



## Investigation of the Main Alkaloid of London Rocket (*Sisymbrium irio* L) as a Wild Medicinal Plant Grown in Iraq

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Accepted on: 25-05-2016; Finalized on: 30-06-2016.

### ABSTRACT

The objective of the study is to Detect and investigate the main alkaloid of aerial parts extract of *Sisymbrium irio* L. as a medicinal plant used in traditional medicine in Iraq for liver diseases. After collection of the aerial parts of this plant, it was dried and converted to powder by grinding. Powdered plant was macerated with 2N HCl overnight. The alkaloid were detected with dragendroff's reagent. Investigation of the extracted alkaloid using GC/MS. The results of this study were referred to the TLC and dragendroff's test and show the presence of nicotine as the single alkaloid was founded in this plant. The study was occurred the effect of environmental condition such as semi-aerial condition soil type were very important on the active compounds biosynthesis.

**Keywords:** London Rocket, *Sisymbrium irio* L, Nicotine.

### INTRODUCTION

*Sisymbrium irio* L, known as London rocket<sup>1</sup> is an annual herb of family Brassicaceae distributed in Iraq. The stems erect, 15-50 cm tall, branched throughout or above the middle. Lower leaves long, gradually reduced upward, upper ones sessile, petals 2.5-4 mm long, pale yellow. Seeds usually in one series per loculeca, oblong, minutely papillose<sup>2</sup>. Shape Figure 1 and 2.



Figure 1



Figure 2

*Sisymbrium irio* generally is found in abandoned fields, waste places, roadsides, orchards, off-highway vehicle staging areas, pastures and livestock watering sites, and open deserts<sup>3,4</sup>.

*S. irio* is used in treating coughs and chest congestion, rheumatism and to detoxify liver and spleen, reduce swelling and clean wounds<sup>5</sup>. *S. irio* has many uses in folk medicine in treatment of inflammation and rheumatism<sup>6</sup>. *S. irio* can be used for dietary purposes<sup>7</sup>. Seeds are used as expectorant, febrifuge and used in treatment of voice disorders<sup>8</sup>.

*S. irio* has antipyretic, analgesic, anti-microbial and antioxidant potential<sup>9</sup>. The Bedouin use the leaf of London Rocket as a tobacco substitute<sup>10</sup>.

### MATERIALS AND METHODS

#### Plant Material

The aerial parts of plant *sisymbrium irio* were collected from area of al-Jadrea in University of Baghdad in Baghdad and authenticated by the national herbarium at Abu-Graib and identified by Prof. Ali Al-Musawi, in department of biology in college of sciences, University of Baghdad. The plant material was collect during April and washed under running tap water to remove the surface pollutants, dried for two week at room temperature in the shade, then reduced to fine powder, weighted, packed in tightly closed containers and stored for studies.

#### Extraction

Powdered plant (50 g.) was macerated in 2N Hydrochloric acid (100 mL) for overnight and stirred gently by a magnetic stirrer. The extract was filtered by a Buchner funnel. Water (20mL) was added and the pH of the extract was adjusted to 8-9 by ammonia solution. The extract partitioned with chloroform (30×3). The combined

organic layers was dried with anhydrous Sodium sulphate evaporated by a rotary evaporator to dryness and sent to the GC/MS lab.

**Detection of Alkaloids**

Detection of alkaloid was carried out on the preparative thin layer chromatography, the spot of alkaloid was detected by spraying with Dragendroff’s reagent. The stock solution of Dragendroff’s was prepared by mixed the fraction (a) and (b) in ratio 1:1.

Solution (a): Dissolve 0.85 g basic bismuth nitrate in 10 ml glacial acetic acid and 40 ml water under heating. If necessary, filter.

Solution (b): Dissolve 8 g potassium iodide in 30 ml water.

Spray reagent: 1 ml stock solution is mixed with 2 ml glacial acetic acid and 10 ml water.

Brown orange color after exposure of extract to Dragendroff’s reagent indicates the presence of alkaloids.

**GC/MS Analysis**

The amounts of pyridine alkaloid was determined using GCMS-QP2010 ultra: SHIMADAZU/ Gas chromatography GC 2010 Plus. GC-MS analysis was carried out in department of chemistry, college of sciences in Al-Mustansiriya University.

Injection Volume was 0.50. Column Oven Temp was 70.0 °C. Injection Temp was 240.00 °C. Injection Mode was Splitless. Sampling Time was 1.00 min. Flow Control Mode

was Pressure. Pressure was 100.0 kPa. Total Flow was 19.9 mL/min. Column Flow was 1.53 mL/min. Linear Velocity was 45.4 cm/sec. Purge Flow was 3.0 mL/min. Split Ratio was 10.

**RESULTS AND DISCUSSION**

TLC and Dragendroff’s tests show the presence of an alkaloid with an Rf value slightly above 0.2, in solvent system isopropanol : acetic acid : water (60:20:20).



