Chemistry of Natural Compounds, Vol. 34, No. 3, 1998

COUMARINS.
PLANTS, STRUCTURE, PROPERTIES

V. M. Malikov and A. I. Saidkhodzhaev

UDC 547.9; 582.89

The second chapter of the review contains information on 330 coumarins, arranged in Russian alphabetical order, with the names of the producing plants, structures, properties, melting points, specific rotations, spectral characteristics (UV, IR, NMR, ^{13}C NMR, etc.), and references to original papers and to unpublished work. For ease in locating these coumarins, they are listed in English alphabetical order in the table of contents below.

^{1}H and ^{13}C NMR spectra were taken in deuterochloroform (δ scale, ppm, J values in Hz) except where otherwise noted.

Abbreviations of the most commonly encountered literature sources were given at the begining of the review, while abbreviations used in the present part are as follows: ac — acetone; alc — ethyl alcohol; br. s — broadened singlet; bz — benzene; chlf — chloroform; chx — cyclohexane; d — doublet; dd — didoublet; dec — with decomposition; ea — ethyl acetate; ee — ethyl ether; hx — hexane; m — multiplet; met — methanol; oct — octet; pyr — pyridine; q — quartet; s — singlet; sex — sextet; t — triplet; u.s — unresolved singlet.

CHAPTER II

PHYSICAL CONSTANTS AND SPECTRAL CHARACTERISTICS OF COUMARINS

*For the first part of this review, see Chemistry of Natural Compounds, 1998, No. 2, pp. 202-264.

Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (3712) 89 14 75. Translated from Khimiya Prirodnykh Soedinenii, No. 3, pp. 384-432, May-June, 1998.

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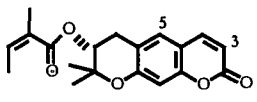


AGASYLLIN

Zosima korovinii, Agasyllis latifolia

$C_{19}H_{20}O_5$, mp 78-80°

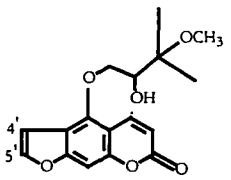
$[\alpha]_D$ –134° (chlf)

IR: 1728, 1705, 1629, 1618, 1569, 1511, 1495 [1]

Mass: 328 (M^+), 228, 213, 176, 175, 147, 83, 55 [2]

PMR: 5.97 (d, 1H, J = 9.5 Hz, H-3), 7.32 (d, 1H, J = 9.5 Hz, H-4), 6.90 (s, 1H, H-5), 6.50 (s, 1H, H-8), 4.89 (t, 1H, J = 5 Hz, H-3′), 2.64 (q, 1H, J_1 = 16; J_2 = 5 Hz, H-4′a), 3.02 (q, 1H, J_1 = 16.0; J_2 = 5.0 Hz, H-4′b), 1.14 (s, 6H, H-1′, H-5′), 1.61 (s, each 3H, H-4″, H-5″), 5.85 (m, 1H, H-3″) [3]

1. Yu. E. Sklyar, L. G. Avramenko, M. G. Pimenov, and R. N. Ovetisyan, Khim. Prir. Soedin., 779 (1982).
2. P. I. Zakharov, V. S. Kabanov, A. I. Ban'kovskii, G. K. Nikonov, and N. E. Ermatov, Khim. Prir. Soedin., 398 (1971).
3. Perel'son.



ALATOL

Prangos alata

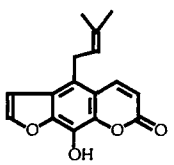
$C_{17}H_{18}O_6$, mp 125-127°

IR: 3370, 1710, 1600, 1570, 1540, 1350

Mass: 218 (M^+), 202, 73

PMR: 6.32 (d, 1H, J = 10.0 Hz, H-3), 8.35 (d, 1H, J = 10.0 Hz, H-4), 7.08 (d, 1H, J = 2.0 Hz, H-5′), 7.65 (d, 1H, J = 2.0 Hz, H-4′), 7.20 (s, 1H, H-8), 1.23 (s, 6H, H-4″, H-5), 2.85 (br.s, 1H, OH), 3.28 (s, 3H, OCH_3), 4.20-4.70 (m, 3H, H-1″, H-2″)

A. Z Abyshev, I. V. Brodskii, P. P. Denisenko, and A. I. Ermakov, Khim. Prir. Soedin., 722 (1973).



ALLOIMPERATORIN

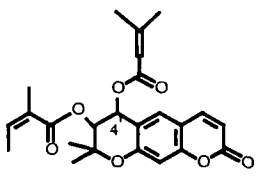
Cnidium monnieri, Prangos ornata

$C_{16}H_{14}O_4$, mp 228-270°

UV: 224, 252, 267, 273, 317

IR: 3334, 3155, 3128, 3089, 3064, 1725, 1643, 1596 [1, 2]

1. G. K. Nikonov, Zh. Obshch. Khim., 1350 (1964).
2. G. A. Kuznetsova and L. M. Belenovskaya, Khim. Prir. Soedin., 430 (1965).



ANGELIN

Angelica decursiva, A. pachyptera

$C_{24}H_{26}O_7$

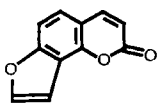
$[\alpha]_D^{20}$ –28.0° (alc.)

UV: 222, 255, 322

IR: 1760, 1735, 1640, 1580, 1510, 1450, 1400, 1360, 1340, 1300

PMR: 6.05 (d, 1H, J = 10.0 Hz, H-3), 7.57 (d, 1H, J = 10.0 Hz, H-4), 6.65 (s, 1H, H-8), 6.65 (s, 1H, H-5), 1.40; 1.43 (s, each 3H, H-1″, H-5″), 5.20 (d, 1H, J = 5.2 Hz, H-3′), 5.95 (d, 1H, J = 5.2 Hz, H-4′)

L. G. Avramenko, G. K. Nikonov, and M. G. Pimenov, Khim. Prir. Soedin., 190 (1970).

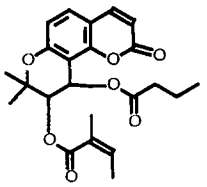


ANGELICIN

Heracleum antasiaticum, H. carpaticum, H. cyclocarpum, H. lehmannianum, H. ligusticifolium, H. liskovii, H. sosnowskyi, Platytaenia pimpinelloides, Psorelea drupaceae, Seseli gracille, S. rigidum

$C_{11}H_6O_3$, mp 138-140°
UV: 248, 300 [1, 2]

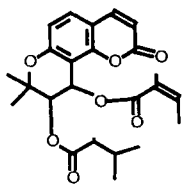
1. Murray.
2. Kuznetsova.



3′-ANGELOYLOXY-4′-BUTOXY-3′,4′-DIHYDROSESELIN

Seseli tschuense
$C_{23}H_{26}O_7$, mp 142-143°, $[\alpha]_D$ –26° (chlf)
UV: 225, 254, 320
IR: 1733, 1650, 1610, 1580
PMR: 6.15 (d, 1H, J = 10.0 Hz , H-3), 7.67 (d, 1H, J = 10.0 Hz, H-4), 7.40 (d, 1H, J = 9.0 Hz, H-5), 6.80 (d, 1H, J = 9.0 Hz, H-6), 1.40 (s, 6H, H-4′, H-5′), 5.40 (d, 1H, J = 5.0 Hz, H-3′), 6.55 (d, 1H, J = 5.0 Hz, H-4′), 1.82 (d, H-4″), 1.92 (s, 3H, H-5″), 6.05 (q, 1H, H-3″), 1.1 (q, 3H, H-4‴), 1.92 (d, 2H, H-1‴)

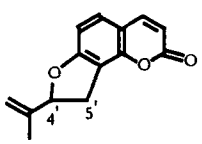
A. M. Aminov, Dissertation for Candidate of Chemical Sciences [in Russian], Tashkent (1974).



4′-ANGELOYLOXY-3′-ISOVALEROYLOXY-3′,4′-DIHYDROSESELIN

Seseli tenuisectum
$C_{24}H_{28}O_7$, M^+428

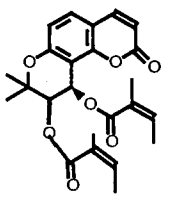
A. M. Aminov and G. K. Nikonov, Khim. Prir. Soedin., 38 (1972).



ANGENOMALIN

Angelica sachalinensis
$C_{14}H_{12}O_3$, mp 104°
UV: 250, 262, 328
IR: 1740, 1620, 1585
PMR: 6.10 (d, 1H, J = 9.5 Hz, H-3), 7.54 (d, 1H, J = 9.5 Hz, H-4), 6.65 (d, 1H, J = 8.5 Hz, H-5), 7.21 (d, 1H, J = 8.5 Hz, H-6), 3.22 (d, 2H, J = 9.0 Hz, H-5′), 5.25 (t, 1H, J = 9.0 Hz, H-4′), 1.70 (s, 3H, H-1′), 4.86; 5.0 (d, each 1H, J = 2.5 Hz, H-2′)

É. F. Ametova, G. K. Nikonov, and P. G. Gorovoi, Khim. Prir. Soedin., 385 (1976).

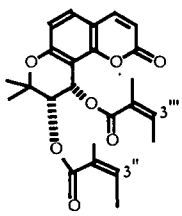


ANOMALIN

Angelica anomala, A. adzharica, A. cinta, A. tatianae, Libanotis lehmanniana, Seseli asperulum, S. coronatum, S. dichotomum, S. grandivittatum, S. incanum, S. iliense, S. talassicum, S. tenuisecta, S. tschuense, S. jamuticum

$C_{24}H_{26}O_7$, mp 172-174°
$[\alpha]_D^{21}$ +41.6° (chlf)
UV: 216, 246, 257, 325
IR: 3095, 3075, 1730, 1658, 1611, 1575, 1492
PMR: 6.12 (d, 1H, J = 10.5 Hz, H-3), 7.57 (d, 1H, J = 10.5 Hz, H-4), 6.77 (d, 1H, J = 10.0 Hz, H-6), 7.35 (d, 1H, J = 10.0 Hz, H-5), 1.44; 1.49 (s, each 3H, H-1′, H-5′), 5.36 (d, 1H, J = 4.0 Hz, H-3′), 6.62 (d, 1H, J = 4.0 Hz, H-4′), 1.8-2.17 (m, 12H, H-5″, H-4″, H-5‴, H-4‴), 5.9-6.1 (m, 2H, H-3″, H-3‴)

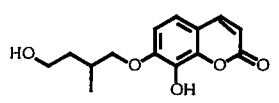
A. M. Aminov and G. K. Nikonov, Khim. Prir. Soedin., 759 (1970); 38 (1972).



(+)-ANOMALIN

Seseli tenuisectum
$C_{24}H_{26}O_7$, M^+426
UV: 225, 260, 320 (lgε 4.0; 3.0; 3.9)
IR: 1730, 1605, 1490, 1477, 910
PMR: 6.14 (d, 1H, J = 10.0 Hz, H-3), 7.66 (d, 1H, J = 10.0 Hz, H-4), 7.40 (d, 1H, J = 9.0 Hz, H-5), 6.78 (d, 1H, J = 9.0 Hz, H-6), 5.40 (d, 1H, J = 5.0 Hz, H-3′), 6.52 (d, 1H, J = 5.0 Hz, H-4′), 1.92-1.97 (m, 12H, H-5″, H-4″, H-5‴, H-4‴), 6.08 (q, 2H, H-3″, H-3‴) [1, 2]

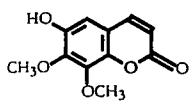
1. A. M. Aminov and G. K. Nikonov, Khim. Prir. Soedin., 760 (1970).
2. Perel'son.



ARMIN

Artemisia armenica
$C_{14}H_{16}O_5$, mp 112-114°
UV: 262.5; 322
IR: 3520, 1740, 1625, 1570
Mass: 264(M^+), 191, 190, 179, 178, 177, 150, 87, 69
PMR: 6.24 (d, 1H, J = 9.7 Hz, H-3), 7.60 (d, 1H, J = 9.3 Hz, H-4), 6.82 (d, 1H, J = 7.0 Hz, H-5), 6.93 (d, 1H, J = 7.0 Hz, H-6) and the signals of the protons of an isopentenyl residue

K. S. Rybalko, O. A. Konovalova, V. I. Sheichenko, and P. I. Zakharov, Khim. Prir. Soedin., 294 (1976).



ARSCOTIN

Artemisia scotina

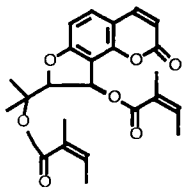
$C_{11}H_{10}O_5$, mp 192-193°

UV: 258, 312

IR: 3350, 1710, 1610, 1575, 1500

PMR: 6.12 (d, 1H, J = 9.8 Hz, H-3), 7.52 (d, 1H, J = 9.8 Hz, H-4), 6.34 (s, 1H, H-5), 3.55; 3.68 (s, each 3H, $2OCH_3$)

M. I. Yusupov and G. P. Sidyakin, Khim. Prir. Soedin., 430 (1973).



ARCHANGELICIN

Angelica komarovii

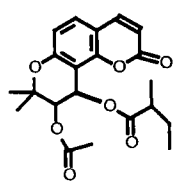
$C_{24}H_{26}O_7$, mp 100-102°

$[\alpha]_D^{20}$ +112.7° (met) [1, 2]

UV: 258, 322

IR: 1716-1743, 1623, 1584, 1497, 1458 [3]

1. E. B. Zorin, N. V. Ivashchenko, M. E. Perel'son, V. V. Vandyshev, and M. G. Pimenov, Khim. Prir. Soedin., 388 (1984).
2. Murray.
3. Kuznetsova.



