Edible and technical olive oils and also the oil cake after the processing of the olive *Olea europea* L. growing in the Azerbaidzhan SSR have been investigated.

The lipids and chlorophylls were isolated by a modified Bligh-Dyer method [1]. The total green pigments were precipitated with petroleum ether and were separated from the accompanying carotenoids and lipids by column chromatography [2]. Separation into individual forms was carried out by thin-layer chromatography on silica gel in the heptane—methyl ethyl ketone (5:3) system. The identification and quantitative determination of the chlorophylls was performed on the basis of spectrophotometric and chromatographic results [2, 3].

The yellow pigments were freed from accompanying chlorophylls and lipids by saponification with the subsequent elimination of sterols [4]. The purified extract of carotenoids was then separated with the aid of column and thin-layer chromatography [5]. To stabilize the carotenoids in relation of oxidation, ethoxyquin was added (500 mg/100 ml) during chromatography, and the pigments were detected visually from their coloration or, in the case of colorless fractions by staining with iodine vapor [4]. The carotenoids were identified on the basis of the characteristic absorption maxima of their absorption curves in the 200-700 nm region. Quantitative determination was performed spectrophotometrically using known specific extinction coefficients [2, 5]. The results obtained are given in Table 1.

Thus, the carotenoid complex of the olive includes 11 individual pigments, and these are present in the largest amount in technical olive oil and press-cake. Edible olive oil is characterized by the smallest set of carotenoids, but it contains a large amount of colorless carotenoids (phytoene, phytofluene), which are precursors in the biosynthesis of carotenes. It must be mentioned that, of the carotenoids identified, α-, β-, and γ-carotenes, cryptoxanthene, and hydroxy-α-carotene possess vitamin activity.

The study of the distribution of the chlorophylls and pheophytins has shown that the a-forms predominate over the b-forms; this is obviously connected both with the activity of the chlorophyllase that is widely distributed in plant tissues and also with the presence of natural antioxidants (tocopherols), which are capable of inhibiting the oxidative transformation of the a-form of chlorophylls into the b-forms.

LITERATURE CITED

1. A. V. Bogatskii, Yu. L. Zherebin, and A. A. Kolesnik, Vinogradarstvo i Vinodelie SSSR, 8, 26 (1979).
2. Pigments of the Plastids of Green Plants and Procedure for Their Investigation [in Russian], Moscow—Leningrad (1964), p. 121.
3. N. N. Strain and J. Sherma, J. Chromatogr., 73, 371 (1972).
4. V. N. Karnaukhov, The Functions of Carotenoids in Animal Cells [in Russian], Moscow (1973), p. 104.
5. K. A. Buckle and F. H. Rahman, J. Chromatogr., 171, 385 (1979).
6. F. L. Kalinin, V. P. Lobov, and V. I. Zhidkov, Handbook of Biochemistry [in Russian], Kiev (1971), p. 1014.

FLAVONOIDS OF Salvia pratensis

S. A. Prokonenko and I. V. Chushenko

UDC 547.972

Flavonoids of the genus *Salvia* have been widely studied [1-4], but no detailed investigation has been made of the phenolic groups of meadow sage *S. pratensis*.

We have isolated and investigated the flavonoids of the epigeal part of meadow sage, which is widely distributed on the territory of the European part of the USSR.

Individual groups of phenolic compounds were obtained from the evaporated aqueous ethanolic extract of the raw material by shaking it out successively with ethyl acetate

---

Khar'kov Pharmaceutical Institute. Translated from Khimiya Prirodnykh Soedinenii, No. 2, p. 242, March-April, 1986. Original article submitted July 3, 1985.

0009-3130/86/2202-0226 $12.50

and butanol. Two-dimensional chromatography in the n-propanol—water—acetic acid (7:2:1) and 15% acetic acid systems on Filtrak FN-8 paper (cardboard, preparative fast) enabled a number of flavonoids to be isolated. The use of chemical, physicochemical, and spectral analytical characteristics permitted the structures of the substances to be established.