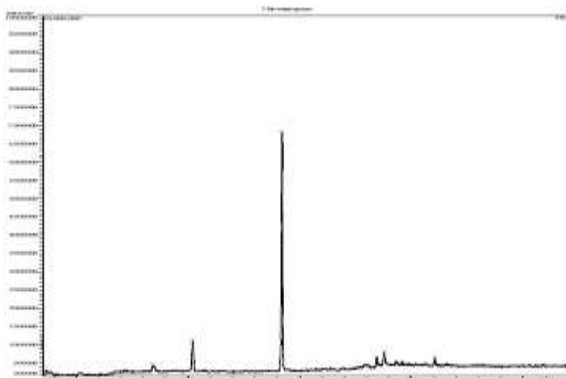
**Figure 3:** TLC for alkaloid extract after spraying with Dragendroff’s reagent

GC/MS analysis reveals the presence of the alkaloids nicotine only with 71.5% from the total extract. The other compounds may be present as impurities in the solvents and acids used in the extraction methods as none of them was representing a natural compounds found in the plants (Table 1).

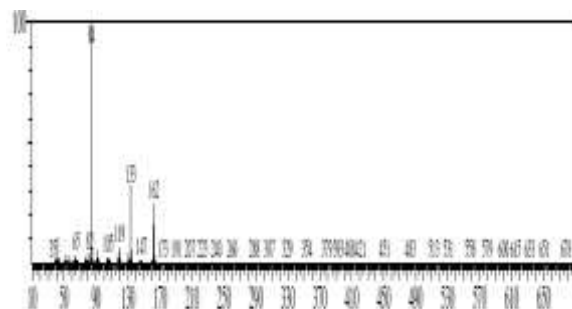
**Table 1:** GC/MS Analysis of the Alkaloids Extracted from the Plant

Peak	R. Time	Area	Area%	Height	Height%	Name
1	8.47	1506309	5.01	172611	2.11	Acetic acid
2	10.23	4166124	13.86	810233	9.91	R-(-)-1,2-propanediol
3	14.21	21485344	71.50	6504160	79.56	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-
4	18.46	806205	2.68	210057	2.57	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-
5	18.79	1325686	4.41	293170	3.59	Glycerin
6	21.06	758888	2.53	184460	2.26	Phthalic acid, 1-cyclopentyl ethyl isobutyl ester
		30048556	100.00	8174691	100.00	

The graphical results of the GC/ MS analysis for the alkaloidal extract are represented in Figure 4.



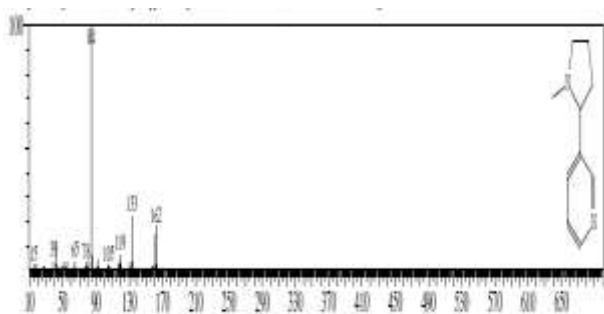
**Figure 4:** GC Analysis of the Extracted Alkaloids



**Figure 5:** Mass Spectrum of the Extracted Alkaloid

Regarding the previous chart, peak 3, the most intense peak, belongs to a compound that has the following fragmentation pattern comparing with literature (Figure 5).

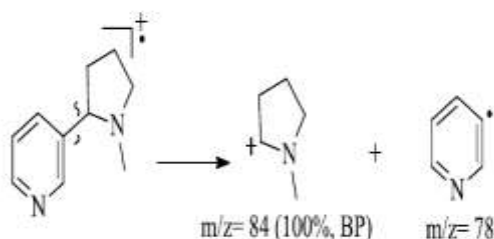
The above data, when compared to the data base of the (GC/MS) device, it shows that those data belong to the alkaloid Nicotine, as the following (Figure 6).



**Figure 6:** Nicotine Fragments in the Database

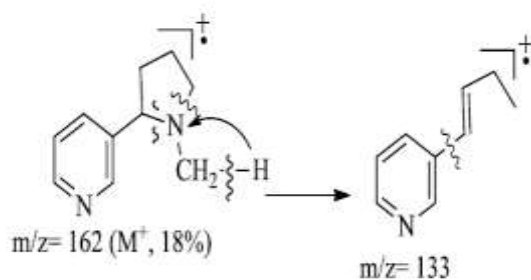
#### Interpretation of the Fragmentation Pattern

The base peak has an  $m/z$  value = 84, and explained by the cleavage of the two nitrogenous heterocycles, which is confirmed by the adjacent peak 78 as follows (Figure 7).



**Figure 7:** Interpretation of the Fragments

Regarding the second peak in intensity, the 133, its explanation is as follows (Figure 8)<sup>11</sup>.



**Figure 8:** Interpretation of Fragment ( $m/z$ , 133)

The Bedouin use the leaf of London Rocket as a tobacco substitute<sup>10</sup>, traditionally. This research showed that Nicotine is percent in this Iraqi species plant in higher

concentrations. This may be attributed to the type of Iraqi soil which results in a fact that Iraqi plants are a rich source of alkaloids. The result of this study was confirmed the use Bedouin this plant as tobacco substitute<sup>10</sup>.

#### CONCLUSION AND RECOMMENDATION

The semi-aerial conditions calcareous soil in miale of Iraq was effected on alkaloids biosynthesis with accumulation such as nicotine alkaloid. The recommendation of this study is refer to the possibility of use this plant as a tool in the aiding of smoking cessations.

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Source of Support: Nil, Conflict of Interest: None.