The phytotoxicity was determined by the method of bioautography using *Cladosporium* ssp. [3] and the method of agar plates with *V. dahliae* [4] modified by ourselves.

As can be seen from the facts given above, in order of toxicity the substances can be arranged in the sequence (IV) > (I) > (III) > (II). In a study of the mechanism of the biological action of quinones it has been reliably established [5] that, by interacting with the sulfhydryl groups of enzyme systems and inhibiting processes taking place with their participation, the quinones inhibit the activity of, for example, succinate dehydrogenase and ATPase, thereby interfering with the processes of oxidative phosphorylation and the respiration of the cell. It is therefore not fortuitous that the system of oxidative physphorylation localized in the membrane of the mitochondria is used to determine the toxic action of substances shown in a change in the structure and function of the mitochondria.

For gossypolone and some of its derivatives we studied their uncoupling activity *in vitro* on preparations of isolated rat liver mitochondria. The determination was performed by G. R. Sologub and F. Kh. Inoyatova. In agreement with the results on the fungi toxicity, compound (IV) proved to be the most toxic, causing uncoupling of oxidative physphorylation and a lowering of the absorption of oxygen in doses of 1 and 0.1 mM, respectively. Compounds (I) and (III) also proved to be toxic, inhibiting respiration and oxidative phosphorylation in a dose of 1 mM.

On the basis of the results obtained, it may be concluded that, apparently, the preparations studied act on the common links of the metabolism of fungi and the animal organism.

LITERATURE CITED

1. L. V. Metlitskii and O. L. Ozeretskovskaya, Phytoalexins [in Russian], Moscow (1973).
2. R. H. Haas and D. A. Shirley, J. Org. Chem., 30, No. 12, 411 (1965).
3. W. L. Klarman and S. B. Sanford, Life Sci., 7, 1095 (1968).
4. A. A. Bell, Phytopathology, 57, 759 (1967).
5. L. S. Vartanyan, Usp. Khim., 44, No. 10, 1851 (1976).

COUMARINS FROM *Haplophyllum alberty-regelii* AND *H. dubium*

L. I. Tikhomirova, G. A. Kuznetsova, and M. G. Pimenov

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On chromatographing as ethanolic extract from the roots of *Haplophyllum alberty-regelii* collected in the Sukhandar' oblast between Baisun and Shurchi, we isolated a coumarin derivative with mp 66.5-67°C. The compound was identified from its melting point and IR spectrum as collinin [1].

Collinin was not found in the epigeal part.

In the chromatographic separation of an ethanolic extract of the whole plant of *Haplophyllum dubium* collected in the valley of the R. Tupoland (Sukhandar' oblast) and in southern Tadzhikistan (environs of the town of Kuleba) we isolated a pyranocoumarin with mp 119°C. It was identified from its melting point and IR spectrum as seselin. We have previously detected seselin in *Haplophyllum dshungaricum* N. Rubtz and *H. multicaule* Vved [2].

This is the first time that collinin has been found in plants of the genus *Haplophyllum*. We isolated it previously from the roots of *Flindersia collina* Bailey (Rutaceae) [1].

The detection of collinin in *H. alberty-regelii* shows the similarity of the coumarin composition of this species and of *Haplophyllum pedicellatum* Bge from the epigeal mass of which coumarins of similar structure — 6-methoxycoumarin, pedicellone, and others — have been isolated [3].

V. L. Komarov Botanical Institute, Leningrad. M. V. Lomonosov Moscow State University.

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0009-3130/77/1306-0725$07.50

LITERATURE CITED

1. F. A. L. Anet, G. K. Huges, and E. Ritchie, Austr. J. Sci. Res. A 2, 127 (1949).
2. L. I. Tikhomirova, M. G. Pimenov, and G. A. Kuznetsova, Khim. Prirodn. Soedin., 401 (1974).
3. G. A. Kuznetsova and N. F. Gashimov, Khim. Prirodn. Soedin., 666 (1972); Khim. Prirodn. Soedin., 113 (1973).

FLAVONOIDS OF *Calluna vulgaris*

V. L. Shelyuto, V. I. Glyzin, L. P. Smirnova, and A. I. Ban'kovskii

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We have previously reported the isolation from Scotch heather and identification of quercetin and hyperoside [1]. Continuing an investigation of the flavonoids of this plant, we have isolated another two substances.

Substance (I) — mp 245-248°C, λ_{max}, 245, 298, 370 nm (+NaOAc 250, 330, 370 nm; +$AlCl_3$ 264, 340, 380 nm; +$AlCl_3$ + HCl 319, 372 nm; +NaOAc + H_3BO_3 249, 309, 380 nm; +NaOMe 252, 300, 380 nm). The intense absorption maximum at 298 nm is characteristic for substances of flavanonol nature, as was confirmed by the NMR spectrum.

The NMR spectrum of the substance had the following signals: d, 7.04 ppm, 2H, J = 8 Hz (H-2', 6'); d 6.50 ppm, 2H, J = 8 Hz (H-3', 5'); d, 4.66 ppm, 1H, J = 11 Hz (H-2); and m, 4.00 ppm, 1H (H-3). On silylation, the substance isomerized, as was shown at the signals of the H-6 and H-8 protons.

Judging from the experimental results, the substance isolated has the structure of 3,4',5,7,8-pentahydroxyflavanone or 3,4',5,6,7-pentahydroxyflavanone. On the basis of biogenetic considerations, we tend to consider that it has the structure of 3,4',5,7,8-pentahydroxyflavanone, since from the plant under investigation we have previously isolated a substance based on 3,4',5,7,8-pentahydroxyflavone (herbacetin) [2]. This was confirmed by the oxidation of (I) by atmospheric oxygen to herbacetin, which was identified by paper chromatography (in the presence of an authentic sample of herbacetin) and by UV spectroscopy.

Thus, it may be concluded that the compound isolated has the structure of 4',5,7,8-tetrahydroxyflavanonol (dihydroherbacetin) and is a new natural substance.

Substance (II) — mp 278-282°C, $[\alpha]_D^{20}$ — 40° (c 0.13; methanol), λ_{max} 273, 329, 376 nm. Substance (II), like (I) has, according to NMR spectroscopy, substituents in positions 3,4', 5,7, and 8, but it is a flavonol derivative, as is confirmed by the nature of the UV spectrum with intense both short-wave and long-wave maxima at 273 and 376 nm). The acid hydrolysis of (II) gave an aglycone which, from its melting point and UV and NMR spectroscopic characteristics was identified as herbacetin [2], and D-glucose.

The NMR spectrum of substance (II) has, in addition to the signals characteristic for herbacetin, a doublet at 4.68 ppm, 1H, J = 6 Hz, which is characteristic for the proton of the glycosidic center of β-glucose. The other glucose protons give a signal in the 3.4-3.9 ppm region. The UV-spectroscopic characteristics show that the hydroxy groups in positions 3,4',5, and 7 are free, and the glucose can be present only in position 8. Judging from the specific rotation, the glucose has a pyranose ring.

On the basis of what has been said above, it may be concluded that substance (II) has the structure of 8-β-D-glucopyranosyloxy-3,4',5,7-tetrahydroxyflavone (herbacetin 8-glucoside).

Herbacetin 8-glucoside has not previously been isolated from plants.

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