COUMARINS AND FLAVONOIDS OF *Dictamnus angustifolius*

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We have studied the epigeal part of *Dictamnus angustifolius* G. Don. (narrow-leaved dittany), collected in Tashkent Province [1, 2]. According to the authors' observations, the whole of the epigeal part possesses the property of causing pronounced photodermatoses, particularly in the flowering period. The nature of the compounds causing the photosensitization in this plant has not hitherto been investigated. It may be assumed that its burning action is caused by psoralen and its 5- or 8-alkyl-substituted derivatives [3].

In an analysis of ethanolic extracts by paper chromatography in systems: 1) petroleum ether—formamide and 2) chloroform—formamide, no fewer than eight compounds provisionally assigned to the coumarin derivatives were detected [4]. Furthermore, three substances of flavonoid nature were detected in the ethanolic extracts by paper chromatography in the systems: 3) 5% acetic acid, 4) butanol-1-ol—acetic acid—water (4:1:2), and 5) benzene—ethyl acetate—acetic acid (24:74:2).

The coumarins and flavonoids were isolated as described previously [5, 6]. Seven coumarins and three flavonoids were obtained (Table 1).

The substances isolated were identified on the basis of a comparison of their UV and IR spectra, R_f values, and the products of acid and enzymatic hydrolysis (for the flavonoid glycoside) and also by mixed melting points with authentic samples.

The furocoumarins isolated possess a high photosensitizing activity [3], which also explains the burning action of *D. angustifolius*.

This is the first time that the coumarins and flavonoids from *Dictamnus angustifolius* have been studied.

TABLE 1. Physicochemical Properties of the Coumarins and Flavonoids of *Dictamnus angustifolius*

Substance	Empirical formula	Melting point, °C	R_f value X100 in systems				
			1	2	3	4	5
Furocoumarins							
Psoralen	$C_{11}H_6O_3$	162—164	18	—	—	—	—
Xanthotoxin	$C_{12}H_8O_4$	154 146	12	—	—	—	—
Bergapten	$C_{12}H_8O_4$	188—19	22	—	—	—	—
Isooimperatorin	$C_{16}H_{14}O_4$	109—111	78	—	—	—	—
Hydroxycoumarins							
Umbelliferone	$C_9H_6O_3$	233—234	—	29	—	—	—
Esculetin	$C_9H_6O_4$	268—272	—	6	—	—	—
Scopoletin	$C_{10}H_8O_4$	204—205	—	74	—	—	—
Flavonoids							
Quercetin	$C_{15}H_{10}O_7$	307—313	—	—	—	—	46
Isoquercetin	$C_{21}H_{20}O_{12}$	218—222 $[\alpha]_D^{20}$ —39° (methanol)	—	—	25	71	—
Rutin	$C_{27}H_{30}O_{16}$	188—182 $[\alpha]_D^{20}$ —29° (dimethylformamide)	—	—	45	62	—

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COUMARINS OF *Seseli peucedanoides*

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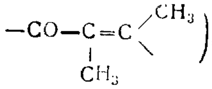
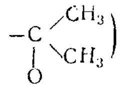
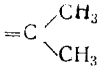
Previously [1], in a study of the coumarin composition of *Seseli peucedanoides* (Bieb.) K.-Pol., one of us isolated β-sitosterol and a linear 3',4'-dihydropyranocoumarin — decursinol. Continuing an investigation of this plant, 1.5 kg of air-dry ground roots collected in the environs of Altyagadzh, Azerbaidzhan SSR, was subjected to extraction successively with chloroform and methanol using three 2-liter portions in each case. Then the combined extracts were distilled in vacuum. This gave 96.5 g of a resinous residue which was chromatographed on a column (90 × 3 cm) of neutral alumina (400 g, activity grade II). Elution was performed with a mixture of petroleum ether and chloroform in a ratio of 4:1.4:2 [sic] and with chloroform. In addition to those mentioned above, another three substances were obtained: (I) — $C_{19}H_{20}O_5$, mp 108-109°C; (II) — $C_{16}H_{18}O_4$, mp 155-156°C; and (III) — $C_{14}H_{14}O_4$, mp 189-191°C; $[\alpha]_D^{22}$ $-20.5°$ (c 1.15; chloroform), which possessed the properties characteristic of coumarins.

Substance (I), according to its physicochemical constants and PMR spectrum [(HX-90, in $CDCl_3$, 0 — HMDS, δ, ppm): 6.23- 7.50 (d, J = 10 Hz, H-3 and H-4); 7.11, 6.64 (s, H-5 and H-8); 5.93 (m, =CH); 4.98 (t, J = 6.5 Hz, H-5'); 3.24 (d, J = 8.5 Hz, Ar—CH_2—); 1.76, 1.84 (s,  $-CO-\underset{CH_3}{\underset{|}{C}}=C\langle^{CH_3}$), 1.52 (s,  $-\underset{O}{\underset{|}{C}}\langle^{CH_3}_{CH_3}$)] corresponded to deltoin [2], but unlike the latter it was optically inactive. Alkaline hydrolysis with 5% KOH in methanol gave prangeferol (IV), $C_{14}H_{14}O_4$, mp 175-176.5°C, $[\alpha]_D^{22}$ ± 0° (c 2.08; chloroform) [3] and angelic acid (V), $C_5H_8O_2$, mp 45-47°C. Consequently, substance (I) was a prangeferol angelate. We have also isolated this from the roots of *Seseli tortuosum* L.

With respect to its chemical composition, melting point, and PMR spectrum [(HX-90 in $CDCl_3$ 0 — HMDS, δ, ppm); 6.12, 7.98 (d, J = 10 Hz, H-3 and H-4); 6.32 (s, H-6); 5.20 (t, J = 7 Hz, —CH=); 3.92 (s, 2 —OCH_3); 3.43 (d, J = 8 Hz, Ar—CH_2—); 1.65, 1.82 (s,  $=C\langle^{CH_3}_{CH_3}$)]. Substance (II) corresponded to the known coumarin coumarain [4]. This was also confirmed by the ^{13}C NMR spectrum.

Substance (III), unlike (I) and (II), was optically active and corresponded in its properties to odakenetin, which we have isolated previously from the roots of *Seseli grandivittatum* Schischk. [5].

Thus, in the roots of the plant studied there were four compounds of coumarin nature — decursinol, prangeferol angelate, coumurrayin, and nodakenetin. Seseloside (decursinol glucoside), which has been isolated from this species by other authors [6], was not found by us in the samples investigated.

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