A SPECTROPHOTOMETRIC METHOD FOR THE SIMULTANEOUS DETERMINATION OF PEUCEDANIN AND OREOSELONE

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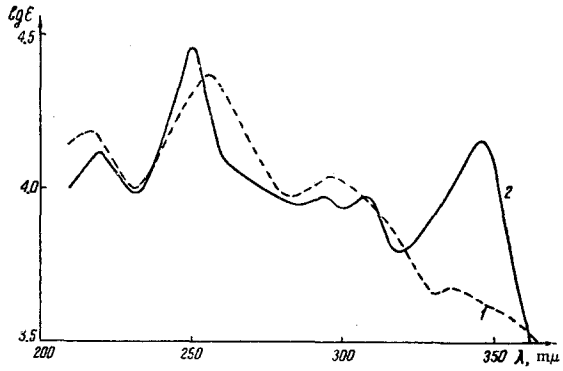
The natural furocoumarin peucedanin, which is used in medical practice [1–3] and is obtained from plant raw material, may be contaminated with the dihydrofurocoumarin oreoselone. For checking the purity of the preparation, we have developed a spectrophotometric method for determining peucedanin and oreoselone in mixtures of them.

The UV spectra of peucedanin and oreoselone (figure) have significant differences which permit the spectrophotometric determinations of the two substances to be carried out simultaneously. For this purpose, in the method proposed the optical densities of a solution containing the two components are determined at 298 and 345 mμ.



UV spectra of peucedanin (1) and oreoselone (2) in 96% ethanol.

The concentrations of peucedanin (X) and oreoselone (Y) (in grams per 100 ml) are obtained by the solution of a system of two equations [4]:

$$D_{1\,cm}^{298} = X\left(D_{1cm}^{1\%}\right)_{p}^{298} + Y\left(D_{1cm}^{1\%}\right)_{or}^{298},$$
$$D_{1\,cm}^{345} = X\left(D_{1\,cm}^{1\%}\right)_{p}^{345} + Y\left(D_{1\,cm}^{1\%}\right)_{or}^{345},$$

where $D_{1\,cm}^{298}$ and $D_{1\,cm}^{345}$ are the optical densities of the solution in a 1-cm cell; and $\left(D_{1cm}^{1\%}\right)_{p}^{298}$ is the specific absorption coefficient of peucedanin at 298 mμ (and the analogous symbols apply to the other specific absorption coefficients).

In the range of working concentrations the absorption of solutions of substances concerned obeys the Lambert-Beer law. Table 1 gives the values of the specific absorption coefficients of peucedanin and oreoselone at 298 and 345 mμ (means of 20 determinations).

Table 1

Substance	Wavelength, mμ	
	298	345
Peucedanin	401 ± 1.52	169 ± 0.79
Oreoselone	375 ± 1.59	506 ± 1.12

Table 2 gives the results of determinations of peucedanin and oreoselone in mixtures containing from 5 to 30% of oreoselone. It can be seen from the table that the error of determination does not exceed 5.26%.

EXPERIMENTAL

The work was carried out with a sample of peucedanin having mp 109° C (from CCl_4), the homogeneity of which was checked by chromatography. The sample of oreoselone had mp 173° C. It was chromatographically homogeneous.

Table 2

Number of the mixture	Substance	Amount taken		Found		Error	
		mg	%	mg	%	Absolute, mg	Relative, %
I	Peucedanin	2.822	66.84	2.825	66.61	+0.003	+0.10
	Oreoselone	1.400	33.16	1.396	33.06	−0.004	−0.29
II	Peucedanin	2.506	79.66	2.467	78.43	−0.039	−1.54
	Oreoselone	0.690	20.34	0.678	19.99	−0.012	−1.68
III	Peucedanin	4.577	89.87	4.381	86.04	−0.196	−4.28
	Oreoselone	0.513	0.13	0.540	10.67	+0.027	+5.26
IV	Peucedanin	6.580	95.22	6.328	91.58	−0.252	−3.83
	Oreoselone	0.330	4.78	0.342	4.95	+0.012	+3.04

A mixture of peucedanin and oreoselone (3-4 mg, accurately weighed) was dissolved in ethanol in a 25-ml measuring flask (solution A); 1 ml of solution A was transferred to a second 25-ml measuring flask and was made up to the mark with ethanol (solution B). The optical densities at wavelengths of 298 and 345 mμ of solution B were determined in a layer 1 cm thick on an SF-4A spectrophotometer. The percentage of peucedanin was calculated from the following formula:

$$X\%_{p} = \frac{\left[D^{298} \cdot \left(D^{1\%}_{1\,cm}\right)^{345}_{or} - D^{345} \cdot \left(D^{1\%}_{1\,cm}\right)^{298}_{or}\right] \cdot 1000 \cdot n \cdot v}{\left[\left(D^{1\%}_{1\,cm}\right)^{98}_{p} \cdot \left(D^{1\%}_{1\,cm}\right)^{345}_{or} - \left(D^{1\%}_{1\,cm}\right)^{345}_{p} \cdot \left(D^{1\%}_{1\,cm}\right)^{298}_{or}\right] \cdot w},$$

$$X = \frac{\left(506 \cdot D^{298}_{1\,cm} - 375 \cdot D^{345}_{1\,cm}\right) \cdot 25}{149.5 \cdot w},$$

where X is the percentage of peucedanin;

$D^{298}_{1\,cm}$ is the optical density of the solution at 298 mμ;

$D^{345}_{1\,cm}$ is the optical density of the solution at 345 mμ; and

w is the weight of the sample taken, mg.

The percentage of oreoselone was determined from the formula

$$X\%_{or} = \frac{\left[D^{298}\left(D^{1\%}_{1\,cm}\right)^{345}_{p} - D^{345}\left(D^{1\%}_{1\,cm}\right)^{298}_{p}\right] \cdot 1000 \cdot n \cdot v}{\left[\left(D^{1\%}_{1\,cm}\right)^{2.98}_{or}\left(D^{1\%}_{1\,cm}\right)^{345}_{p} - \left(D^{1\%}_{1\,cm}\right)^{345}_{or}\left(D^{1\%}_{1\,cm}\right)^{298}_{p}\right] \cdot w},$$

$$Y = \frac{\left(401 \cdot D^{345}_{1\,cm} - 169 \cdot D^{298}_{1\,cm}\right) \cdot 25}{149.5 \cdot w},$$

where Y is the percentage of the oreoselone;

$D^{298}_{1\,cm}$ is the optical density of the solution at 298 mμ;

$D^{345}_{1\,cm}$ is the optical density of the solution at 345 mμ; and

w is the weight of the sample taken in mg.

CONCLUSIONS

A spectrophotometric method for the simultaneous determination of peucedanin and oreoselone has been proposed.

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