Carotenoids				
α-carotene	1.6	--	1.4	2.2
β-carotene	32.4	39.5	28.9	31.2
lutein	25.9	43.5	49.2	50.1
zeaxanthin	4.8	--	2.0	1.2
lutein 5,6-epoxide	2.3	--	--	--
violaxanthin	19.7	12.6	12.7	11.2
neoxanthin	13.3	4.4	5.8	4.1
Total amount, mg/kg of dry mass	155	136	322	290

The total amounts of both chlorophylls and carotenoids in spinach were considerly higher (1.5-2 times) than in dock. Dock of the Shirokolistnyii variety, in contrast to Odesskii-17, contained a large amount of magnesium-free and phytol-free chlorophyll derivatives which is possibly explained by the high activity of chlorophyllase in variety and by the formation of methyl derivatives from the chlorophyllides as the result of the occurrence of methanolysis in the extraction process [6]. The low content of pheophytins or their absence in leaf vegetables is obviously connected with a low acidity of the medium.

The carotenoids were represented by 4-7 forms of pigments of which the predominating (60-80%) components were β-carotene and lutein.

LITERATURE CITED

1. T. S. Lebedeva and K. M. Sytnik, Pigments of the Vegetable Kingdom [in Russian], Kiev (1986), pp. 42, 51.
2. N. S. Enikolopyan (ed.), Porphyrins: Structure, Properties, Synthesis [in Russian], Moscow (1985), p. 179.
3. H. H. Strain and W. A. Svec, The Chlorophylls, Interscience, New York (1966), p. 63.
4. M. Kates, Techniques of Lipidology, American Elsevier, New York (1972) [Russian translation, Moscow (1975), p. 122].
5. K. A. Buckle and F. M. Rahman, J. Chromatogr., 171, 385 (1979).
6. Pigments of the Plastids of Green Plants and Methods for Their Investigation [in Russian], Moscow–Leningrad (1964), p. 83.

PHENOLCARBOXYLIC ACIDS AND IRIDOIDS OF Ziziphora bungeanae

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Hydroxycinnamic acids and bitter glycosides of terpene alcohols belonging to the iridoid group are frequently found in plants of the family Lamiaceae [1, 2]. In view of this, it appeared of interest to investigate Ziziphora bungeanae for the presence of these compounds.

The acids were extracted with ether from a dried methanolic extract of the ziziphora [1, 3]. The ethereal solution was treated with 2% sodium bicarbonate solution. The sodium bicarbonate solution was acidified with 10% hydrochloric acid to pH 3-4 and was again extracted with ether. The solvent was distilled off to dryness. When the residue was crystallized from a mixture of ether and ethanol (7:1), a substance with the composition $C_9H_8O_4$, M^+ 180, mp 192-193°C was obtained.

The physical constants, physicochemical properties, and IR, UV, and PMR spectra [4] of the substance isolated and of caffeic acid were identical.

After the isolation of the caffeic acid, the filtrate and the mother liquor were combined, the solvent was driven off, and the mixture was chromatographed on a column of silica

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gel in the hexane–ethyl acetate system. This gave a crystalline substance with the composition $C_{10}H_{10}O_4$, M^+ 194, mp 174-175°C, which was identified as ferulic acid [1-4]. The iridoids were obtained by extraction with n-butanol from the concentrated methanolic extract of the Ziziphora after its treatment with ether [2, 5]. The extract contained a mixture of three substances with R_f 0.27, 0.45, and 0.68 [Silufol, chloroform–methanol (4:1); visualization with the Stahl reagent]. The solution was passed through alumina and was chromatographed on a column of silica gel. Washing with chloroform–methanol yielded an amorphous hygroscopic substance with the composition $C_{16}H_{20}O_{10}$, R_f 0.45, that, on the basis of qualitative reactions and absorption maxima in the UV spectrum at 206 and 227 nm, which are characteristic for a conjugated carbonyl group, was assigned to the iridoids [5, 6].

The aglycon could not be isolated by acid hydrolysis since it resinified, but in the sugar fraction of the hydrolysate D-glucose was detected by PC in the butan-1-ol–acetic acid–water (4:1:2) system in the presence of a marker. Thus, caffeic and ferulic acids and an iridoid with the composition $C_{10}H_{20}O_{10}$ have been isolated from a Ziziphora for the first time.

LITERATURE CITED

1. V. A. Bandyukova, Khim. Prir. Soedin., 263 (1983).
2. N. F. Komissarenko, A. I. Derkach, I. P. Sheremet, and D. A. Pakali, Khim. Prir. Soedin., 109 (1976).
3. F. A. Rasulov, A. Sh. Ibragimov, and M. B. Belyi, Khim. Prir. Soedin., 524 (1983).
4. N. V. Sergeeva, V. A. Bandyukova, D. K. Shapiro, T. I. Narizhnaya, and L. V. Anikhimovskaya. Khim. Prir. Soedin., 726 (1980).
5. C. H. Brieskorn and R. Ahlborn, Tetrahedron Lett., No. 41, 4037 (1973).
6. K. Weinges, P. Kloss, and W. D. Henkels, Ann. Chem., 767, 4 (1973), p. 556.

BITTER IRIDOID GLUCOSIDE FROM THE FRUIT OF Lonicera caerulea

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The fruit of sweetberry honeysuckle is used in folk medicine as a hypotensive agent in hypertonic disease. The use of the berries as a food product is limited by their specific bitter taste.

The material for investigation was collected in July, 1986, in Sverdlovsk province. To determine the chemical nature of the bitter components of the fruit of Lonicera caerulea L. (sweetberry honeysuckle), family Caprifoliaceae, aqueous ethanolic extracts were fractionated successively with hexane, chloroform, ether, and ethyl acetate. It was found that the bitterness of the fruit was due to a complex of minor components which were detected in various fractions of the extract.

When the water-soluble residue from the extract of fresh fruit was chromatographed on polyamide with elution by water, a bitter fraction of substances which included citric acid was obtained. The fraction was methylated with diazomethane and was chromatographed on a column of silica gel. The main component, trimethyl citrate [1], mp 77-78°C, was eluted by chloroform and by chloroform–methanol (200:1). When the proportion of methanol was increased to 10%, a bitter iridoid glycoside was eluted that was identified as 7-oxologanin (I) on the basis of the facts given below.

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