3′-O-ACETYL-4′-O-(2-METHYLBUTANOYL)-cis-KHELLACTONE

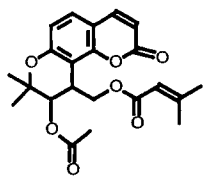
Phlojodicarpus sibiricus

$C_{21}H_{24}O_7$

UV: 328, 258, 245

IR: 1740, 1670, 1620

D. Gantimur, A. I. Syrchina, and A. A. Semenov, Khim. Prir. Soedin., 108 (1986).



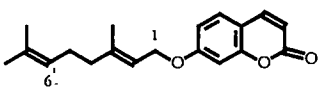
3′-ACETOXY-4′-SENECIOYLOXY-3′,4′-DIHYDROSESELIN

Seseli campestre

$C_{21}H_{22}O_7$, mp 121.5-122.5°

$[\alpha]_D^{22}$ −142° (alc)

L. I. Shagova, V. N. Flora, G. A. Kuznetsova, and M. E. Perel'son, Khim. Prir. Soedin., 665 (1973).

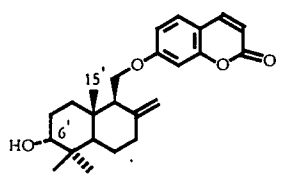


AURAPTENE

Ferula microloba

$C_{19}H_{22}O_3$, 298
mp 67°
UV: 220, 243, 254, 294, 325 (lgε 4.15; 3.68; 3.41; 3.93; 4.2)
IR: 1725, 1620, 1510, 1460, 3085, 3050
Mass: 298, 187, 175, 163, 162, 137, 136, 95, 93, 81, 69
PMR: 1.52; 1.58; 1.69 (s, each 3H, H-8′, H-9′, H-10′), 4.48 (d, 2H, J = 5 Hz, H-1′), 5.36 (t, J = 5 Hz, 1H, H-2′), 4.96 (1H, br.s, H-6′), 6.15 (d, 1H, J = 9.5 Hz, H-3), 7.51 (d, 1H, J = 9.5 Hz, H-4), 7.25 (d, 1H, J = 8.5 Hz, H-5), 6.75 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.70 (d, 1H, J = 2.5 Hz, H-8) [1]

V. N. Borisov, A. I. Ban'kovskii, V. I. Sheichenko, and V. S. Kabanov, Khim. Prir. Soedin., 659 (1974).

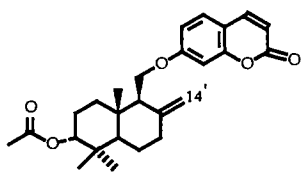


BADRAKEMIN

Ferula badrakema, F. lehmanni
$C_{24}H_{30}O_4$
mp 199-200°

$[\alpha]_D$ –64° (chlf)
UV: 252, 322 (lgε 3.35; 4.08)
IR: 1725, 1650, 1615, 1557, 1508 [1]
Mass: 382, 221, 220, 203, 162 [2]
PMR: 0.78 (s, 6H, H-11′, H-15′), 0.93 (s, 3H, H-12′), 3.46 (br.s, 1H, H-6′), 4.20 (m, 2H, H-13′), 4.52 and 4.89 (br.s, each 1H, H-14′), 6.18 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.77 (q, 1H, J = 8.5 Hz; 2.5 Hz, H-6), 6.75 (d, 1H, J = 2.5 Hz, H-8) [3]

1. N. P. Kir'yalov, Khim. Prir. Soedin., 363 (1967).
2. V. Yu. Bagirov, N. P. Kir'yalov, V. I. Sheichenko, and V. N. Bochkarev, Khim. Prir. Soedin., 466 (1970).
3. M. E. Perel'son, A. A. Kir'yanov, A. I. Ban'kovskii, N. P. Kir'yalov, and T. V. Bukreeva, Khim. Prir. Soedin., 442 (1976).

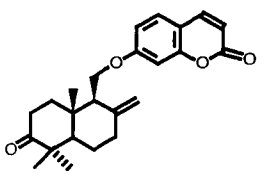


BADRAKEMIN ACETATE

Ferula teterrima
$C_{26}H_{32}O_5$
mp 173-174°, $[\alpha]_D$ –37.8°

PMR: 0.89; 0.91; 0.94 (s, each 3H, H-11′, H-12′, H15′), 2.09 (s, 3H, H-2″), 4.72 (br.s, 1H, H-6′), 4.19 (m, 2H, H-13′), 4.56 and 4.90 (br.s, each 1H, H-14′), 6.25 (d, 1H, J = 9.5 Hz, H-3), 7.64 (d, 1H, J = 9.5 Hz, H-4), 7.37 (d, 1H, J = 9 Hz, H-5), 6.83 (q, 1H, J_1 = 9; J_2 = 2.5 Hz, H-6), 6.81 (d, 1H, J = 2.5 Hz, H-8) [1, 2]

1. A. I. Sokolova, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 134 (1978).
2. V. N. Borisov, A. I. Ban'kovskii, V. I. Sheichenko, and M. G. Pimenov, Khim. Prir. Soedin., 516 (1974).

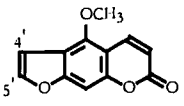


BADRAKEMONE

Ferula teterrima
$C_{24}H_{28}O_4$
mp 185-186°, $[\alpha]_D$ –39.8° [1]

PMR: 1.04; 1.05; 1.12 (s, each 3H, H-11′, H-12′, H-15′), 4.23 (d, 2H, J = 6 Hz, H-13′), 4.61 and 4.97 (br.s, each 1H, W1/2 = 5 Hz, H-14′), 6.24 (d, 1H, J = 9.5 Hz, H-3), 7.63 (d, 1H, J = 9.5 Hz, H-4), 7.37 (d, 1H, J = 9.0 Hz, H-5), 6.83 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.5 Hz, H-6), 6.81 (d, 1H, J = 2.5 Hz, H-8) [2]

1. A. I. Sokolova, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 134 (1978).
2. V. N. Borisov, A. I. Ban'kovskii, V. I. Sheichenko, and M. G. Pimenov, Khim. Prir. Soedin., 516 (1974).

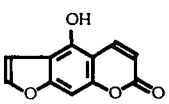


BERGAPTEN

Angelica dahurica, A. brevicaulis, A. graveolens, A. saxatilis, Ammi majus, Anethum graveolens, Archangelica decurrens, Cachrus adontalgica, Caragana frutex, Cryptodiscus didymus, Daucus carota, Dictamnus angustifolius, Foeniculum vulgarae, Ficus carica, Heracleum antasiaticum, H. aconitofolium, H. asperum, H. carpaticum, H. cyclocarpum, H. grandifolorum, H. apiifolium, H. lehmannianum, H. ligusticifolium, H. liskovii, H. moellendorfii, H. sosnovskyi, H. sommieri, H. sibiricum, H. villosa, Hippomorathrum caspium, H. microcarpum, Libanotis buchtormensis, L. lehmannae, Pastinaca sativa, Platytaenia dasycarpa, P. pimpinelloides, Peucedanum baicalense, Prangos aris-romanae, P. acaulis, P. equisetoides, P. lamellata, P. lipskyi, P. uloptera, Psoralea drupaceae, Ruta graveolens, Scoliosa comosa, Seseli abolini, S. dichotomum, S. gracille, S. giganteum, S. korovinii, S. jamuticum, S. rigidum, Symphyoloma graveolens, Vicia sativa, Xanthogalum sachokianum

$C_{12}H_8O_4$, mp 188-189°
UV: 222, 245, 250, 259, 268, 311
IR: 1720, 1628, 1600, 1575, 1550 [1]
PMR: 6.25 (d, 1H, J = 10.0 Hz, H-3), 8.15 (d, 1H, J = 10.0 Hz, H-4), 7.05 (d, 1H, J = 2.5 Hz, H-5′), 7.60 (d, 1H, J = 2.5 Hz, H-4′), 7.15 (s, 1H, H-8), 4.20 (s, 3H, OCH_3) [2]

1. A. Z. Abyshev, V. A. Pendin, Yu. B. Kerimov, É. I. Ismailov, É. M. Agaev, and N. Ya. Isaev, Khim. Prir. Soedin., 458 (1992).
2. Perel'son.

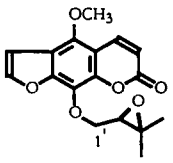


BERGAPTOL

Peucedanum morissonii, Xanthogalum tatianae
$C_{11}H_6O_4$, mp 276-282°
UV: 250, 267, 307
IR: 3314, 3141, 3117, 3089, 1718, 1636, 1618, 1588, 1560 [1, 2]
^{13}C NMR [3]

C-2	160.1	5	147.7	8	90.9
3	110.8	6	112.4	9	152.6
4	139.5	7	156.8	10	103.7

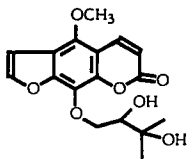
1. Murray.
2. Kuznetsova.
3. A. Z. Abyshev, V. P. Zmeikov, and I. P. Sidorova, Khim. Prir. Soedin., 301 (1982).



(–)-BYAKANGELICOL

Angelica komarovii
$C_{17}H_{26}O_6$, M^+ 316, mp 87-89°
$[\alpha]_D^{23}$ –50° (pyr)
UV: 222, 241, 249, 271, 313
PMR: 6.19 (d, 1H, J = 10.0 Hz, H-3), 8.03 (d, 1H, J = 10.0 Hz, H-4), 6.94 (d, 1H, J = 2.5 Hz, H-4′), 7.55 (d, 1H, J = 2.5 Hz, H-5′), 4.11 (s, 3H, OCH_3), 4.36 (d, 2H, J = 5.5 Hz, H-1″), 3.28 (t, 1H, J = 5.5 Hz, H-2″) 1.17; 1.25 (s, each 3H, H-4″, H-5″)

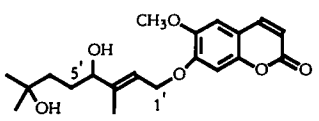
E. B. Zorin, P. V. Ivashchenko, M. E. Perel'son, V. V. Vandyshev, and M. G. Pimenov, Khim. Prir. Soedin., 664 (1986).



BYAKANGELICIN

Angelica dahurica, A. komarovii, A. tatianae, Archangelica tchimganica, Heracleum aconitofolium, H. asperum, H. grandiflorum, H. leskovii, H. moellendorfii, Xanthogalum sachokianum
$C_{17}H_{18}O_7$, mp 117-118°
$[\alpha]_D^{25}$ +24.62° (pyr)
UV: 223, 241, 249, 271, 312 [1, 2]
IR: 3352, 3175, 3144, 3077, 1723, 1639, 1608, 1598, 1550
PMR: 6.29 d (10; H-3); 8.16 d (10; H-4); 7.18 d (2.5; H-4′); 7.80 d (2.5; H-5`); 4.17 s (OCH_3); 4.24 q (10.3; 8.0; H-1″); 4.54 q (10.3; 2.8; H-1″); 3.82 q (8.0; 2.8; H-2″), 1.24; 1.28 s ($2CH_3$) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



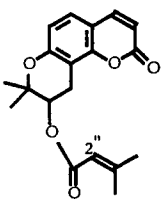
BUNGEIDIOL

Haplophyllum bungei
$C_{20}H_{26}O_6$, mp 108-109°
$[\alpha]_D^{20}$ +42.8° (chlf)
IR: 3480, 1725, 1610, 1585, 1520
PMR: In addition to the signals of the protons of the coumarin nucleus: 1.05; 1.14 (s, each 3H, H-8′, H-9′), 1.72 (s, 3H, H-10′), 3.84 (s, 3H, OCH_3), 3.27 (q, 2H, J_1 = 8.0 Hz; J_2 = 2.0 Hz, H-1′), 4.63 (d, 1H, J = 7.0 Hz, H-4′), 5.47 (t, 1H, J = 7.0 Hz, H-2′), 2.20 (m, 4H, H-5′, H-6′)

^{13}C NMR [2]:

C-2	161.0	9	149.3	16	29.4
	112.9	10	111.1	17	72.9
4	143.1	11	66.2	18	26.4
5	107.8	12	118.5	19	23.3
6	146.8	13	141.5	20	18.8
7	151.6	14	77.7	OCH_3	56.1
8	100.9	15	36.5		

1. A. Z. Abyshev and N. F. Gashimov, Khim. Prir. Soedin., 648 (1980).
2. A. Z. Abyshev and V. P. Zmeikov, Khim. Prir. Soedin., 294 (1982).



BUCHTARMIN

Phlojodicarpus turczaninovii

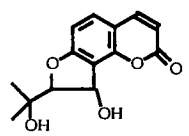
$C_{19}H_{20}O_5$, mp 58-62°

$[\alpha]_D$ +72,0° (chlf) [1]

Mass: 328, 228, 213, 176, 175, 147, 83, 55 [2]

PMR: 6.06 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 6.62 (d, 1H, J = 8.5 Hz, H-5), 7.19 (d, 1H, J = 8.5 Hz, H-6), 5.10 (t, 1H, J = 5.0 Hz, H-3′), 3.20 (q, 1H, J_1 = 5.0 Hz, J_2 = 1.8 Hz, H-4′a), 2.90 (q, 1H, J_1 = 5.0 Hz, J_2 = 1.8 Hz, H-4′b), 1.31 (s, 6H, H-1′, H-5′), 1.78; 2.05 (br.s, each 3H, H-4″, H-5″), 5.64 (br.s, 1H, H-2″)

1. N. V. Veselovskaya, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 828 (1980).
2. P. I. Zakharov, V. S. Kabanov, L. I. Ban'kovskii, G. K. Nikonov, and N. E. Ermatov, Khim. Prir. Soedin., 398 (1971).



VAGINOL

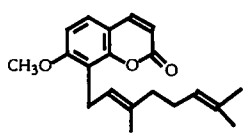
Angelica komarovii

$C_{14}H_{14}O_5$, mp 164-165°

$[\alpha]_D^{24}$ +127.6° (alc) [1, 2]

PMR: 6.23 d (9.5 Hz; H-3); 7.96 d (9.5 Hz; H-4), 7.60 d (8.5 Hz; H-5); 6.86 d (8.5 Hz; H-6), 5.78 d (3.5 Hz; H-4′), 4.50 d (3.5; H-5′),1.30; 1.33 ($2CH_3$) [3]

1. Murray.
2. E. B. Zorin, N. V. Ivashchenko, M. E. Perel'son, V. V. Vandyshev, and M. G. Pimenov, Khim. Prir. Soedin., 388 (1984).
3. Perel'son.



VERSICOLIN

Haplophyllum versicolor

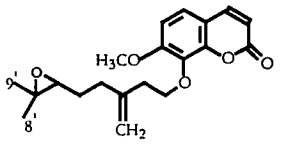
$C_{20}H_{24}O_3$, M^+312

mp 105-107°

IR: 1720, 1610, 1560, 1500

PMR: 1.56; 1.64; 1.82 (s, each 3H, H-8′, H-9′, H10′), 3.50 (d, 2H, J = 6.0 Hz, H-1′), 5.05; 5.12 (d, each 1H, J = 6.0 Hz, H-2′, H-6′), 1.98 (s, 4H, H-4′, H-5′)

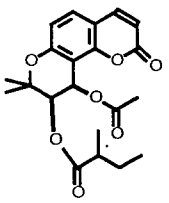
N. F. Gashimov, A. Z. Abyshev, A. A. Kagramonov, and A. I. Rozhkova, Khim. Prir. Soedin., 87 (1979).



