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TERPENOID ESTERS OF *Ferula soongorica*

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Continuing an investigation of plants of the genus *Ferula* L. (fam. *Apiaceae*), we have studied the esters of *Ferula soongorica* Pall. ex Spring, which is widely distributted on the territory of the Republic of Kazakhstan. This species belongs to the *Lobulata* subgenus, representatives of which are characterized by the presence of esters of terpenoids with organic acids.

The raw material for study was gathered in the Karaganda province, Republic of Kazakhstan, in the flowering phase. The total extractive substances were obtained by the extraction of 3 kg of comminuted roots with ethanol, and they were separated into acid, phenolic, and neutral fractions by treatment with 5% sodium carbonate and 3% sodium hydroxide solutions. This gave 274 g (9.13% on the raw material) of phenolic, 32 g (1.07%) of acid, and 4 g (0.13%) of neutral fractions.

The phenolic fraction (30 g) was deposited on a column of KSK silica gel (4.5 × 100 cm), and the substances were eluted with hexane–ethyl acetate (revealing agent: a 1% solution of vanillin in concentrated sulfuric acid).

The following individual compounds were isolated:

Substance I: $C_{23}H_{32}O_5$, mp 78-80°, $[\alpha]_D$ + 86.5° (c 1.0; chloroform);

Substance II: $C_{23}H_{32}O_5$, mp 130-131°, $[\alpha]_D$ + 101.5° (c 1.0; chloroform);

Substance III: $C_{22}H_{30}O_4$, mp 120-121°, $[\alpha]_D$ + 65.5° (c 1.0; chloroform);

Substance IV: $C_{27}H_{36}O_6$, mp 160-161°, $[\alpha]_D$ + 8.1° (c 1.0; chloroform);

Substance V: $C_{17}H_{22}O_3$, mp 155-156°, $[\alpha]_D$ + 5.1° (c 1.0; chloroform);

Substance VI: $C_{18}H_{24}O_4$, mp 85-86°, $[\alpha]_D$ + 5.0° (c 1.0; chloroform);

Substance VII: $C_{22}H_{30}O_5$, mp 53-54°, $[\alpha]_D$ + 28.5° (c 1.0; chloroform).

Substances (I-VII) were identified by a comparison of physicochemical constants and IR spectra and by mixed melting points with authentic samples as teferin, ferutin, ferutinin, akichenin, *d*-chimgin, *d*-chimganin, and akiferidin [1, 2], respectively.

Among the compounds isolated the amount of ferutinin was higher than in other species of *Ferula* [2-4].

Esters of ferutinol and lapiferol have been isolated previously form *F. soongorica* collected close to L. Sasyk-Kul (Kazakhstan) [5]. The detection of, in addition to esters of ferutinol, esters of akichenol and of borneol in our investigations shows the influence of the growth site on the qualitative compositions of *Ferula* terpenoids.

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