The pharmacognostic study of the aerial part of *Prangos ferulacea* *lindl.* at the stage of the beginning of vegetation

**Aim.** To study the coumarin composition of salted *Prangos ferulacea* herb collected at the stage of vegetation and compare it with the coumarin composition of the freshly collected raw material.

**Materials and methods.** The analysis was performed using Agilent 5977 GC and 7890B MS devices. The carrier gas was helium with a constant flow of 1 ml/min. The data of NIST library of standard mass-spectra were used to identify compounds.

**Results and discussion.** The results of the study of coumarin derivatives in the food additive prepared from *Prangos ferulacea* herb collected at the beginning of the vegetation period are presented. The anatomical structure of the aerial part of *Prangos ferulacea* has been studied, and the diagnostic features of the plant raw material have been identified.

**Conclusions.** The composition of coumarin derivatives in the food additive and in the freshly collected aerial part is identical. The diagnostic features of the structure of the plant raw material of *Prangos ferulacea* have been identified.

**Key words:** *Prangos; coumarins; gas chromatography-mass spectrometry; microscopy*
The representatives of *Apiaceae* family, and in particular *Prangos* genus, are characterized by the content of essential oils, coumarins, furocoumarins and other substances [1, 2]. Coumarins and furocoumarins of *Prangos* species have a variety of pharmacological properties [1, 3, 4]. *Prangos* genus in the flora of Azerbaijan are represented by five species [5]. Since olden times in early spring the local population prepare a food additive (pickle) under the name of “chashir” and a water distillate (chashir aragy) from the aerial part of *Prangos ferulacea*, they are used to improve digestion, as well as in spasms in the abdominal area [6]. The chemical composition of this food additive is unknown; therefore, the aim of our work is to study the coumarin composition of salted *Prangos ferulacea* herb collected at the stage of vegetation and compare it with the coumarin composition of the freshly collected raw material. To determine the diagnostic signs of *Prangos ferulacea* herb it was necessary to study its anatomical structure.

**Materials and methods**

The analysis was performed using Agilent 5977 GC and 7890B MS devices. The column size was 30 m with the internal diameter of 0.25 mm, and the film thickness of the stationary phase was 0.25 µ (HP-5 MS Ultra Inert). The carrier gas was helium with a constant flow of 1 ml/min. The initial temperature of 80 °C maintained for 5 min, then for each minute the temperature increased by 20 °C, reached 220 °C and retained for 4 min; after that there was the programmed rise in temperature up to 5 °C/min to a constant temperature of 280 °C. The data of NIST library of standard mass-spectra were used to identify compounds (Table).

The microscopic examination of the anatomical structure and detection of diagnostic features were performed using the known methods [7].

**Results and discussion**

After concentration the alcoholic extract of the aerial part of *Prangos ferulacea* herb collected at the stage of vegetation was treated with hexane. Then it was analyzed by the method of gas chromatography-mass spectrometry. As it can be seen from Table, this extract contains 14 components, 7 of them refer to coumarin compounds:

- isopsoralen
- 2H,8H-benzo[1,2-b:5,4-b’]dipyran-2-one,8,8-dimethyl-
- 2-isopropenyl-2,3-dihydrofuro[3,2-g]chromen-7-one
- 2-(1-hydroxy-1-methylethyl)-2,3-dihydrofuro[3,2-g]chromen-7-one
- (S)-7-hydroxy-8,8-dimethyl-7,8-dihydropyrano(3,2-g)chromen-2(6H)-one
- 2H-1-benzopyran-2-one,6-(2,3-dihydroxy-3-methylbutyl)-

Chemical compounds of the amount of extractives of the *Prangos ferulacea* aerial part at the beginning of the vegetation period