VILLOSIN

Haplophyllum villosum, H. tenue
$C_{20}H_{24}O_5$
PMR: 6.33 (d, 1H, J = 10.0 Hz, H-3), 7.73 (d, 1H, J = 10.0 Hz, H-4), 6.91 (d, 1H, J = 9.0 Hz, H-6), 7.37 (d, 1H, J = 9.0 Hz, H-5), 3.91 (s, 3H, OCH_3), 5.11; 5.28 (br.s, each 1H, H-10′), 4.37 (m, 2H, H-1′), 2.06-2.80 (m, 7H), 1.17; 1.25 (s, each 3H, H-8′, H-9′)

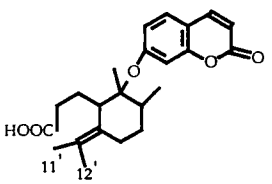
A. Z. Abyshev, N. Ya. Isaev, and Yu. B. Kerimov, Khim. Prir. Soedin., 800 (1980).



VISNADIN

Phlojodicarpus sibiricus, P. villosus
$C_{21}H_{24}O_7$, mp 85-86°
$[\alpha]_D^{20}$ +48° (dioxane) [1, 2]
IR: 3080, 3055
Mass: 388, 332, 329, 328, 313, 286, 271, 261, 244, 229, 85, 71 [3]
PMR: 6.09 d (9.5; H-3), 7.47 d (9.5; H-4), 7.28 d (8.5; H-5), 6.67 d (8.5; H-6), 6.38 d (4.8; H-4′), 5.21 d (4.8; H-5′), 1.41 ($2CH_3$), 2.06 (OAc), 1.17 d (7.0; H-3″), 0.94 t (7.5; H-5′) [4]

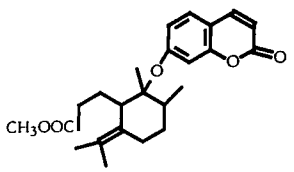
1. Murray.
2. G. K. Nikonov and V. V. Vandyshev, Khim. Prir. Soedin., 118 (1969).
3. P. I. Zakharov, P. V. Terent'ev, G. K. Nikonov, A. I. Ban'kovskii, and N. E. Ermatov, Khim. Prir. Soedin., 292 (1970).
4. Perel'son.



GALBANIC ACID

Ferula galbaniflua, F. gummosa, F. kopetdagensis, F. violaceae, F. eugenii
$C_{24}H_{30}O_5$, M^+398
Mp 94-96°, $[\alpha]_D$ –25° (alc) [1]
UV: 220, 245, 255, 295, 327
IR: 1750, 1720, 1660, 1620, 1560
PMR: 6.15 (d, 1H, J = 10.0 Hz, H-3), 7.55 (d, 1H, J = 10.0 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.75 (q, 1H, J_1 = 8.5; J_2 = 2.5 Hz, H-6), 6.68 (d, 1H, J = 2.5 Hz, H-8), 8.85 (d, 1H, H-6′), 3.81 (d, each 1H, J = 8.0 Hz, H-13′), 1.42 and 1.58 (s, each 3H, H-11′, H-12′), 1.11 (s, 3H, H-15′), 0.85 (d, 3H, J = 7.5 Hz, H-14′)

1. A. E. Bednyak, Aptechn. Delo, No. 3, 28 (1962).
2. A. A. Kir'yanova, Yu. E. Sklyar, M. G. Pimenov, and Yu. V. Baranova, Khim. Prir. Soedin., 73 (1979).
3. V. Yu. Bagirov, V. I. Sheichenko, N. V. Veselovskaya, Yu. E. Sklyar, A. A. Savina, and I. A. Kir'yanova, Khim. Prir. Soedin., 620 (1980).



METHYL GALBANATE

Ferula microloba, F. szowitsiana, F. inciso-serrata

$C_{25}H_{32}O_5$

$[\alpha]_D$ –125.8°, bp 252°

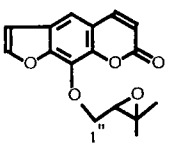
UV: 217, 244, 254, 294, 325 (lgε 4.17; 3.60; 3.44; 4.07; 4.27)

IR: 1740-1720, 1620, 1560, 1510, 1470

Mass: 381 (6.4), 251 (79), 237 (42), 163 (100), 162 (32), 161 (22), 59 (24)

PMR: 0.81 (d, 3H, J = 7 Hz, H-14′), 1.13 (s, 3H, H-15′), 1.44 and 1.57 (s, each 3H, H-11′, H-12′), 3.58 (s, 3H, OCH_3), 3.64 and 3.72 (d, each 1H, J = 7.5 Hz, H-13′), 6.15 (d, 1H, J = 9.5 Hz, H-3), 7.50 (d, 1H, J = 9.5 Hz, H-4), 7.25 (d, 1H, J = 9.0 Hz, H-5), 6.75 (q, 1H, J_1 = 9.0 Hz, J_2 = 2 Hz, H-6), 6.70 (d, 1H, J = 2.0 Hz, H-8) [1]

V. N. Borisov, A. I. Ban'kovskii, V. I. Sheichenko, V. S. Kabanov, and P. I. Zakharov, Khim. Prir. Soedin., 516 (1974).



(–)-HERACLENIN [(–)-IMPERATORIN OXIDE]

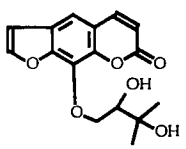
Hippomarathrum caspicum

$C_{16}H_{14}O_5$, mp 107.5°

$[\alpha]_D^{20}$ –23.5° (chlf)

PMR: 6.44 (d, 1H, J = 10.0 Hz, H-3), 7.92 (d, 1H, J = 10.0 Hz, H-4), 6.92 (d, 1H, J = 2.0 Hz, H-5′), 7.83 (d, 1H, J = 2.0 Hz, H-4′), 7.4 (s, 1H, H-5), 4.62 (d, 2H, J = 6.0 Hz, H-1″), 3.34 (t, 1H, J = 6.0 Hz, H-2″), 1.23; 1.34 (s, each 3H, H-4″, H-5″)

A. Z. Abyshev, Khim. Prir. Soedin., 550 (1973).

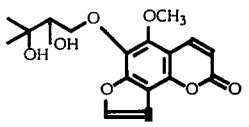


(+)-HERACLENOL

Prangos lophoptera

$C_{16}H_{16}O_6$, mp 120-122°, $[\alpha]_D$ +19.5° (pyr) [1, 2]

1. Murray.
2. A. Z. Abyshev, Khim. Prir. Soedin., 708 (1974).



HERACLESOL

Heracleum leskowii

$C_{17}H_{18}O_7$, mp 117-118°

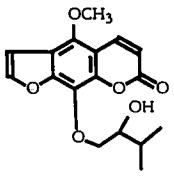
$[\alpha]_D^{20}$ +30.0° (met)

UV: 222, 254, 306

IR: 3525, 3400, 3170, 3135, 2980, 2950, 2860, 1715, 1624, 1577

PMR: 1.27; 1.30 (s, each 3H, H-4″, H-5″), 3.22 (br.s, 2H, 2-OH), 3.81 (q, 1H, J_1 = 7.5; J_2 = 3.5; H-2″), 4.25 (q, 1H, J_1 = 9.5; J_2 = 3.5 Hz, H-1″), 4.55 (q, 1H, J_1 = 9.5; J_2 = 3.5 Hz, H-1″), 4.02 (s, 3H, OCH_3)

N. F. Komissarenko, A. I. Derkach, I. P. Kovalev, and I. F. Satsyperova, Khim. Prir. Soedin., 184 (1978).

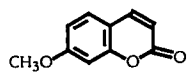


HERACOL

Heracleum leskovii

$C_{17}H_{18}O_7$, mp 148-151°, $[\alpha]_D^{20}$ +18° (alc) [1, 2]

1. Murray.
2. N. F. Komissarenko, A. I. Derkach, I. P. Kovalev, and I. F. Satsyperova, Khim. Prir. Soedin., 184 (1978).



HERNIARIN

Althaea armenica, A. officinalis, Artemisia diffusa, A. porrecta, A. silvatica, A. stolonifera, Herniaria auxina, H. polygonum, Matricaria recutita, Polygonum divaricatum, P. weyrichii, Psoralea drupaceae

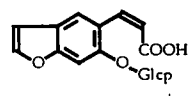
$C_{10}H_8O_3$, mp 117-118°

UV: 216, 300, 319

IR: 3100, 3060, 3035, 1722, 1616, 1512 [1, 2]

PMR: 6.25 d (10 Hz; H-3), 7.66 d (10 Hz; H-4), 7.39 d (7.8 Hz; H-5), 6.86 q (7.8; 2.5 Hz; H-6); 6.80 d (2.5 Hz; H-8); 3.86 s (OCH_3) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



FUROCOUMARINIC ACID GLUCOSIDE

Ficus carica

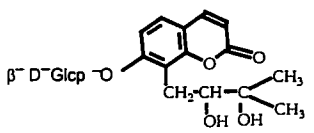
$C_{17}H_{18}O_9$

UV: 224, 243, 251, 278, 316

IR: 3650-3200, 1730-1700, 1618

PMR: 6.13 (d, 1H, J = 10.0 Hz, H-3), 8.00 (d, 1H, J = 10.0 Hz, H-4), 6.90 (d, 1H, J = 2.5 Hz, H-5′), 7.52 (d, 1H, J = 2.5 Hz, H-4′), 7.10-7.25 (br.s, 2H, H-5, H-8), 3.0-4.50 (m, protons of the sugar moiety), 5.20 (d, 1H, J = 6.5 Hz, H-1″)

É. A. Yarosh and G. K. Nikonov, Khim. Prir. Soedin., 521 (1971).



8-(2′,3′-DIHYDROXY-3′METHYLBUTYRYL)UMBELLIFERONE 7β-O-*D*-GLUCOPYRANOSIDE

Phlojodicarpus sibiricus

$C_{20}H_{26}O_{10}$, mp 224-226°

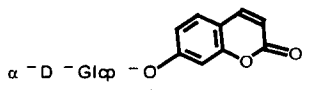
UV: 314

PMR: 6.30 (d, 1H, J = 10.0 Hz, H-3), 7.98 (d, 1H, J = 10.0 Hz, H-4), 7.15 (d, 1H, J = 8.5 Hz, H-6), 7.53 (d, 1H, J = 8.5 Hz, H-5), 4.87 (s, 1H, J = 7.5 Hz, H-1″), 5.30 (d, 1H, J = 8.0 Hz, H-2′), 3.44 (d, 2H, J = 8.0 Hz, H-1′), 1.17 (s, 6H, H-4′, H-5′)

^{13}C NMR:

C-2	161.0	1′	25.5	1″	102.4
3	112.2	2′	77.1	2″	74.4
4	145.2	3′	72.7	3″	77.7
4a	117.9	4′	26.0	4″	70.6
5	127.6	5′	26.5	5″	78.1
6	113.7			6″	61.6
7	159.8				
8	114.4				
8a	157.0				

D. Gantimur, A. I. Syrchina, and A. A. Semenov, Khim. Prir. Soedin., 36 (1986).



UMBELLIFERONE 7-O-α-*D*-GLUCOPYRANOSIDE

Doronicum macrophyllum

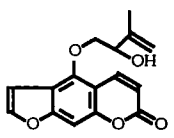
$C_{15}H_{16}O_8$, mp 219-220°

$[\alpha]_D^{13}$ +85° (pyr)

IR: 3400, 1710, 1615, 1580, 840

PMR: 6.15 (d, 1H, J = 10.0 Hz, H-3), 7.83 (d, 1H, J = 10.0 Hz, H-4), 6.82 (q, 1H, J_1 = 9.0; J_2 = 2.0 Hz, H-6), 7.43 (d, 1H, J = 9.0 Hz, H-5), 6.72 (d, 1H, J = 2.0 Hz, H-8), 3.40-5.10 signals of the protons of the sugar moiety.

A. Z. Abyshev, Sh. A. Alieva, I. A. Damirov, P. P. Denisenko, and G. I. D'yachik, Rastit. Resurs., 249 (1982).



GOSFEROL

Prangos ferulaceae, Heracleum sosnovskyi

$C_{16}H_{14}O_5$, mp 136.5-138.5°

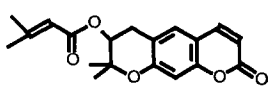
UV: 222, 250, 258, 266, 310

IR: 3455, 1715, 1630, 1610, 1585, 1555

Mass: 286(M^+), 244, 215, 202, 187, 174, 58, 42

PMR: 6.19 (d, 1H, J = 9.7 Hz, H-3), 8.11 (d, 1H, J = 9.7 Hz, H-4), 6.91 (d, 1H, J = 2.8 Hz, H-5′), 7.48 (d, 1H, J = 2.8 Hz, H-4′), 7.07 (s, 1H, H-8), 5.01; 5.17 (br.s, each 1H, H-5″), 1.81 (s, 3H, H-4″), 4.25-4.60 (m, 3H, H-1″, H-2″), 2.33 (br.s, 1H, OH)

A. Z. Abyshev, P. P. Denisenko, N. P. Kostyuchenko, and A. I. Ermakov, Khim. Prir. Soedin., 49 (1972); 550 (1979).



GRANDIVITIN

Seseli grandivittatum

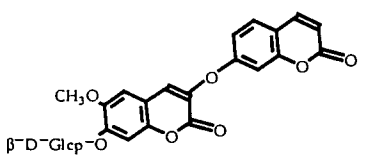
$C_{19}H_{20}O_5$, M^+ 328, $[\alpha]_D^{22}$ –83.2° (chlf)

IR: 1750-1710

IR: 3400, 1720, 1615, 1505, 1145, 1130, 1020, 910, 838
Mass: 352(M^+), 337, 324, 309, 179, 145, 134
PMR: (DMSO-d_6): 8.07 (d, 1H, J = 9 Hz, H-4), 7.88 (s, 1H, H-4′), 7.77 (m, 1H, H-5), 7.23 (s, 1H, H-5′), 7.19 (s, 1H, H-8), 7.10 (m, 1H, H-6), 6.80 (s, 1H, H-8′), 6.39 (d, 1H, J = 9 Hz, H-3), 3.84 (s, 3H, OCH_3)
^{13}C NMR [3]:

C-2	161.10	2′	160.81
3	136.85	3′	111.31
4	132.02	4′	146.84
4a	113.52	4′a	114.98
5	103.94	5′	130.98
6	151.54	6′	105.09
7	154.60	7′	156.13
8	110.56	8′	114.55
8a	145.08	8′a	148.58
		OCH_3	52.12

1. Z. G. Zhuang, O. Seligmann, L. Jurcick, and H. Wagner, Planta Med, **45**, 112 (1982)
2. L. D. Modonova, Ts. Shanova, N. V. Bulatova, and A. A. Semenov, Khim. Prir. Soedin., 709 (1985).
3. S. Narantuya, D. Batsurén, Ya. V. Rashkes, and E. G. Mil'grom, Khim. Prir. Soedin., 216 (1994).