Substances (I) and (II) were identified as apigenin and luteolin, mp 346-347°C and 331-333°C, respectively. Substance (III) had mp 251-253°C; UV spectrum: λ^{CH_3OH} 269, 302 sh., 334 nm; it was identified as acacetin 7-glucopyranoside (tilianin). The results obtained were confirmed by an analysis of the products of the hydrolysis of substance (III).

Substance (IV) could not be obtained in the crystalline state. UV spectrum: $\lambda^{CH_3OH + 0.1\%\ HCl}$ 279, 504 sh., 544 nm. On the basis of the results of an analysis of the initial compound and also of the derivatives obtained in the course of stepwise hydrolysis, substance (IV) was identified as delphinidin 3-diglucoside.

LITERATURE CITED

1. É. V Gella and L. I. Prokosheva, Khim. Prir. Soedin., 270 (1970).
2. N. Z. Sagdullaeva, R. L. Khazanovich, P. E. Krivenchuk, and A. I. Tikhonov, in: Abstracts of the 2nd Symposium on Phenolic Compounds [in Russian], Alma-Ata (1970), p. 45.
3. L. P. Smirnova, V. I. Glyzin, A. V. Patudin, and A. I. Ban'kovskii, Khim. Prir. Soedin., 668 (1974).
4. S. N. Brieskorn and W. Biechele, Arch. Pharm., 557 (1971).

CHEMICAL STUDY OF PLANTS OF THE MONGOLIAN FLORA ISOFLAVONES OF Ammopiptanthus mongolicus

D. Sélengé, D. Batsurén,
É. Kh. Batirov, and V. M. Malikov

UDC 547.972

Ammopiptanthus mongolicus (family Fabaceae) is a perennial poisonous subshrub growing in the desert zone of the Mongolian People's Republic. A number of alkaloids have been isolated from it previously [1]. The presence of phenolic compounds in this plant has been established by qualitative reactions and the TLC method.

Comminuted leaves collected in the fruit-bearing period in the environs of Mount Zuramtai (South Gobi aimak) were extracted with ethanol. The concentrated ethanolic extract was diluted with water and was shaken out successively with hexane, benzene, ether, chloroform, and ethyl acetate.

When the ethereal extract was concentrated, a precipitate deposited from which, by column chromatography on polyamide, a flavonoid was isolated with the composition $C_{15}H_{10}O_5$, M^+ 270, mp 346-348°C, λ_{max} 270, 297 infl., 340 nm, which was identified as apigenin [2, 3].

The residue obtained after the ethereal extract had been evaporated was separated on columns of polyamide and of silica gel. Five individual isoflavonoids (I-V) were isolated.

Substances (I) — $C_{15}H_{10}O_4$, M^+ 254, mp 318-322°C, λ_{max} 239, 249, 260 infl., 305 nm — and (II) — $C_{16}H_{12}O_4$, M^+ 268, mp 262-264°C, λ_{max} 240 infl., 250, 260 infl., 306 nm — were identified from their IR, PMR, and mass spectra as daidzein and formononetin, respectively [2-4].

Substance (III) $C_{16}H_{12}O_6$, M^+ 284, mp 250-252°C, λ_{max} 250, 261 infl., 293, 309 (infl.)nmn (log ε 3.56, 3.55, 3.41, 3.33). Its UV spectrum was characteristic for a 3',4',7-trihydroxyflavone [2, 4]. According to PMR and mass spectra, (III) contained one methoxy and two hydroxy groups. The presence in the mass spectrum of peaks of ions with m/z 148, 137, and 133, arising as the result of the retrodiene decomposition of (III) showed that one of the hydroxy groups was present in ring A, and the OCH_3 and the other OH group of ring B.

Institute of Chemistry, Academy of Sciences of the Mongolian People's Republic, Ulan-Bator. Institute of the Chemistry of Plant Substances, Academy of Sciences of the Uzbek SSR, Tashkent. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 242-243, March-April, 1986. Original article submitted July 22, 1985.