<table>
<thead>
<tr>
<th>The formula of the compound</th>
<th>The name of the compound</th>
<th>Peak area</th>
<th>Retention time, min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerin</td>
<td></td>
<td>5.66 %</td>
<td>4</td>
</tr>
<tr>
<td>2-[4-(Methoxymethoxymethyl)cyclohex-3-enyl]propan-2-ol</td>
<td></td>
<td>1.13 %</td>
<td>10.256</td>
</tr>
<tr>
<td>3,5-Heptadienal, 2-ethylidene-6-methyl-</td>
<td></td>
<td>1.19 %</td>
<td>10.569</td>
</tr>
<tr>
<td>Cyclohexanone, 2,2-dimethyl-5-(3-methyloxiranyl)-, {2α(R*),3α}(-.-.-.)-</td>
<td></td>
<td>1.01 %</td>
<td>10.665</td>
</tr>
<tr>
<td>9,12-Octadecadienyl chloride, [Z,Z]-</td>
<td></td>
<td>0.67 %</td>
<td>12.296</td>
</tr>
<tr>
<td>Isopsoralen (Furo[5′:4′:7,8]coumarin)</td>
<td></td>
<td>1.99 %</td>
<td>13.409</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
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<td>------------------------------------------------------------------</td>
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</tr>
<tr>
<td></td>
<td>2H,8H-Benzo[1,2-b:5,4-b']dipyran-2-one, 8,8-dimethyl-(8,8-Dimethyl-2H,8H-pyraño[3,2-g]chromen-2-one)</td>
<td>3.13 %</td>
<td>15.932</td>
</tr>
<tr>
<td></td>
<td>2-Isopropenyl-2,3-dihydrofuro[3,2-g]chromen-7-one (2-Isopropenyl-2,3-dihydro-7H-furo[3,2-g]chromen-7-one)</td>
<td>1.36 %</td>
<td>17.356</td>
</tr>
<tr>
<td></td>
<td>Benzo[e][1H]indene, 1,2,3a,4,5,9b-hexahydro-7-methoxy-3-oxo-3a,9b-dimethyl-</td>
<td>1.36 %</td>
<td>18.616</td>
</tr>
<tr>
<td></td>
<td>2-(1-Hydroxy-1-methylethyl)-2,3-dihydrofuro[3,2-g]chromen-7-one (2-(1-Hydroxy-1-methylethyl)-2,3-dihydro-7H-furo[3,2-g]chromen-7-one)</td>
<td>11.03 %</td>
<td>19.347</td>
</tr>
<tr>
<td></td>
<td>(S)-7-Hydroxy-8,8-dimethyl-7,8-dihydropyrano(3,2-g)chromen-2(6H)-one (S)-7-Hydroxy-8,8-dimethyl-7,8-dihydro-2H,6H-pyrano[3,2-g]chromen-2-one</td>
<td>2.34 %</td>
<td>19.971</td>
</tr>
<tr>
<td></td>
<td>Naphthalene, 6,7-diethyl-1,2,3,4-tetrahydro-1,1,4,4-tetramethyl-</td>
<td>4.08 %</td>
<td>21.347</td>
</tr>
<tr>
<td></td>
<td>Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester</td>
<td>7.93 %</td>
<td>22.183</td>
</tr>
<tr>
<td></td>
<td>2H-1-Benzopyran-2-one, 6-(2,3-dihydroxy-3-methylbutyl)-7-methoxy-, (±)-6-(2,3-Dihydroxy-3-methylbutyl)-7-methoxy-2H-chromen-2-one</td>
<td>46.41 %</td>
<td>22.679</td>
</tr>
<tr>
<td></td>
<td>(S)-8,8-Dimethyl-2-oxo-7,8-dihydro-2H,6H-pyraño[3,2-g]chromen-7-yl 3-methyl-2-butoate (Decursin)</td>
<td>6.63 %</td>
<td>25.565</td>
</tr>
<tr>
<td></td>
<td>As-Indacen-1(2H)-one, 3,6,7,8-tetrahydro-3,3,6,6-tetramethyl</td>
<td>2.48%</td>
<td>26.130</td>
</tr>
</tbody>
</table>
7-methoxy-; (S)-8,8-dimethyl-2-oxo-7,8-dihydro-2H, 6H-pyrano(3,2-g)chromen-7-yl; 3-methyl-2-butenoate. In percentage terms such coumarin derivatives as 2H-1-benzopyran-2-one, 6-(2,3-dihydroxy-3-methylbutyl)-7-methoxy- (46.41 %); 2-(1-hydroxy-1-methylethyl)-2,3-dihydrofuro[3,2-g]chromen-7-one (11.03 %) prevail. The remaining 10 components belong to different classes of compounds.