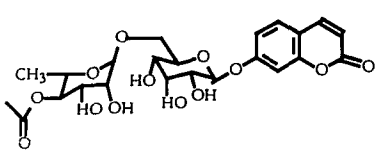
DAPHNORIN (CHAMAEJASMOSIDE)

Stellera chamaejasme
$C_{25}H_{22}O_{12}$, M^+ 514, 1171
mp 204-205°

$[\alpha]_D$ –78° (water)
UV: 228, 284, 324, 336 [2]
224, 260, 325, 339 [1]
IR: 1720, 1610, 1500, 1270 [1, 2]
Mass: 352 (100), 337 (6), 324 (7), 309 (14), 295 (5), 202 (2), 179 (31), 164 (12), 145 (9), 89 (30)
PMR: 7.82 (s, 1H, H-4), 8.03 (d, 1H, J = 9.5 Hz, H-4′), 6.37 (d, 1H, J = 9.5 Hz, H-3′), 7.25 (s, 1H, H-5), 7.73 (d, 1H, J = 9.5 Hz, H-5′), 7.14 (dd, 1H, J = 2.5 Hz, H-6′), 7.17 (d, 1H, J = 2.5 Hz, H-8′), 5.12 (d, 1H, J = 8.0 Hz, H-1″), 3.82 (s, 3H, OCH_3), 7.22 (s, 1H, H-8) [1]
^{13}C NMR:

C-2	159.55	2′	158.08	1″	99.68
3	137.10	3′	112.15	2″	72.89
4	129.17	4′	146.35	3″	73.7
4a	113.15	4′a	114.41	4″	69.57
5	103.17	5′	123.65	5″	76.3
6	154.76	6′	104.29	6″	62.74
7	148.80	7′	156.40	OCH_3	56.12
8	113.46	8′	109.98		
8a	143.64	8′a	146.47		

1. Sudam C. Basa, Phytochemistry, 1933 (1988).
2. S. Narantuya, D. Batsuren, Ya. V. Rashkes, and E. G. Mil'grom, Khim. Prir. Soedin., 216 (1994).



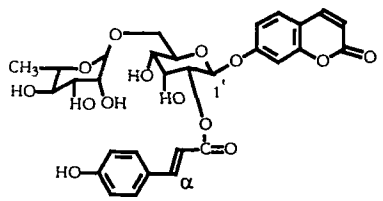
DAUROSIDE A

Haplophyllum davuricum
$C_{23}H_{28}O_{13}$, mp 145-147°
$[\alpha]_D^{22}$ –72.7° (met)

UV: 215, 241, 251, 297, 321
IR: 3540-3300, 1723, 1710, 1626, 1615, 1560
PMR: (DMSO-d_6): 0.92 (d, 3H, J = 6.0 Hz, H-6″) 2.01 (s, 3H, OAc), 3.10-3.92 (m, protons of the carbohydrate moiety), 4.60 (br.s, 1H, H-1″), 4.77 (t, 1H, J = 9.0 Hz, H-4′), 5.09 (d, 1H, J = 7.0 Hz, H-1′), 6.38 (d, 1H, J = 10.0 Hz, H-3), 7.06 (d, 1H, J = 9.0 Hz, H-6), 7.08 (br.s, 1H, H-8), 7.70 (d, 1H, J = 9.0 Hz, H-5), 8.06 (d, 1H, J = 10.0 Hz, H-4)
^{13}C NMR:

C-2	160.0	1′	99.8	$COCH_3$	20.8
3	113.1	2′	73.3	OCH_3	169.8
4	144.2	3′	76.3		
5	129.3	4′	69.5		
6	113.4	5′	75.2		
7	160.3	6′	65.7		
8	103.3	1″	100.1		
9	154.8	2″	70.2		
10	113.3	3″	68.0		
		4″	73.7		
		5″	65.9		
		6″	17.2		

D. Batsurén, É. Kh. Batirov, V. M. Malikov, and M. R. Yagudaev, Khim. Prir. Soedin., 142 (1983).



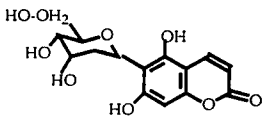
DAUROSIDE B

Haplophyllum davuricum
$C_{30}H_{32}O_{14}$, mp 148-150°
$[\alpha]_D$ ±0° (pyr)
UV: 229, 294, 318
IR: 3340-3280, 1706, 1693, 1608, 1590, 1518, 1112-1030
PMR: (DMSO-d_6): 1.08 (d, 3H, J = 6.5 Hz, H-6″), 3.10-3.08 (m, protons of the carbohydrate moiety), 4.57 (br.s, 1H, H-1″), 4.93 (t, 1H, J = 9.0 Hz, H-2′), 5.44 (d, 1H, J = 9 Hz, H-1′), 6.36 (d, 1H, J = 10 Hz, H-3), 6.42 (d, 1H, J = 16.0 Hz, H-α), 6.81 (d, 2H, J = 8.0 Hz, H-2″, H-6″), 6.96 (dd, 1H, J_1 = 8.5 Hz; J_2 = 2.5 Hz, H-6), 7.03 (br.s, 1H, H-8), 7.58 (d, 2H, J = 8.0 Hz, H-3″, H-5″), 7.68 (d, 1H, J = 16.0 Hz, H-β), 7.68 (d, 1H, J = 8.2 Hz, H-5), 8.03 (d, 1H, J = 10.0 Hz, H-4)

^{13}C NMR:

C-2	159.3	1′	97.6	1‴	124.9
3	113.3	2′	73.9	2‴	130.3
4	144.1	3′	73.0	3‴	115.7
5	129.5	4′	69.8	4‴	159.8
6	113.9	5′	75.6	5‴	115.7
7	160.2	6′	63.8	6‴	130.3
8	103.3	1″	100.4	7‴	145.8
9	154.8	2″	70.3	8‴	113.8
10	113.4	3″	70.6	9‴	165.6
		4″	71.8		
		5″	68.3		
		6″	17.7		

D. Batsurén, É. Kh. Batirov, V. M. Malikov, and M. R. Yagudaev, Khim. Prir. Soedin., 142 (1983).



DAUROSIDE D

Haplophyllum davuricum

$C_{15}H_{16}O_9$, mp 214-215°

$[\alpha]_D$ +108.6 (pyr)

UV: 225, 253, 262, 333

IR: 3460, 3400, 3176, 1723, 1637, 1620, 1586, 1090, 1080, 1030

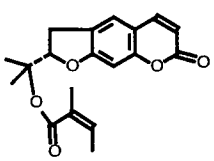
PMR: (Py-d_5): 3.82-4.58 (m, glucose protons), 5.66 (d, 3H, J = 9.5 Hz, H-1′), 6.04 (d, 1H, J = 10 Hz, H-3), 6.46 (s, 1H, H-8), 7.90 (d, 1H, J = 10 Hz, C_4-H)

PMR: (DMSO-d_6): 2.95-3.84 (m, glucose protons), 4.70 (d, 1H, J = 9.0 Hz, H-1′), 4.95 (br.s, 1H, OH), 6.00 (d, 1H, J = 10 Hz, H-3), 6.25 (br.s, 1H, H-8), 7.92 (d, 1H, J = 10.0 Hz, H-4)

^{13}C NMR (DMSO-d_6):

C-2	153.7	1′	74.6
3	108.6	2′	72.0
4	139.4	3′	77.7
5	160.4	4′	69.1
6	109.2	5′	80.8
7	159.9	6′	60.0
8	94.6		
9	154.9		
10	102.3		

A. D. Vdovin, D. Batsurén, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 441 (1983).

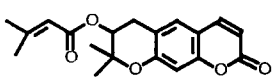


DELTOIN

Agasyllis latifolia, Peucedanum baicalense, Prangos acaulis, P. equisetoides, P. lamellata, P. lipskyi, P. ornata, Seseli asperulum, S. campestra, S. gracille, S. peucedanoides, S. rigidum, Zosima absinthifolia

$C_{19}H_{20}O_5$, mp 104-105.5°
$[\alpha]_D^{18}$ –47.5° (chlf)
IR: 3097, 3045, 1731, 1633, 1574, 1497 [1]
Mass: 328, 246, 229, 228, 214, 185, 176, 175, 171, 159, 115, 103, 102, 83, 77
PMR: 5.97 (d, 1H, J = 10.0 Hz, H-3), 7.38 (d, 1H, J = 9.5 Hz, H-4) 7.04 (s, 1H, H-5), 6.53 (s, 1H, H-8), 1.49; 1.55 (s, each 3H, H-3′, H-1′), 3.16 (d, 2H, J = 8.0 Hz, H-4′), 5.0 (t, 1H, J = 8.0 Hz, H-5′), 1.76; 1.90 (s, each 3H, H-4″, H-5″), 5.9 (m, 1H, H-3″) [3]

1. L. G. Avramenko, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 421 (1975).
2. P. I. Zakharov, P. B. Terent'ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 431 (1972).
3. Perel'son.

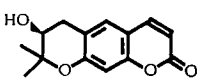


DECURSIN

Phlojodicarpus villosus

$C_{19}H_{20}O_5$, mp 110-111° $[\alpha]_D^{15}$ +172.9° (chlf) [1, 2]
PMR: 6.02 d (9.5 Hz; H-3), 7.42 d (9.5 Hz; H-4), 7.05 s (H-5), 6.59 s (H-8), 2.83 q (17.0; 5.1 Hz, H-4′) 3.18 q (17.0; 5.1 Hz, H-4′), 4.98 t (5.1 Hz, H-3′), 1.35; 1.40 s ($2CH_3$), 5.57 u.s (H-2″), 1.88; 2.16 ($2CH_3$) [3]

1. Murray.
2. D. Gantimur and A. A. Semenov, Khim. Prir. Soedin., 386 (1984).
3. Perel'son.



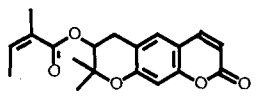
(–)-3-(R)-DECURSINOL

Seseli grandivittatum, Phlojodicarpus villosus

$C_{14}H_{14}O_4$, M^+ 246, mp 180-181.5° [1]
$[\alpha]_D^{22}$ –8.98° (chlf)
UV: 221, 248, 259, 329 [4]
IR: 3460, 1715, 1640 [4]
PMR: 6.15 (d, 1H, J = 9.5 Hz, H-3), 7.56 (d, 1H, J = 9.5 Hz, H-4), 6.73 (s, 1H, H-8), 7.16 (s, 1H, H-5), 3.16 (q, 1H, J_1 = 17.0 Hz, J_2 = 5.0 Hz, H-4′), 3.89 (q, 1H, J_1 = 6.5 Hz, J_2 = 5.0 Hz, H-3′), 2.65 (br.s, 1H, –OH), 1.39 (s, 6H, H-1′, H-5′) [2]
^{13}C NMR [3]:

C-2	161.0	9	153.6
3	112.7	10	112.5
4	142.7	2′	78.0
5	128.6	3′	68.9
6	116.4	4′	30.6
7	156.8	CH_3	25.1
8	104.8	CH_3	219

1. N. F. Gashimov, P. P. Denisenko, A. Z. Abyshev, and Yu. B. Kerimov, Khim. Prir. Soedin., 640 (1977).
2. Perel'son.
3. A. Z. Abyshev, V. P. Zmeikov, and I. P. Sidorov, Khim. Prir. Soedin., 301 (1982).
4. D. Gantimur and P. P. Semenov, Khim. Prir. Soedin., 386 (1984).



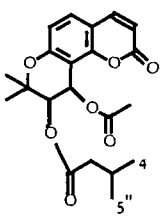
DECURSINOL ANGELATE

Seseli grandivittatum

$C_{19}H_{20}O_5$, M^+ 328

$[\alpha]_D^{22}$ –90.5° (chlf)

D. Z. Abyshev, P. P. Denisenko, A. Z. Abyshev, and Yu. B. Kerimov, Khim. Prir. Soedin., 640 (1977).



DIHYDROSAMIDIN

Phlojodicarpus villosus

$C_{21}H_{24}O_4$, mp 113-114°

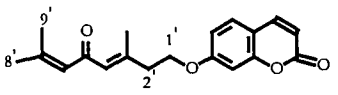
$[\alpha]_D^{21}$ +64.5° (dioxane)

UV: 219, 245, 257, 322

IR: 3105, 3060, 1738, 1615, 1584, 1495, 1238 [1]

PMR: 6.25 (d, 1H, J = 10.0 Hz, H-3), 7.63 (d, 1H, J = 10.0 Hz, H-4), 6.81 (d, 1H, J = 8.0 Hz, H-6), 7.38 (d, 1H, J = 8.0 Hz, H-5), 6.55 (d, 1H, J = 5.4 Hz, H-4′), 5.34 (d, 1H, J = 5.4 Hz, H-3′), 1.41; 1.44 (s, each 3H, H-1′, H-5′), 2.14 (s, 3H, OAc), 2.18 (d, 2H, J = 7.5 Hz, H-2″), 0.96 (d, 6H, J = 6.9 Hz, H-4″, H-5″) [2]

1. F. B. Babilev and G. K. Nikonov, Khim. Prir. Soedin., 353 (1965).
2. Perel'son.



DIVERSIN

Ferula diversivittata

$C_{19}H_{20}O_4$

mp 97-98.5° [1]

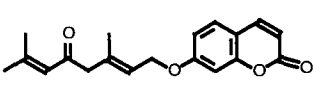
UV: 252, 275, 320 nm (lgε 4.32; 4.43; 4.29)

IR: 1720, 1615, 1570, 1710, 1625 cm^{-1}

Mass: 312, 297, 175, 165

PMR: 1.82; 1.94; 2.10 (s, each 3H, H-8′, H-9′, H-10′), 4.05 (t, 2H, J = 7 Hz, H-2′), 4.15 (t, 2H, J = 7 Hz, H-1′), 6.02 and 6.10 (br.s, each 1H, H-4′, H-6′), 6.17 (d, 1H, J = 9.5, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.80 (q, 1H, J_1 = 8.5 Hz, J_2 = 8.5 Hz, H-6), 6.15 (d, 1H, J = 2.5, H-8) [2]

1. N. P. Kiryalov, Khim. Prir. Soedin., 51 (1969).
2. V. V. Kiseleva, G. K. Nikonov, and M. O. Karryev, Khim. Prir. Soedin., 344 (1975).



