.41%), Vanillin (1.70%), Butyl acetate (3.23%), 1,2-Benzenedicarboxylic acid (13.50%), 7-Acetyl-6-ethyl-1,1,4,4-tetramethyltetralin (19.61%). The other compounds were mostly presented in low amounts, most of the components of Urtica oil are found in references [10-14], and they are the main components of the species in other parts of the world, and some other components were not mentioned in the references. In other words, the aromatic oil content shows a diversity in the proportions of its components compared to the references. The chemical composition of the oil and their percentage in the oil extracted from urtica pilulifera grown in Syria is compared to the composition of oil studied in the references and that is due to several factors, such as the climatic difference and geographical conditions in each country such as soil type and conditions in which the leaves were harvested [12,13].

The analyses of table 1 shows that most of compounds are mentioned in other species, but with difference in proportions.

![Fig. 1. The GC chromatogram of essential oils obtained from dried aerial part of Urtica pilulifera.](image-url)
The essential oil exhibit significant activity against the pathogenic bacteria including: Staphylococcus aureus, Escherichia coli, in comparing to the gentamicin. The damping area is measured by a graduated ruler and the results are recorded in the table 2.

5 Conclusion

This is the first report of essential oil composition of Urtica pilulifera from Syria by the conventional hydro-distillation extraction (HD). 45 compounds representing 99.62% of the essential oil were characterized. By the domination of four compounds as majority of the components: (-)Limonene (1.24%), 1,8-Cineole (8.20%), 3-Carene (3.76%), (+) Limonene (6.76%), Terpine (2.41%), Vanillin (1.70%), Butyl acetate (3.23%), 1,2-Benzenedicarboxylic acid (13.50%), 7-Acetyl-6-ethyl-1,1,4,4-tetramethyltetralin (19.61%). The other compounds were mostly presented in low amount. The Urtica pilulifera from Urticacea family is a natural source of antimicrobial. The essential oil extracted this plant contains constituents with antimicrobial Activity. therefore, it can be used as a medical medicinal drug of high importance in the treatment of many diseases, and also described as anti-bacterial and inflammation.

Acknowledgement

The author expresses his thanks to central organic laboratory in, department of chemistry, AL Baath University, faculty of sciences, for their assistance during the work.

References


