Investigation of the chemical composition of essential oil of aerial branches of *Achillea wilhelmsii* C.Koch Charvsa plant area

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**ABSTRACT**

*A. Wilhelmsii* is herbaceous and perennial chicory (or flower of dark stars) that its height is 15 to 40 cm and natural habitat of this plant (*A. Wilhelmsii*) in some regions of the Iran are including the South Khorasan, Isfahan, Elam, Persia, Kohgiloyeh Vbvyrahmd provinces. The local name of this plant among the villagers and nomads Kohgiluyeh Vbvyrahmd is Brnjas. Yarrow flowering specimens were collected of the habitats of natural growth in the region *A. Wilhelmsii* Charvsa (castle spinning) Kohgiloyeh province in the late April 2009. Essential oil was extracted from dried plant material by distillation Clevenger apparatus. In the next step gas chromatography-mass spectrometric (GC - MS) was used for investigation of available essential components in essential oils of *A. Wilhelmsii*. In total, 62 compounds were identified in these oils. According to obtained results most of the essential oil from aerial branches were sabynyl acetate (24.4%), cis-dominant-Sabynvl (21.5%), kryzantnyl acetate (15.2%), linalool (8.2%) and 1, 8- cineol (3.3%).

**Key words:** *Achillea wilhelmsii* C.Koch, Essential oil, GC-MS, Sabynyl acetate.

**Introduction**

*A. Wilhelmsii* is herbaceous and perennial chicory (or flower of dark stars) that its height is 15 to 40 cm that it growth weedy in tropical and gebirge area in some regions of Iran. The leaves of this plant are without petiole, covered with long and shaggy, and divided into very *Achillea* cuts. White and yellowish white flowers of these plants are often appearing in May and June. These plants’s have length and width between 4 to 8 mm and 2 to 5 mm, respectively [2-10]. Natural habitat of this plant (*A. Wilhelmsii*) in some regions of the Iran are including the South Khorasan, Isfahan, Elam, Persia, Kohgiloyeh, Vbvyrahmd provinces [1,3]. The local name of this plant among the villagers and nomads Kohgiluyeh is Brnjas. This plant was known with the other names such as Qysvn, Qysvm, Babvny, Turkish Artemisia, Byzhan, Flyh, Ghadir and old spark of fire. The main parts of this plant that they were used including floral leaves and aerial branches and schematic diagram related to botanically of this plant was illustrated in Figure 1-1 [4].

*Achillea wilhelmsii* is containing compounds such as kamazvl [5], protein and carbohydrates [6], aromatic and phenolic compounds [7]. The aerial branches of *A. wilhelmsii* are rich of the flavonoieds such as xanthine oxidase inhibitor and regulatory pathway arachidonic acid [6]. Because of existence of Tannin, spicy and bitter materials in the *A. Wilhelmsii*, it can effects on the heart and nerves cells. For this reason, this plant was used for various therapeutic affect such as increases immunomodulatory activity [8], free radical scavenging [9] weakness heart and neurological diseases such as epilepsy [10].

**Materials and Methods**

**Collection of species A. Wilhelmsii:**

The floral leaves of *A. wilhelmsii* were collected of natural habitats in the region Charvsa (castle spinning) koohgiloeh province in the late April 2009. Information about places and geographical features that *A. wilhelmsii* plants were collected illustrated in Table 1.

**Essential oil extracted from the aerial branches:**

In order to extraction essential oil, 20 grams of air drying powder samples of aerial branches was used. Essential oil was extracted and collected by n-hexane from dried plant material by using water distillation with a Clevenger apparatus for 4 hours. In the next step gas chromatography-mass spectrometric (GC - MS) was used for investigation of available essential components in essential oils of *A. Wilhelmsii*.
<table>
<thead>
<tr>
<th>Latitude</th>
<th>The height of the sea (M)</th>
<th>Average annual rainfall (Mm)</th>
<th>Time to collect</th>
<th>Place of collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>50° and 33’ East</td>
<td>700</td>
<td>300 to 420</td>
<td>spinning late April, 2009</td>
<td>Kohgiloyeh province, ghalarisi city</td>
</tr>
</tbody>
</table>

Instrumentation:

All analyses were performed on GC system model 6890 (Building America) with a model 5973 MS detector. The GC system was fitted with a HP-1 column (30m×0.32mm i.d., 0.25μm film thickness). Helium was used as the carrier gas at a flow rate of 1.7 ml/min. The reported mass spectrum of essential oil components were compared to its storing in the library mass spectrometer (Wiley, Version D.00.00.38).