DIVERSININ

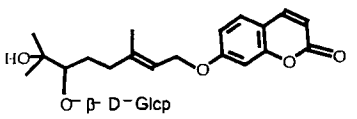
Ferula diversivittata

$C_{19}H_{20}O_4$, mp 55-57°

UV: 320 nm (lgε 4.32)

PMR: 1.72; 1.81; 2.10 (s, each 3H, H-8′, H-9′, H-10′), 4.61 (d, 1H, J = 7 Hz, H-1′), 5.51 (t, 2H, J = 7 Hz, H-2′), 3.09 (s, 2H, H-4′), 6.05 (br.s, 1H, H-6′), 6.20 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 7.25 (d, 1H, J = 8.5 Hz, H-5), 6.75 (q, 1H, J = 8.5; J = 2.5 Hz, H-6), 6.72 (d, 1H, J = 2.5 Hz, H-8) [1]

V. V. Kiseleva, G. K. Nikonov, and M. O. Karryev, Khim. Prir. Soedin., 344 (1975).



DIVERSOSIDE

Ferula diversivittata

$C_{25}H_{34}O_{10}$

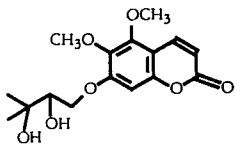
mp 154-155°, $[\alpha]_D^{20}$ +10.0° (alc)

UV: 244, 255, 327 (lgε 4.01; 3.86; 4.50)

IR: 3250-3600, 1620, 1562, 1515, 1735, 840

PMR: 6.25 (d, 1H, J = 9.5 Hz, H-3), 7.65 (d, 1H, J = 9.5 Hz, H-4), 7.35 (d, 1H, J = 8.5 Hz, H-5), 6.81 (q, 1H, J_1 = 8.5; J_2 = 2.0 Hz; H-6), 6.85 (d, 1H, J = 2.0 Hz, H-8), 4.30 (d, J = 9 Hz, 1H, H-1″), 3.2-3.9 (m, 7H, protons of the sugar moiety), 5.02 (t, 1H, J = 6.0 Hz, H-2′), 4.50 (d, 2H, J = 6.0 Hz, H-1′), 1.20 (s, 3H, H-10′), 0.90; 0.95 (s, each 3H, H-8′, H-9′)

Kh. M. Kamilov, V. V. Kiseleva, and G. K. Nikonov, Khim. Prir. Soedin., 781 (1974).



7-(2′,3′DIHYDROXY-3′-METHYLBUTOXY)-5,6-DIMETHOXYCOUMARIN

Artemisia laciniata

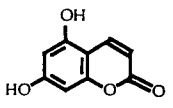
$C_{16}H_{20}O_7$, M^+ 324

Mp 110°, $[\alpha]_D^{20}$ –60,6° (alc)

UV: 298, 348

PMR: 6.30 (d, 1H, J = 10.0 Hz, H-3), 7.96 (d, 1H, J = 10.0 Hz, H-4), 7.10 (s, 1H, H-8), 3.86; 3.96 (s, each 3H, 2-OCH_3), 4.76 (d, 2H, J = 6.5 Hz, H-1′), 4.24 (d, 1H, J = 6.5 Hz, H-2′), 1.04; 1.10 (s, each 3H, H-4′, H-5′)

I. I. Chemesova, T. V. Bukreeva, and É. V. Boiko, Khim. Prir. Soedin., 115 (1990).



5,7-DIHYROXYCOUMARIN

Haplophyllum davuricum

$C_9H_6O_4$, mp 283-285° [1]

UV: 223, 253, 261, 334

IR: 3330, 1666, 1600, 1560

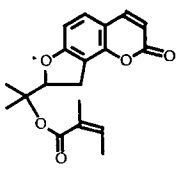
Mass: 178 (M^+), 150, 121, 111, 94, 81, 74, 69, 66, 65

PMR (Py-d_5): 6.02 (d, 1H, J = 10 Hz, H-3), 6.46 (br.s, 2H, H-6, H-8), 8.09 (d, 1H, J = 10 Hz, H-4) [2]

^{13}C NMR [2]:

C-2	156.6	7	162.9
3	107.3	8	93.3
4	140.0	9	157.5
5	161.0	10	101.8
6	98.6		

1. A. G. Heyes and A. Robertson, J. Chem. Soc., 1831 (1936).
2. D. Batsurén, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 650 (1982).



ZOSIMIN

Zosima korovinii

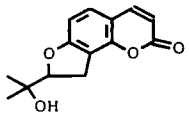
$C_{19}H_{20}O_5$, mp 119-120°

$[\alpha]_D^{20}$ +23° (dioxane), +27.2° (chlf)

UV: 217, 251, 262, 300, 327

PMR: 5.95 (d, 1H, J = 9.5 Hz, H-3), 7.37 (d, 1H, J = 9.5 Hz, H-4), 6.44 (d, 1H, J = 8.0 Hz, H-6), 7.0 (d, 1H, J = 8.0 Hz, H-5), 3.19 (d, 2H, J = 8.0 Hz, H-4′), 4.89 (t, 1H, J = 8.0 Hz, H-4′), 1.35; 1.39 (s, each 3H, H-1′, H-3′), 1.68; 1.89 (s, each 3H, H-4″, H-5″), 5.92 (m, 1H, H-3″)

1. Yu. E. Sklyar, L. G. Avramenko, M. G. Pimenov, amd R. N. Ovetisyan, Khim. Prir. Soedin., 779 (1982); 83 (1974).



ZOSIMOL (COLUMBIANETIN)

Angelica komarovii, Siseli mucronatum

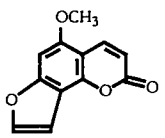
$C_{14}H_{14}O_4$, mp 156-158° $[\alpha]_D^{24}$ +209° (chlf) [1, 2]

UV: 220, 252, 262, 300, 327

Mass: 246, 231, 229, 228, 213, 200, 199, 191, 190, 189, 175, 174, 173, 163, 162, 161, 147, 145, 129, 128, 105, 89, 77, 69 [3]

PMR: 6.14 d (9.6 Hz; H-3), 7.75 d (9.6 Hz; H-4), 7.20 d (8.2 Hz; H-5), 6.67 d (8.2 Hz; H-6), 3.31 d (9.6 Hz; H-4′), 4.74 t (8.4 Hz; H-5′), 1.25; 1.35 s ($2CH_3$), 1.83 (OH) [4]

1. E. B. Zorin, N. V. Ivashchenko, M. E. Perel'son, V. V. Vandyshev, and M. G. Pimenov, Khim. Prir. Soedin., 388 (1984).
2. Murray.
3. P. I. Zakharov, P. V. Terent'ev. G. K. Nikonov, L. G. Avramenko, V. S. Kabanov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 560 (1974).
4. Perel'son.



ISOBERGAPTEN

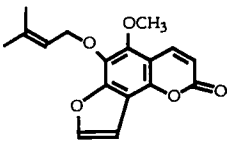
Angelica brevicaulis, Cachrus odontalgica, Heraclium aconitofolium, H. antasiaticum, H. asperum, H. cyclocarpum, H. disectum, H. grandiflorum, H. lehmannianum, H. legusticifolium, H. liskovi, H. moellendorfii, H. ponticum, H. sosnowskyi, H. villosa, H. welhelmsii, Platytaenia pimpinelloides, Psoralea drupaceae, Symphyoloma graveolens, Stellera chamaejasme

$C_{12}H_8O_4$, mp 218-222°

UV: 225, 270, 310, 355

IR: 3133, 3111, 3091, 1753, 1636, 1619, 1578, 1545 [1, 2, 3]

1. Murray.
2. Kuznetsova.
3. Perel'son.

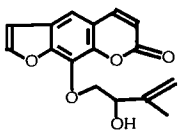


6-ISOPENTENYLOXYISOBERGAPTEN

Heracleum leskovii

$C_{17}H_{16}O_5$, mp 95-96° [1, 2]

1. Murray.
2. N. F. Komissarenko, A. I. Dergach, I. P. Kovalev, and I. F. Satsyperova, Khim. Prir. Soedin., 184 (1978).



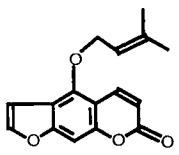
ISOGOSFEROL

Prangos lophoptera

$C_{16}H_{14}O_5$, M^+ 286, mp 72-73.5°

PMR: 6.35 (d, 1H, J = 10.0 Hz, H-3), 7.75 (d, 1H, J = 10.0 Hz, H-4), 6.81 (d, 1H, J = 2.5 Hz, H-4′), 7.68 (d, 1H, J = 2.5 Hz, H-5′), 7.37 (s, 1H, H-5), 1.87 (s, 1H, –OH), 4.99; 5.06 (s, H-4″), 4.30-4.68 (m, 2H, H-1″)

A. Z. Abyshev [sic].



ISOIMPERATORIN

Angelica decursiva, *A. dahurica*, *A. genuflexa*, *A. pachuptera*, *A. saxatilis*, *A. tschimganica*, *Cachrys odontalgica*, *C. pubescens*, *Cnidium dubium*, *Cryptodiscus didimus*, *Ferulago turcomanica*, *F. sylvatica*, *Haplophyllum schelkovnikovii*, *Hippomarathrum caspicum*, *H. microcarpum*, *Heracleum sosnowskyi*, *Komorovia anisosperma*, *Libanotis buchtormensis*, *Phlojodicarpus sibiricus*, *Peucedanum baicalense*, *P. morrisoni*, *Prangos aris-romanae*, *P. acaulis*, *P. alata*, *P. bucharica*, *P. equisetoides*, *P. lamellata*, *P. latiloba*, *P. lipskyi*, *P. lophoptera*, *P. ispairamica*, *P. fedtschenkovi*, *P. ferulaceae*, *P. quasiperforata*, *P. tschimganica*, *P. ornata*, *P. uloptera*, *Seseli abolonii*, *S. campestre*, *S. gracille*, *S. grandivittatum*, *S. jamuticum*, *S. krylovii*, *S. rigidum*

$C_{16}H_{14}O_4$, mp 106-108°

UV: 220, 248, 260, 267, 309 [1]

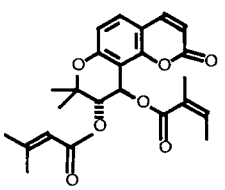
IR: 3161, 3141, 3083, 1729, 1625, 1610, 1580, 1547 [2]

PMR: 6.05 (d, 1H, J = 9.5 Hz, H-3), 7.93 (d, 1H, J = 9.5 Hz, H-4), 6.83 (d, 1H, J = 2.0 Hz, H-4′), 7.46 (d, 1H, J = 2.0 Hz, H-5′), 5.44 (t, 1H, J = 7.0 Hz, H-2″), 4.82 (d, 2H, J = 7.0 Hz, H-1″), 1.65; 1.77 (s, each 3H, H-4″, H-5″) [3]

^{13}C NMR [2]:

C-2	160.1	5	148.6	8a	152.1	2″	119.5
3	112.4	6	113.9	2′	146.0	3″	139.0
4	139.6	7	157.3	3′	105.5	4″	18.0
4a	106.8	8	93.6	1″	69.4	5″	25.5

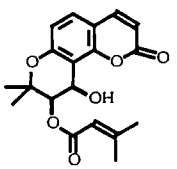
1. A. I. Sokolova, Yu. E. Sklyar, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 166 (1976).
2. D. Gantimur, A. I. Syrchina, and A. A. Semenov, Khim. Prir. Soedin., 109 (1986).
3. Perel'son.



ISOCALYPTERYXIN

Seseli campestre
$C_{24}H_{26}O_7$, viscous oil
IR: 1740, 1730, 1650, 1610, 1580, 1500

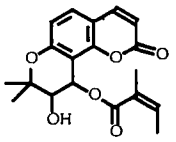
A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



ISOCAMPESOL

Seseli campestre
$C_{19}H_{20}O_6$

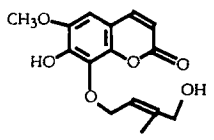
A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



ISOLEHMANNIDIN

Libanotis lehmanniae
$C_{19}H_{20}O_6$, M^+344 (amorph.)
$[\alpha]_D$ –54.5° (chlf)
UV: 229, 261, 332
IR: 3520-3400, 1732, 1610, 1490, 1470
PMR: 6.15 (d, 1H, J = 10.0 Hz, H-3), 7.78 (d, 1H, J = 10.0 Hz, H-4), 7.40 (d, 1H, J = 9.0 Hz, H-5), 6.73 (d, 1H, J = 9.0 Hz, H-6), 1.34 and 1.40 (s, each 3H, H-1′, H-5′), 3.95 (d, 1H, J = 5.0 Hz, H-3′), 6.33 (d, 1H, J = 5.0 Hz, H-4′), 1.85-1.98 (m, 6H, H-4″, H-5″), 6.05 (m, 1H, H-3″)

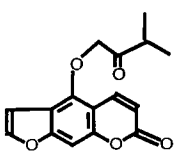
A. M. Aminov, K. B. Bizhanova, and G. K. Nikonov, Khim. Prir. Soedin., 246 (1975).



ISOOBTUSICIN

Haplophyllum obtusifolium
$C_{16}H_{16}O_6$, mp 203-204°
UV: 233, 308
IR: 3420, 1730, 1611, 1573
PMR: 6.30 (d, 1H, J = 10.0 Hz, H-3), 7.60 (d, 1H, J = 10.0 Hz, H-4), 6.67 (s, 1H, H-5), 5.26 (d, 2H, J = 8.0 Hz, H-1′), 5.70 (m, 1H, H-2′), 4.88 (br.s, 2H, H-4′), 1.71 (br.s, 3H, H-5′), 3.92 (s, 3H, OCH_3)

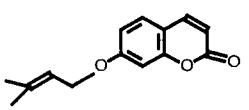
A. D. Matkarimov, Author's abstract of Candidate's dissertation [in Russian], Tashkent (1985).



ISOOXYPEUCEDANIN

Ferulago turcomanica, Prangos latiloba
$C_{10}H_{14}O_5$, mp 146-148°
IR: 3152, 3122, 1745, 1722, 1624, 1615, 1581, 1548 [1, 2]

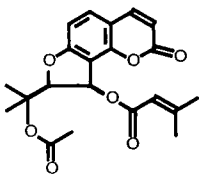
1. Murray.
2. Perel'son.



