LITERATURE CITED

1. A. A. Savina, T. A. Sokol'skaya, and D. A. Fesenko, Khim. Prir. Soedin., 113 (1983).
2. D. H. S. Horn and J. A. Lamberton, Aust. J. Chem., 17, 477 (1964).
3. B. I. Ionin and B. A. Ershov, NMR Spectroscopy in Organic Chemistry [in Russian], Khimiya, Leningrad (1967), p. 116.
4. G. Y. Provan and P. G. Waterman, Phytochemistry, 25, 917 (1986).

INFLUENCE OF INDUSTRIAL OPERATIONS ON THE ISOMERIC COMPOSITION OF THE TOCOPHEROLS IN PRODUCTION OF COTTONSEED OIL

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A special place in the group of biologically active substances participating in the regulation of a number of the most important vital functions belongs to the tocopherols (vitamins of the E group).

One of the promising sources of tocopherols are the wastes from the oils and fats industry. The tar obtained in the distillation of the fatty acids of cottonseed soapstock contains an average of 400-500 mg-% of tocopherols [1]. The amount and, in particular, the isomeric composition of the tocopherols in the tar, may, in the final account, be affected by all the preceeding industrial operations.

The aim of the present work was to study the influence of industrial operations on the ~~isomeric composition of cottonseed tocopherols. The oils and the products of processing the~~ seeds were investigated, the raw material having the following characteristics: contamination – 3.55%; moisture – 8.32%; kernel – 52.60%; husk – 47.40%.

The oils from the seeds, crushed seeds, flakes, meal, and husks were extracted with petroleum ether in a Soxhlet apparatus for 10-12 h. The amounts of tocopherols were determined by thin-layer chromatography followed by colorimetry [2].

Information on the change in the total amount and the isomeric composition of the tocopherols is given in Table 1. In none of the technological stages up to the neutralization of the cottonseed oil is there an appreciable change in the isomeric composition of the tocopherols: the amount of α-tocopherol is 46-47% and that of β- + γ-tocopherols 53-54%. This is explained by the fact that up to the neutralization of the cottonseed oil it undergoes no chemical or prolonged temperature treatment.

In the neutralization stage, the total amount of tocopherols decreases, which is due to their passage into the soapstock and partial oxidation. The amount of α-tocopherol also

TABLE 1. Change in the Amounts of Tocopherols in the Production of Cottonseed Oil

Sample	Oil, % on the abs. dry matter	Unsaponifiable substances, % in the oil	Total amount of tocopherols, mg-%	Individual isomers, % on the total amount of tocopherols	
				α	β+γ
Cotton seeds	18,2	2,8	120,0	46,0	54,0
Crushed seeds	20,0	1,8	122,0	46,3	53,7
Husks	1,5	4,1	34,2	45,0	55,0
Flakes	24,1	2,3	140,0	45,1	54,9
Roasted flake	26,9	2,3	153,0	47,7	52,3
Forepressed oil		2,4	140,0	46,2	53,8
Extraction oil		2,4	144,9	46,7	53,3
Neutralized oil		0,9	115,8	38,0	62,0
Meal	1,1	1,6	73,5	46,7	53,3
Soapstock		4,7	158,5	36,8	63,2
Fatty acids		3,3	—	—	—
Cottonseed tar.		20.0	500.0	33.3	66.7

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decreases, because of which the relative amount of β- + γ-tocopherols increases. The decrease in the amount of α-tocopherol is connected with its lower resistance to the oxidizing action of the alkali.

The main products of the oxidation of tocopherols are tocopherol p-quinones. The relatively large amount of tocopherols in the tar is due to the fact that, in the distillation of the fatty acids, the tocopherols do not volatilize together with the fatty acids but remain in the still residue. The decrease in the relative amount of α-tocopherol in the tar is connected with the action of the temperature in the distillation process.

LITERATURE CITED

1. N. K. Nadirov, R. Kh. Khafizov, A. T. Tolstova, G. Yu. Tsvetkova, and R. F. Sakaeva, Inventors' Certificate No. 427005; Method of Obtaining Tocopherols [in Russian], Byull. Izobret., No. 17, 101 (1974).
2. N. K. Nadirov, K. A. Kabyl'bekov, A. M. Ashirov, D. N. Nurmanov, S. Sapakhov, and E. Lenskaya, Maslo-Zhir. Prom-st', No. 11, 21 (1985).

FLAVONOIDS OF *Campanula maleevii*

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In a phytochemical study of the epigeal part of *Campanula maleevii* Fed. (Maleev's bellflower), collected in the flowering period in Krasnodar krai, village of Nebug, flavonoid compounds were detected by paper chromatography.

The air-dry raw material (200 g) was comminuted and extracted with methanol. The methanolic extracts were concentrated to small volume diluted with water, and extracted with chloroform. On cooling, the purified aqueous extract deposited a greenish-yellow precipitate (2.9 g) consisting of an unpurified compound of flavonoid nature. After repeated recyrstallization from 40% ethanol, the substance of the precipitate had mp 187-189°C, $[\alpha]_D^{24} + 1.9°$ (c 0.5; methanol) and it gave a full acetate with mp 113-115°C, $[\alpha]_D^{24} -64.3°$ (c 0.59; chloroform). From the results of acid and enzymatic hydrolysis and IR, UV, and PMR spectroscopy, the flavonoid isolated was identified as quercetin 3-O-rutinoside, or rutin. Rutin has been isolated previously from the epigeal part of *Campanula glomerata* L. [1] and *C. oblongifolia* (C. Koch) Charadze [2], for which it was likewise the dominating compound.

Chromatography on polyamide of the total extract with elution by water—ethanol mixtures gave, in addition to rutin, another flavonol glycoside, identified as quercetin 3-O-β-D-glucoside (isoquercitrin). The amount of rutin determined by a chromato-spectrophotometric method was 1.47% (98% of the total flavonoids), and the amount of isoquercetrin 0.03%. Chlorogenic acid was also detected in the plant.

LITERATURE CITED

1. L. S. Teslov and S. V. Teslov, Nauch. Trudy Permsk. In-Ta, No. 3, 211 (1969).
2. S. F. Kzhumyrko, Khim. Prir. Soedin., 635 (1970).

Leningrad Institute of Pharmaceutical Chemistry. Translated from Khimiya Prirodnykh Soedinenii, No. 2, pp. 298, March-April, 1988. Original article submitted June 9, 1987.