Results:

Essential oils obtained from aerial parts of *A. wilhelmsii* plants were analyzed with GC-MS system (Figure 1). In total, 62 compounds were identified in these oils. According to obtained results most of the essential oil from aerial branches were sabynyl acetate (24.4%), cis-dominant-Sabynvl (21.5%), kryzantnyl acetate (15.2%), linalool (8.2%) and 1, 8-cineol (3.3%). Details of the essential oil components are shown in Table 2 and typical GC-MS spectrum of essential oil from aerial parts of *A. wilhelmsii* was shown in Figure 1.

![GC-MS spectrum of essential oil from aerial parts of *A. Wilhelmsii*.](image)

**Table 2:** The components of essential oil from aerial parts of *Achillea Wilhelmsy*.

<table>
<thead>
<tr>
<th>No.</th>
<th>t_R</th>
<th>Compound</th>
<th>Peak area</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.584</td>
<td>Acetone</td>
<td>31152401</td>
<td>0.438</td>
</tr>
<tr>
<td>2</td>
<td>2.095</td>
<td>Hexane</td>
<td>11839267</td>
<td>0.167</td>
</tr>
<tr>
<td>3</td>
<td>2.21</td>
<td>Isobutanol</td>
<td>1322051</td>
<td>0.019</td>
</tr>
<tr>
<td>4</td>
<td>3.467</td>
<td>Isopentanol</td>
<td>39786695</td>
<td>0.056</td>
</tr>
<tr>
<td>5</td>
<td>3.538</td>
<td>sec-Butylcarbinol</td>
<td>10664238</td>
<td>0.149</td>
</tr>
<tr>
<td>6</td>
<td>6.344</td>
<td>3-Hexen-1-ol</td>
<td>1862157</td>
<td>0.026</td>
</tr>
<tr>
<td>7</td>
<td>6.857</td>
<td>1-Hexanol</td>
<td>1426317</td>
<td>0.020</td>
</tr>
<tr>
<td>8</td>
<td>7.039</td>
<td>Isocynyl acetate</td>
<td>2125694</td>
<td>0.030</td>
</tr>
<tr>
<td>9</td>
<td>7.133</td>
<td>2-Methyl butyl acetate</td>
<td>5772954</td>
<td>0.081</td>
</tr>
<tr>
<td>10</td>
<td>7.655</td>
<td>Heptanal</td>
<td>802779</td>
<td>0.011</td>
</tr>
<tr>
<td>11</td>
<td>8.526</td>
<td>Isobutyl isobutyrate</td>
<td>1616725</td>
<td>0.023</td>
</tr>
<tr>
<td>12</td>
<td>9.39</td>
<td>alpha-Thujene</td>
<td>5942321</td>
<td>0.084</td>
</tr>
<tr>
<td>13</td>
<td>9.577</td>
<td>alpha-Pinene</td>
<td>14542891</td>
<td>2.047</td>
</tr>
<tr>
<td>14</td>
<td>9.983</td>
<td>Camphene</td>
<td>6132061</td>
<td>0.086</td>
</tr>
<tr>
<td>15</td>
<td>11.025</td>
<td>Sabinene</td>
<td>16634508</td>
<td>0.234</td>
</tr>
<tr>
<td>16</td>
<td>11.128</td>
<td>beta-Pinene</td>
<td>15554154</td>
<td>0.219</td>
</tr>
<tr>
<td>17</td>
<td>12.252</td>
<td>Isobutyl 2-methylbutanoate</td>
<td>4775507</td>
<td>0.067</td>
</tr>
</tbody>
</table>
Discussion:

Available compounds in the essential oils of the A. Wilhelmsii plants collection of Kerman province (Iran) were reported by Afsharpour and coauthor (1996) and Kamfr, borneol, linalool, 1,8-cineol, Kryzantvl acetate and carvacrol as the major compounds were identified [11]. Also Azadbakht and colleagues (2003) studied the essential oil compounds in species A. wilhelmsii collected from Neka region (Mazandaran province, Iran). In this research Kamfr, 1,8-cineol, borneol and myrtnvl were identified as major compounds [12]. It can say that differences in the type and amount of essential oil compounds between the collected species of A. Wilhelmsii from Kerman and Neka were related to geographical and climate conditions of these regions.

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