7-ISOPENTENYLOXYPEUCEDANIN

Heracleum dissectum
$C_{14}H_{14}O_3$, mp 73-74°
IR: 1718, 1615, 1560, 1505, 1460, 1375, 1350, 1280
Mass: 230(M^+), 163, 162, 75, 69 [1]
PMR: 6.21 (d, 1H, J = 10.0 Hz, H-3), 7.63 (d, 1H, J = 10.0 Hz, H-4), 6.82 (q, 1H, J_1 = 9.4, J_2 = 2.0 Hz, H-6), 7.36 (d, 1H, J = 9.4 Hz, H-5), 6.78 (d, 1H, J = 2.0 Hz, H-8), 4.56 (d, 2H, J = 6.4 Hz, H-1′), 5.46 (t, 1H, J = 6.4 Hz, H-2′), 1.71; 1.81 (br.s, each 3H, H-4′, H-5′) [2]

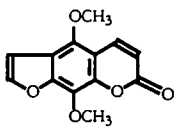
1. L. M. Belenovskaya, V. S. Sinitskii, and Kh. Tumboa, Khim. Prir. Soedin., 574 (1977).
2. Perel'son.



ISOPEUCENIDIN

Libanotis montana
$C_{12}H_{22}O_7$, mp 132-134°
$[\alpha]_D^{20}$ +139° (alc)
UV: 217, 249, 323
IR: 1730, 1650, 1625, 1580
PMR: 1.51; 1.62 (s, each 3H, H-1′, H-3′), 5.12 (d, 1H, J = 6.1 Hz, H-5′), 6.92 (d, 1H, J = 6.1 Hz, H-4′), 6.75 (d, 1H, J = 8.0 Hz, H-6), 7.31 (d, 1H, J = 8.0 Hz, H-5), 6.15 (d, 1H, J = 10.0 Hz, H-3), 7.52 (d, 1H, J = 10.0 Hz, H-4), 1.91 (s, 3H, –OAc), 1.82; 2.17 (s, each 3H, H-4″, H-5″), 5.52 (m, 1H, H-2″)

V. B. Andrianova and Yu. E. Sklyar, Khim. Prir. Soedin., 89 (1975).

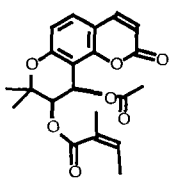


ISOPIMPINELLIN

Ammi majus, Angelica brevicaulis, Cnidium monnieri, Heracleum antasiatcum, H. asperum, H. carpaticum, H. cyclocarpum, H. dissectum, H. grandiflorum, H. ligusticifolium, H. lehmannianum, H. sibiricum, H. sommieri, H. sosnovsyi, H. stevenii, H. villosa, H. wilhelmsii, Hippomorathrum caspicum, H. microcarpum, Pastinaca sativa, Platytaenia pimpinelloides, Psoralea drupaceae, Symphyoloma graveolens, Stellera chamaejasme, Xanthogalum sachokianum
$C_{13}H_{10}O_5$, mp 148-151° [1, 2]
UV: 223, 241, 249, 268, 312
IR: 3150, 3124, 1755,1600, 1556

PMR: 6.22 d (10, H-3), 8.04 d (10, H-4), 6.94 d (2.3, H-4′), 7.57 d (2.3, H-5′), 4.10; 4.13 s ($2OCH_3$) [3]

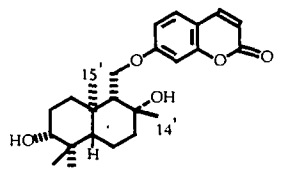
1. Murray.
2. Kuznetsova.
3. Perel'son.



ISOPTERYXIN

Angelica sachalinensis
$C_{21}H_{22}O_7$, mp 131-132°
$[\alpha]_D^{20}$ –41° (chlf) [1, 2]

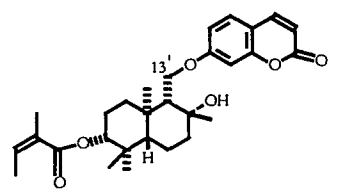
1. É. F. Ametova, G. K. Nikonov, and P. G. Gorovoi, Khim. Prir. Soedin., 385 (1976).
2 Murray.



ISOSAMARCANDIN

Ferula samarcandica
$C_{24}H_{32}O_5$
mp 221°, $[\alpha]_D$ +26.75° (alc)
UV: 218, 243, 253, 295, 326 nm (lgε 4.14; 3.63; 3.53; 3.93; 4.19)
IR: 3440, 3380, 1720, 1620, 1510, 1460 cm^{-1}
Mass: 385, 382, 349, 221, 219, 203, 187, 177, 163, 162
PMR: 0.73; 0.88; 0.95 (s, each 3H, H-15′, H-11′, H-12′), 1.17 (s, 3H, H-14′), 3.2 (br.s, 1H, H-6′), 4.1 and 4.32 (q, each 1H, J_1 =10.5 Hz, J_2 = 6; H-13′), 6.16 (d, 1H, J = 9.5 Hz, H-3), 7.52 (d, 1H, J = 9.5 Hz, H-4), 7.27 (d, 1H, J = 9.0 Hz, H-5), 6.77 (q, 1H, J_1 = 9.0, J_2 = 2.0 Hz, H-6), 6.74 (d, 1H, J = 2.0 Hz, H-8) [1]
Abs conf. [2]

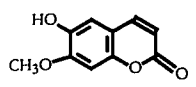
1. V. N. Borisov, A. I. Ban'kovskii, V. I. Sheichenko, and V. S. Kabanov, Khim. Prir. Soedin., 786 (1974).
2. A. I. Saidkhodzhaev and V. M. Malikov, Khim. Prir. Soedin., 707 (1978).



ISOSAMARCANDIN ANGELATE

Ferula pseudooreoselinum
$C_{29}H_{38}O_6$
mp 176-178°, $[\alpha]_D$ –26°(alc)
UV: 325, 252, 218 (lgε 4.11; 3.23; 4.18)
IR: 3600, 3500, 3060, 1740, 1712, 1618, 1513, 1240
PMR: 0.92 (s, 6H, H-11′, H-15′), 0.99 (s, 3H, H-12′), 1.23 (s, 3H, H-14′), 1.85 and 2.06 (s, 3H, H-4″, H-5″), 4.41 (q, 1H, J_1 = 11 Hz; J_2 = 4 Hz, H-13′), 4.13 (q, 1H, J_1 = 11 Hz; J_2 = 6 Hz, H-13′), 4.60 (m, 1H, H-6′), 6.02 (oct, 1H, J_1 = 12.5 Hz; J_2 = 5.0 Hz, H-4″), 6.23 (d, 1H, J = 9 Hz, H-3), 7.63 (d, 1H, J = 9 Hz, H-4), 7.33 (d, 1H, J = 7.7 Hz, H-5), 6.87 (s, 1H, H-8), 6.82 (q, J_1 = 7.7 Hz; J_2 = 2 Hz, 1H, H-6) [1]

1. N. P. Kir'alov and T. V. Bukreeva, Khim. Prir. Soedin., 643 (1972).



ISOSCOPOLETIN

Helichrysum italicum

$C_{10}H_8O_4$, mp 185°

UV: 274, 360 [1]

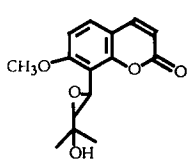
Mass: M^+192

PMR: 6.27 (d, 1H, J = 9.5 Hz, H-3), 7.76 (d, 1H, J = 9.5 Hz, H-4), 6.92 (s, 1H, H-5), 6.85 (s, 1H, H-8), 3.90 (s, 3H, OCH_3) [2]

^{13}C NMR [3]:

C-2	160.6	7	151.6
3	112.5	8	99.9
4	144.1	9	148.2
5	111.8	10	111.5
6	143.3	OCH_3	56.3

1. Kuznetsova.
2. B. S. Karasartov, V. A. Kurkin, G. G. Zapesochnaya, Khim. Prir. Soedin., 577 (1992).
3. A. Z. Abyshev and V. P. Zmeikov, Khim. Prir. Soedin., 299 (1982).



ISOPHLOJODICARPIN

Phlojodicarpus sibiricus

$C_{15}H_{16}O_5$, mp 132-134°

$[\alpha]_D^{25}$ –102.5° (met)

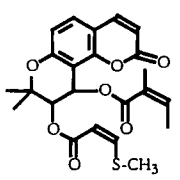
UV: 260; 328

IR: 3430, 3000, 1714, 1610, 1246, 930, 860, 835

Mass: 276 (M^+), 246, 205, 204

PMR: 6.11 (d, 1H, J = 10.0 Hz, H-3), 7.73 (d, 1H, J = 10.0 Hz, H-4), 6.61 (d, 1H, J = 8.0 Hz, H-6), 7.34 (d, 1H, J = 8.0 Hz, H-5), 4.53 (d, 1H, J = 5.0 Hz, H-1′), 3.80 (d, 1H, J = 5.0 Hz, H-2′), 3.68 (s, 3H, OCH_3), 4.11 (s, 1H, –OH), 1.31 (s, 6H, H-4′, H-5′)

D. Gantimur and A. A. Semenov, Khim. Prir. Soedin., 47 (1981).



ISOFLOROSELIN

Seseli coronatum

$C_{23}H_{24}O_7S$, mp 122-123°

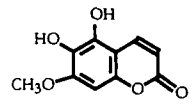
$[\alpha]_D^{20}$ –87.3° (alc)

UV: 247, 257, 269, 320

IR: 1750-1700, 1620

PMR: 6.12 (d, 1H, J = 10.0 Hz, H-3), 7.51 (d, 1H, J = 10.0 Hz, H-4), 6.71 (d, 1H, J = 8.5 Hz, H-5), 7.19 (d, 1H, J = 8.5 Hz, H-6), 6.61 (d, 1H, J = 5.0 Hz, H-4′), 5.34 (d, 1H, J = 5.0 Hz, H-3′), 7.26; 5.70 (d, each 1H, J = 8.5 Hz, H-2″, H-3″), 2.34 (s, 3H, S–CH_3), 1.7-2.0 (br.s, 6H, H-4″, H-5″), 5.88 (m, 1H, H-3″)

L. I. Dukhovlinova, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 782 (1974).



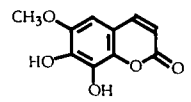
ISOFRAXETIN

Fraxinus mandschurica

$C_{10}H_8O_5$, M^+208, mp 228-230°

UV: 227, 350

M. V. Artem'eva, G. K. Nikonov, and M. O. Karryev, Khim. Prir. Soedin., 493 (1973).



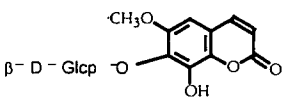
ISOFRAXIDIN

Artemisia scotina, Eleutherococcus senticosus, Salsola laricifolia

$C_{11}H_{10}O_5$, M^+222, mp 141-147° [1, 2, 3]

UV: 226, 256, 343

1. Murray.
2. M. I. Yusupov and G. P. Sidyakin, Khim. Prir. Soedin., 91 (1975).
3. S. Narantuya, D. Batsurén, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 243 (1986).



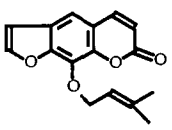
ISOFRAXIDIN 7-GLUCOPYRANOSIDE (CALYCANTHOSIDE)

Salsola laricifolia

$C_{17}H_{20}O_{10}$, mp 217-218°; $[\alpha]_D^{20}$ –42° (met)

UV: 230, 308, 342 [1, 2]

1. Kuznetsova.
2. S. Narantuya, D. Batsurén, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 243 (1986).



IMPERATORIN

Ammi majus, Angelica dahurica, A. decursiva, A. tschimganica, A. saxatilis, A. ursina, Archangelica decurrens, Cachrys odontalgica, C. pubescens, Cnidium dubium, C. monnieri, Cryptodiscus didimus, Heracleum asperum, H. ligusticifolium, H. moelendorfii, H. ponticum, Hippomarathrum caspicum, H. microcarpum, Pastinaca sativa, Prangos acaulis, P. paris-romanae, P. bucharica, P. isphairamica, P. lamellata, P. lophoptera, P. lipskyi, P. fedtschenkoi, P. ornata, P. pabularia, P. sarawschanica, P. tschimganica, P. uloptera, Seseli gracile, S. rigidum, S. talassicum, Symphyoloma graveolens

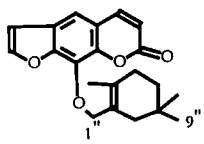
$C_{16}H_{14}O_4$, mp 102-103°

UV: 219, 250, 265, 301

IR: 3140, 3116, 3076, 3025, 1726, 1715, 1680, 1628, 1590 [1, 2]

PMR: 6.17 d (10.0; H-3), 7.60 d (10.0; H-4), 7.20 s (H-5), 6.70 d (2.3; H-4′), 7.60 d (2.3; H-5′), 4.86 d (6.5; H-1″), 5.49 t (6.5; H-2″), 1.70 s ($2CH_3$) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



ILIENSIN

Seseli iliense

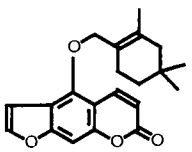
$C_{21}H_{22}O_4$, mp 72-73°

UV: 219, 245, 250, 265, 302

IR: 3145, 3120, 1720, 1622, 1586

PMR: 6.27 (d, 1H, J = 9.5 Hz, H-3), 7.69 (d, 1H, J = 9.5 Hz, H-4), 7.28 (s, 1H, H-5), 7.74 (d, 1H, J = 2.5 Hz, H-5'), 7.61 (d, 1H, J = 2.5 Hz, H-4'), 4.91 (s, 2H, H-1''), 2.16 (m, 2H, H-3''), 1.56 (s, 3H, H-8'), 0.84 (s, 6H, H-9'', H-10'')

L. I. Dukhovlinova, M. E. Perel'son, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 308 (1974).



ISELIN

Seseli iliense

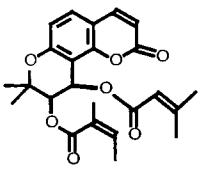
$C_{21}H_{22}O_4$, mp 127-128°

UV: 221, 244, 251, 260, 268

IR: 3170, 3130, 3075, 1722, 1624, 1605, 1579, 1545

PMR: 6.19 (d, 1H, J = 10.0 Hz, H-3), 8.04 (d, 1H, J = 10.0 Hz, H-4), 7.05 (s, 1H, H-8), 6.91 (d, 1H, J = 2.0 Hz, H-4'), 7.52 (d, 1H, J = 2.0 Hz, H-5'), 4.85 (s, 2H, H-1''), 2.16 (m, 2H, H-3''), 1.62 (s, 3H, H-8''), 0.86 (s, 6H, H-9'', H-10'')

L. I. Dukhovlinova, M. E. Perel'son, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 308 (1974).

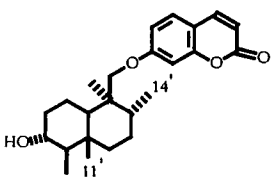


CALYPTERYXIN

Seseli campestre

$C_{24}H_{26}O_7$, mp 149-151°, $[\alpha]_D^{20}$ –64° (chlf) [1, 2]

1. Murray.
2. M. E. Shagova, V. N. Florya, G. A. Kuznetsova, and M. E. Perel'son, Khim. Prir. Soedin., 665 (1973).



KAMOLOL

Ferula penninervis

$C_{24}H_{32}O_4$, mp 141-142°, $[\alpha]_D$ +55° (chlf)

UV: 245, 255, 295, 325 [lgε 3.55; 3.38; 3.25; 4.15]

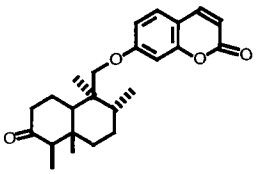
IR:1720, 1620, 1560, 3200-3600 [1, 2]

Mass: 384, 223, 222, 205, 193, 176, 175, 166, 163, 162, 149, 135, 123, 109, 97, 95, 83, 69 [3]

PMR: 6.20 (d, 1H, J = 10.0 Hz, H-3), 7.55 (d, 1H, J = 10.0 Hz, H-4), 7.28 (d, 1H, J = 8.0 Hz, H-5), 6.77 (q, 1H, J = 8.0; J_2 = 2.0 Hz, H-6), 6.72 (d, 1H, J = 2.0 Hz, H-8), 3.70 (s, 2H, H-13'), 0.72 and 0.77 (s, each 3H, H-15', H-11'), 0.95 (d, 3H, J = 7.5 Hz, H-14'), 0.85 (d, 3H, J = 7.5 Hz, H-12'), 3.45 (m, 1H, H-6') [4]

1. N. E. Ermatov, A. I. Ban'kovskii, and M. E. Perel'son, Khim. Prir. Soedin., 158 (1966)
2. N. E. Ermatov, A. I. Ban'kovskii, M. E. Perel'son, G. M. Syrova, and Yu. N. Sheinker, Khim. Prir. Soedin., 79 (1969).