There is a large number of glands on the epidermis of the stem (Fig. 1). On the cross section of the stem along the entire surface of the cut there are clearly visible schizogenic spaces and vascular-fibrous bundles of the closed type where the layer of cambium between the phloem and xylem is absent (Fig. 2). The glands consist of a stalk and a spiked round top (Fig. 3).

On the cross section of the leaf the large and small vascular bundles surrounded by the magnocellular parenchyma and a schizogenic space are observed (Fig. 4).

**CONCLUSIONS**

1. *Prangos ferulacea* herb at the beginning of vegetation contains isopsoralen; 2H,8H-benzo[1,2-b:5,4-b’]dipyran-2-one, 8,8-dimethyl-; 2-isopropenyl-2,3-dihydrofuro[3,2-g]chromen-7-one; 2-(1-hydroxy-1-methylethyl)-2,3-dihydrofuro [3,2-g]chromen-7-one; (S)-7-hydroxy-8,8-dimethyl-7,8-dihydrofuro(3,2-g)chromen-2(6H)-one; 2H-1-benzopyran-2-one, 6-(2,3-dihydroxy-3-methylbutyl)-7-methoxy-; (S)-8,8-dimethyl-2-oxo-7,8-dihydro-2H, 6H-pyrano(3,2-g)chromen-7-yl 3-methyl-2-butenoate (±)-coumarin derivatives.

2. The coumarin composition in the freshly collected and salted *Prangos ferulacea* herb is identical.

3. The structure of the glands and schizogenic spaces are diagnostic features of the anatomic structure of the plant raw material.

**Conflict of Interests:** authors have no conflict of interests to declare.
REFERENCES


Information about authors:
Kerimov Yusif Balakerim oglu, Doctor of Pharmacy (Dr. habil.), professor, scientific adviser of the Department of Pharmacognosy and Botany, Azerbaijan Medical University. E-mail: ykerimov@yahoo.com
Isaev Javanshir Issa oglu, Doctor of Pharmacy (Dr. habil.), professor, head of the Department of Pharmacognosy and Botany, Azerbaijan Medical University. E-mail: isaev.cavanshir@amu.edu.az
Kerimli Elvin Haji oglu, senior lecturer of the Department of Pharmacognosy and Botany, Azerbaijan Medical University. E-mail: kelvin83@list.ru
Akhmedov Elshin Yusin oglu, Candidate of Pharmacy (Ph.D.), associate professor of the Analytical Chemistry Department, National University of Pharmacy

Відомості про авторів:
Керімов Юсіф Балакерім оглы, д-р фарм. наук, професор, науковий консультант кафедри фармакогнозії та ботаніки, Азербайджанський медичний університет. Е-mail: ykerimov@yahoo.com
Ісаєв Джаваншир Іса оглы, д-р фарм. наук, професор, завідувач кафедри фармакогнозії та ботаніки, Азербайджанський медичний університет. Е-mail: isaev.cavanshir@amu.edu.az
Керімлі Ельвін Гаджі оглы, ст. викл. кафедри фармакогнозії та ботаніки, Азербайджанський медичний університет. Е-mail: kelvin83@list.ru
Ахмедов Елшан Юнес оглы, канд. фарм. наук, доцент кафедри аналітичної хімії, Національний фармацевтичний університет

Сведения об авторах:
Керимов Юсиф Балакерим оглы, д-р фарм. наук, профессор, научный консультант кафедры фармакогнозии и ботаники, Азербайджанский медицинский университет. E-mail: ykerimov@yahoo.com
Исаев Джаваншир Иса оглы, д-р фарм. наук, профессор, заведующий кафедрой фармакогнозии и ботаники, Азербайджанский медицинский университет. E-mail: isaev.cavanshir@amu.edu.az
Ахмедов Элшан Юнис оглы, канд. фарм. наук, доцент кафедры аналитической химии, Национальный фармацевтический университет