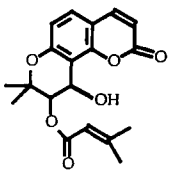
3. I. P. Zakharov, V. S. Kabanov, M. E. Perel'son, A. I. Ban'kovskii, and N. E. Ermatov, Khim. Prir. Soedin., 296 (1970).
4. M. E. Perel'son, A. I. Ban'kovskii, and N. E. Ermatov, Khim. Prir. Soedin., 702 (1975).



KAMOLONE

Ferula penninervis, F. kopetdaghensis
$C_{24}H_{30}O_4$, mp 191-192°, $[\alpha]_D$ +63° (s 1.0; chlf)
UV: 244, 255, 327 (lgε 3.64; 3.38; 4.29) [1, 2]
IR: 1733, 1617, 1562, 1713, 2990, 2965, 2940 [2, 3]
Mass: 384, 223, 222, 205, 193, 176, 175, 166, 163, 162, 149, 135, 123, 109, 97, 95, 83, 69 [2]
PMR: 6.16 (d, 1H, J = 10.0 Hz, H-3), 7.57 (d, 1H, J = 10.0 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.78 (q, 1H, J = 8.5; J_2 = 2.0 Hz, H-6), 6.74 (d, 1H, J = 2.0 Hz, H-8), 3.74 (s, 2H, H-13′), 0.75 (s, 6H, H-11′, H-15′), 0.98 (d, 3H, J = 7.5 Hz, H-14′), 0.86 (d, 3H, J = 7.5 Hz, H-12′) [4]

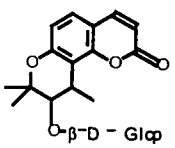
1. Kh. M. Kamilov and G. K. Nikonov, Khim. Prir. Soedin., 85 (1974).
2. N. E. Ermatov, A. I. Ban'kovskii, M. E. Perel'son, G. M. Syrova, and Yu. N. Sheinker, Khim. Prir. Soedin., 79 (1969).
3. I. P. Zakharov, V. S. Kabanov, M. E. Perel'son, A. I. Ban'kovskii, and N. E. Ermatov, Khim. Prir. Soedin., 296 (1970).
4. M. E. Perel'son, A. I. Ban'kovskii, and N. E. Ermatov, Khim. Prir. Soedin., 703 (1975).



CAMPESOL

Seseli campestre
$C_{19}H_{20}O_6$, mp 122-123.5°, $[\alpha]_D$ +67.6° (chlf)
UV: 220, 248, 258, 320
IR: 3400, 1720, 1695, 1655, 1615, 1575, 1500

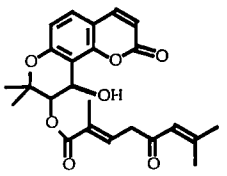
A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



CAMPESTRINOSIDE

Seseli campestre
$C_{20}H_{24}O_{10}$, mp 172-173°, $[\alpha]_D^{20}$ –272.5° (alc)
IR: 3490-3250, 1725, 1670, 1620, 1572, 1500, 1095, 1075, 1052, 908, 890, 840
PMR: signals of the sugar moiety: 3.72-4.50 m (10H), 5.25 d (7, 1H)

A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



CAMPESTRINOL

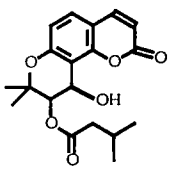
Seseli campestre

$C_{24}H_{26}O_7$, mp 116-118°

IR: 3390, 1725, 1690, 1680, 1645, 1590, 1560, 1500

PMR: the protons H-3-H-6-6.11-7.61; 5.20 d; 5.10 d (3; H-3′; H-4′) 1.75; 1.78; 2.04 s (3 CH_3); 1.32; 1.43 s (2CH_3); 5.54; 6.0 m (=CH–), 3.45 (OH), 4.93-4.97 m (=C–CH_2–)

A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



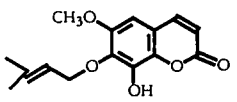
CAMPESTROL

Seseli campestre

$C_{19}H_{22}O_6$, $[\alpha]_D^{20}$ +32° (chlf)

IR: 3450, 1735, 1708, 1650, 1580, 1500

A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



CAPENSIN

Haplophyllum obtusifolium [1, 2]

$C_{15}H_{16}O_5$, mp 137-139°

UV: 230, 259, 315

IR: 3410-3140, 1698, 1617, 1572, 1500, 849, 821, 740

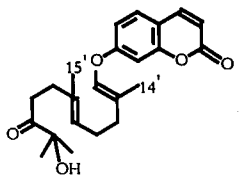
Mass: 276 (M^+), 209, 208, 193, 180, 165, 153, 137, 109, 69, 53

PMR: 1.56 (br.s, 6H, H-4′, H-5′), 3.63 (s, 3H, OCH_3), 4.53 (d, 2H, J = 7.0 Hz, H-1′), 5.32 (m, 1H, H-2′), 6.08 (d, 1H, J = 9.5 Hz, H-3), 6.35 (s, 1H, H-5), 7.41 (d, 1H, J = 9.5 Hz, H-4)

^{13}C NMR:

C-2	160.2			C-1′	68.9
3	114.4	7	139.0	2′	120.7
4	144.7	8	137.4	3′	138.8
5	100.2	9	138.8	4′	17.7
6	150.1	10	114.3	5′	25.5

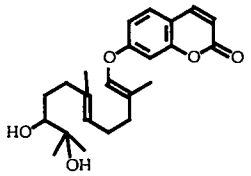
1. É. Kh. Batirov, A. D. Matkarimov, V. M. Malikov, N. R. Yagudaev, and E. Seitmuratov, Khim. Prir. Soedin., 785 (1980).
2. A. D. Vdovin, É. Kh. Batirov, A. D. Matkarimov, M. R. Yagudaev, and V. M. Malikov, Khim. Prir. Soedin., 796 (1987).



KARATAVIKIN

Ferula karatavica
$C_{24}H_{30}O_5$, mp 59-60°
UV: 222, 322 (lgε 3.78; 4.10)
IR: 3520, 1750, 1718, 1620, 1518, 1408
PMR: 1.36 (s, 6H, H-11′, H-12′), 1.61 and 1.74 (s, each 3H, H-15′, H-14′), 5.15 and 5.45 (t, each 1H, H-1′, H-10′)

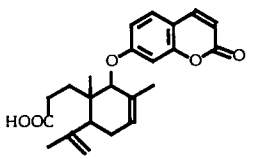
N. P. Kir'yalov and V. Yu. Bagirov, Khim. Prir. Soedin., 223 (1967).



KARATAVICINOL

Ferula karatavica
$C_{24}H_{32}O_5$, mp 52-53°
UV: 324 (lgε 4.20)
IR: 3370, 1725, 1615, 1404, 1135, 1027, 900, 835, 794
PMR: 1.20 (s, 6H, J = 1.5 Hz, H-11′, H-12′), 1.76 and 1.57 (s, each 3H, H-14′, H-15′), 5.37 and 5.10 (d, each 1H, J = 6 Hz, H-1′, H-10′)

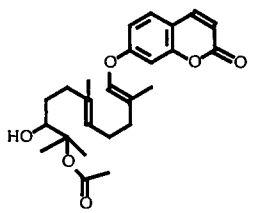
N. P. Kir'yalov and V. Yu. Bagirov, Khim. Prir. Soedin., 225 (1969).



KARATAVIC ACID

Ferula karatavica
$C_{24}H_{28}O_5$, mp 89-90°, $[\alpha]_D$ –105° (alc)
UV: 222, 244, 255, 295, 324
IR: 1750, 1720, 1660, 1565, 1520
PMR (of the methyl ester): 6.15 (d, 1H, J = 10.0 Hz, H-3), 7.55 (d, 1H, J = 10.0 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.77 (q, 1H, J = 8.5; J_2 = 2.0 Hz, H-6), 6.75 (d, 1H, J = 2.0 Hz, H-8), 3.57-4.20 (m, 2H, H-13′), 1.65 and 1.76 (H-11′, H-14′), 4.73 and 4.81 (s, each 1H, H-12′), 0.87 (s, H-15′)

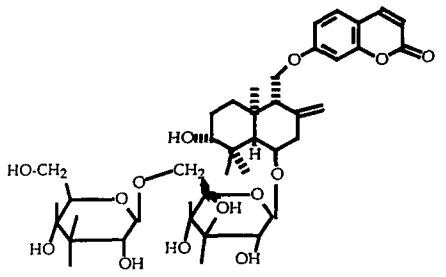
1. N. P. Kir'yalov and V. Yu. Bagirov, Khim. Prir. Soedin., 283 (1968).
2. V. Yu. Bagirov and V. I. Sheichenko, Khim. Prir. Soedin., 700 (1975).



KARATAVICIN

Ferula karatavica
$C_{26}H_{34}O_6$
mp 60-62° $[\alpha]_D$ –21° (alc)
UV: 219, 243, 250, 325 (lgε 4.36; 3.65; 3.53; 4.10)
IR: 3450, 1735, 1720, 1620, 1518, 1510 cm^{-1}
PMR: 1.13 (s, 6H, H-11′, H-12′), 1.53 and 1.59 (br.s, each 3H, H-14′, H-15′), 2.0 (s, 3H, H-2″), 4.53 (d, 2H, J = 9 Hz, H-13′), 4.73 (q, 1H, J_1 = 8 Hz, J_2 = 3 Hz, H-6′), 5.05 (m, 1H, H-1′), 6.16 (d, 1H, J = 10 Hz, H-3), 6.72 (m, 1H, H-8), 6.76 (m, 1H, H-6), 7.28 (m, 1H, H-5), 7.55 (d, 1H, J = 10 Hz, H-4)

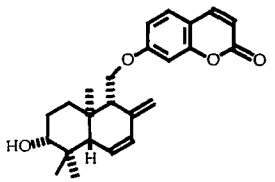
1. A. A. Nabiev, V. M. Malikov, and T. Kh. Khasanov, Khim. Prir. Soedin., 526 (1983).



CAULOSIDE

Ferula conocaula
$C_{36}H_{50}O_{15}$
mp 161-162°, $[\alpha]_D$ –90° (chlf)
IR: 3400, 1730, 1617, 1560, 1514
PMR: 0.90 (s, 3H, H-11′), 1.58 (s, 6H, H-15′, H-12′), 3.10-5.95 (m, 12H, H-6′, H-4′, H-13′), 10H of the carbohydrate moiety

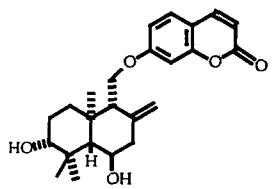
Z. A. Kuliev, T. Kh. Khanasov, and V. M. Malikov, Khim. Prir. Soedin., 477 (1979).



CAUFERIDIN

Ferula conocaula
$C_{24}H_{28}O_4$
mp 184-185.5°, $[\alpha]_D$ –60° (alc)
IR: 3630, 1715, 1622, 1560, 1510
Mass: 380, 219, 201, 162
PMR: 0.79 (s, 6H, H-11′, H-15′), 1.02 (s, 3H, H-12′), 3.27 (q, 1H, J_1 = 9.0 Hz, J_2 = 6.0 Hz, H-6′), 4.14 (m, 2H, H-13′), 4.89 and 4.95 (br.s, each 1H, H-14′), 5.68 and 6.17 (d, each 1H, J = 10 Hz, H-3′ and H-4′), 6.19 (d, 1H, J = 9.5 Hz, H-3), 7.62 (d, 1H, J = 9.5 Hz, H-4), 6.77 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.5 Hz, H-6), 7.34 (d, 1H, J = 9.0 Hz, H-5), 6.81 (d, 1H, J = 2.5 Hz, H-8) [1]

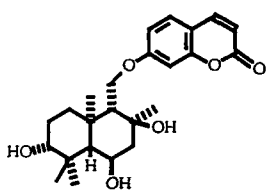
Z. A. Kiliev and T. Kh. Khasanov, Khim. Prir. Soedin., 327 (1978).



CAUFERIN

Ferula conocaula
$C_{24}H_{30}O_5$
mp 104-106°, $[\alpha]_D$ –50° (chlf)
UV: 217, 241, 296, 325 (lgε 3.96; 3.50; 3.80; 3.95)
IR: 3600-3200, 1730, 1617, 1560, 1518
Mass: 398, 380, 237, 219, 201, 162
PMR: 0.83; 0.97; 1.30 (s, each 3H, H-11′, H-12′, H-15′), 4.11 (m, 2H, H-13′), 4.56 and 4.89 (br.s, each 1H, H-14′), 3.20 (q, 1H, J_1 = 8.5 Hz, J_2 = 6.0 Hz, H-6′), 3.95 (sex, 1H, J_1 = 12 Hz, J_2 = 11 Hz, J_3 = 5 Hz, H-4′) [1]

Z. A. Kiliev and T. Kh. Khasanov, Khim. Prir. Soedin., 327 (1978).

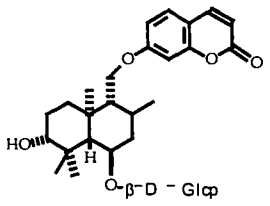


CAUFERININ

Ferula conocaula
$C_{24}H_{32}O_6$
mp 204-206°, $[\alpha]_D$ +37.5° (m)
UV: 218, 244, 255, 328 nm (lgε 4.22; 3.80; 3.65; 4.08)

IR: 3400, 1713, 1618, 1515 cm^{-1}
Mass: 416, 398, 380, 255, 237, 219, 201, 162, 161
PMR: 1.04 (s, 3H, H-11′), 1.37 (s, 6H, H-12′, H-15′), 1.85 (s, 3H, H-14′), 3.57 (m, 2H, H-4′, H-6′), 4.25 (m, 2H, H-13′), 6.16 (d, 1H, J = 9.0 Hz, H-3), 7.52 (d, 1H, J = 9.0 Hz, H-4), 7.30 (d, 1H, J = 9.0 Hz, H-5), 6.78 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.0 Hz, H-6), 6.76 (d, 1H, J = 2.0 Hz, H-8) [1]

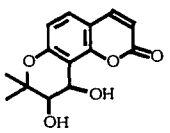
1. Z. A. Kuliev, T. Kh. Khasanov, and V. M. Malikov, Khim. Prir. Soedin., 151 (1979).



CAUFEROSIDE

Ferula conocaula
$C_{30}H_{40}O_{10}$
mp 176-177°, $[\alpha]_D$ –140° (alc)
UV: 217, 245, 254, 297, 326 (lgε 4.35; 3.74; 3.47; 4.01; 4.24)
IR: 3430, 1725, 1615, 1560, 1512
PMR: 0.79 (s, 3H, H-11′), 1.40 (s, 6H, H-12′, H-15′), 3.10-5.92 (m, 10H, H-4′, H-6, H-14′, protons of the carbohydrate moiety)

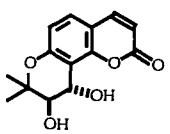
Z. A. Kuliev, T. Kh. Khasanov, and V. M. Malikov, Khim. Prir. Soedin., 477 (1979).



***cis*-KHELLACTONE**

Libanotis lehmanniana, Seseli tenuisectum, S. lehmanniana
$C_{14}H_{14}O_5$, mp 174.5-175°, $[\alpha]_D$ +82° (chlf) [1]
UV: 258, 228
IR: 3380, 3080, 3060, 1698, 1607, 1568 [2]
Mass: 262, 244, 243, 229, 228, 191, 190, 176, 162, 134, 72, 71 [3]

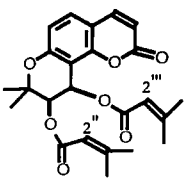
1. A. I. Sokolova, A. I. Ban'kovskii, M. G. Pimenov, and T. A. Blokhina, Khim. Prir. Soedin., 759 (1970).
2. Perel'son.
3. P. I. Zakharov, P. V. Terent'ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 704 (1970).



***trans*-KHELLACTONE**

Seseli tenuisectum, S. campestre
$C_{14}H_{14}O_5$, mp 185-187°, $[\alpha]_D^{20}$ –24.5° (chlf) [1, 2]

1. Murray.
2. A. Z. Abyshev, I. P. Sidorova, D. Z. Abyshev, V. I. Florya, V. P. Zmeikov, and Yu. B. Kerimov, Khim. Prir. Soedin., 434 (1982).



cis-KHELLACTONE DISENECIONATE

Seseli incanum

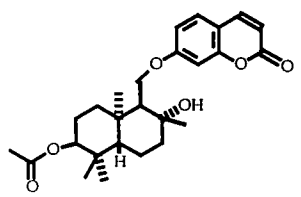
$C_{24}H_{26}O_7$, M^+426, mp 108-110°

$[\alpha]_D^{23}$ –20.0° (chlf)

IR: 1731, 1635, 1610, 1587, 1497 [1]

PMR: 5.98 (d, 1H, J = 10.0 Hz, H-3), 7.43 (d, 1H, J = 10.0 Hz, H-4), 6.62 (d, 1H, J = 8.5 Hz, H-6), 7.22 (d, 1H, J = 8.5 Hz, H-5), 1.34 (s, 6H, H-1′, H-5′), 5.22 (d, 1H, J = 5 Hz, H-3′), 6.35 (d, 1H, J = 5.0 Hz, H-4′), 1.82 (s, 6H, H-4″, H-5″), 2.19 (s, 6H, H-4‴, H-5‴), 5.42-5.46 (m, 2H, H-2″, H-2‴) [2]

1. V. V. Vandyshev, Yu. E. Sklyar, L. I. Dukhovlinova, and M. G. Pimenov, Khim. Prir. Soedin., 512 (1975).
2. Perel'son.



KELLERIN

Ferula kellerii

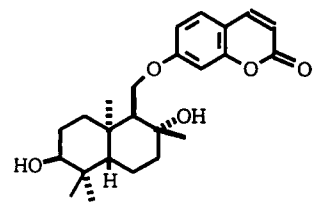
$C_{26}H_{34}O_6$

mp 76-78°, $[\alpha]_D$ –66.7° (alc)

UV: 215, 243, 253, 325 (lgε 4.17; 3.65; 3.46; 4.16)

PMR: 0.84 (s, 3H, H-11′), 0.87 (s, 3H, H-12′), 1.26 (s, 3H, H-15′), 1.31 (s, 3H, H-14′), 1.71 (s, 3H, H-2″), 4.11 (m, 2H, H-13′), 4.58 (br.s, W1/2 = 6.0 Hz, H-6′), 6.20 (d, 1H, J = 9.5 Hz, H-3), 7.62 (d, 1H, J = 9.5 Hz, H-4), 7.35 (d, 1H, J = 9.0 Hz, H-5), 6.82 (m, 2H, H-6, H-8) [1, 2]

1. V. B. Andrianova, Yu. E. Sklyar, and M. E. Perel'son, Khim. Prir. Soedin., 795 (1977).
2. M. E. Perel'son, V. B. Andrianova, Yu. E. Sklyar, and V. B. Andrianova, Khim.-farm. Zh., **8**, 33 (1977).



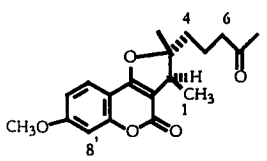
DEACETYLKELLERIN

Ferula kellerii

$C_{24}H_{32}O_5$

PMR: 0.81; 0.92; 1.22 (s, each 3H, H-11′, H-12′, H-15′), 1.28 (s, 3H, H-14′), 3.15 (q, 1H, J_1 = 3.0 Hz, J_2 = 2.0 Hz, H-6′), 4.01 and 4.16 (q, each 1H, J_1 = 10.3 Hz, J_2 = 3.0 Hz, J_2 = 3.4 Hz, H-13′), 6.16 (d, 1H, J = 9.5 Hz, H-3), 7.53 (d, 1H, J = 9.5 Hz, H-4), 7.27 (d, 1H, J = 8.0 Hz, H-5), 6.76 (q, 1H, J = 8.0 Hz, J_2 = 2.0 Hz, H-6), 6.75 (d, 1H, J = 2.0 Hz, H-8)

V. B. Andrianova, Yu. E. Sklyar, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 795 (1973).



α-KIRIALOVIN

Ferula kirialovii M. Pimen

$C_{19}H_{22}O_5$

mp 74-76°, $[\alpha]_D$ +0.5° (chlf)

UV: 208, 228, 244, 278, 289, 306, 319, 334 nm

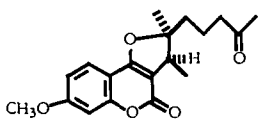
IR: 3080, 1715, 1640, 1615, 1570, 1520, 1480, 1465, 1415, 1400

PMR: 7.42 (d, 1H, J = 9.0 Hz, H-5′), 6.73 (1H, q, J_1 = 9 Hz, J_2 = 5 Hz, H-6′), 6.72 (d, 1H, J = 1.5 Hz, H-8′), 1.20 (d, 3H, J = 7 Hz, H-1), 3.16 (q, 1H, J = 7 Hz, H-2), 1.65 (t, 2H, J = 6 Hz, H-4), 1.60-1.72 (m, 2H, H-5), 2.39 (t, 2H, J = 6 Hz, H-6), 2.04 (s, 3H, H-8), 1.35 (s, 3H, H-9), 3.77 (s, 3H, OCH_3)

^{13}C NMR:

C 2′	160.2	8′	100.2	2	41.9	7	207.9
3′	102.8	9′	156.2	3	96.3	8	29.7
4′	164.2	10′	105.5	4	40.8	9	20.0
5′	123.1	11′	55.5	5	17.4		
6′	111.4	1	13.7	6	43.0		
7′	162.6						

T. V. Bukreeva, A. L. Shavarda, and M. G. Pimenov, Rastit. Resurs, **29**, No. 2, 45 (1993).



β-KIRIALOVIN

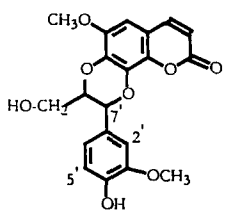
Ferula kirialovii M. Pimen

$C_{19}H_{22}O_5$

^{13}C NMR:

C 2′	160.2	8′	100.2	2	43.6	7	207.9
3′	102.8	9′	156.2	3	95.6	8	29.7
4′	164.2	10′	105.5	4	33.8	9	23.3
5′	123.1	11′	55.5	5	17.5		
6′	111.4	1	13.0	6	43.1		
7′	162.6						

T. V. Bukreeva, A. L. Shavarda, and M. G. Pimenov, Rastit. Resurs, **29**, No. 2, 45 (1993).



CLEOMISCOSIN B

Salsola laricifolia

$C_{20}H_{18}O_8$

mp 239-242°

UV: 214, 235, 325

IR: 3423, 2930, 1700, 1611, 1570, 1521

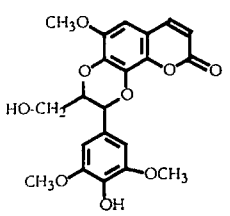
Mass: 386 (M^+), 368, 249, 208, 206, 180, 178, 139, 137

PMR (DMSO-d_6): 7.94 (d, 1H, J = 9.6 Hz, H-4), 7.03 (d, 1H, J = 1.9 Hz, -H-2′), 6.89 (s, 1H, H-6′), 6.88 (s, 1H, H-5), 6.84 (d, 1H, J = 8.2 Hz, H-5′), 6.30 (d, 1H, J = 9.6 Hz, H-3), 5.01 (d, 1H, J = 7.7 Hz, H-7′), 4.30 (dd, 1H, H-8′), 3.70 (dd, 1H, H-9a), 3.45 (dd, 1H, H-9b), 3.79; 3.81 (s, each 3H, $2OCH_3$)

^{13}C NMR:

C-2	160.3	8	132.8	1′	126.0	6′	120.9
3	113.2	9	138.2	2′	112.2	7′	76.3
4	144.9	10	111.5	3′	147.8	8′	78.0
5	101.2			4′	147.8	9′	60.0
6	145.5			5′	115.6		
7	137.2					OCH_3	56.02; 56.14

1. B. Proksa, D. Uhrik, S. Narantuyaa, and D. Batsuren, Pharmazie, **45**, 804 (1990).
2. D. Batsurén, Author's abstract of Doctoral dissertation [in Russian], Tashkent (1992).

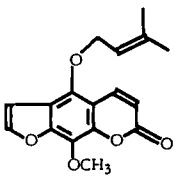


CLEOMISCOSIN D

Salsola laricifolia
$C_{21}H_{20}O_9$
mp 240-242°
IR: 3423, 2930, 2850, 1700, 1611, 1570, 1510
Mass: 416 (M^+), 398, 249, 210, 208, 193, 167
PMR: (DMSO-d_6): 7.94 (d, 1H, J = 9.6 Hz, H-4), 6.88 (s, 1H, H-5), 6.75 (s, 1H, H-2′), 6.30 (d, 1H, J = 9.6 Hz, H-3), 4.99 (d, 1H, J = 7.7 Hz, H-7′), 4.34 (dd, 1H, H-8′), 3.70 (dd, 1, H-9′a), 3.45 (dd, 1H, H-9′b), 3.78; 3.81 (s, each 3H, 2OCH_3)
^{13}C NMR:

C-2	160.3	8	131.8	1′	127.0	6′	105.9
3	113.2	9	138.2	2′	105.9	7′	76.6
4	144.9	10	111.5	3′	148.1	8′	17.9
5	101.2			4′	136.3	9′	60.0
6	145.5			5′	148.1		
7	137.2					OCH_3	56.14; 56.41

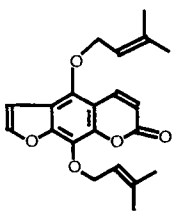
1. B. Proksa, D. Uhrik, S. Narantuyaa, and D. Batsuren, Pharmazie, **45**, 804 (1990).
2. D. Batsurén, Author's abstract of Doctoral dissertation [in Russian], Tashkent (1992).



CNIDILIN

Cnidium dubium
$C_{17}H_{16}O_5$, mp 117-118°

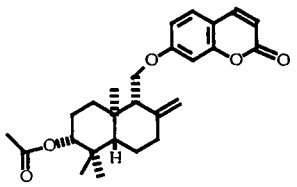
N. F. Komissarenko and V. T. Chernobai, Khim. Prir. Soedin., 375 (1966).



CNIDICIN

Cnidium dubium, Heracleum antasiaticum, Prangos tschimganica
$C_{21}H_{22}O_5$, mp 78-79° [1, 2]

1. Murray.
2. A. Z. Abyshev, Khim. Prir. Soedin., 830 (1980).



COLLADIN

Colladonia triquetra

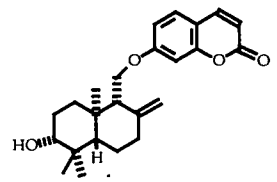
$C_{26}H_{32}O_5$, mp 153-154°, $[\alpha]_D$ –65° (chlf) [1]

UV: 222, 245, 254, 295, 327

IR: 1715, 1660, 1620, 1560, 1520, 3200-3500

PMR: 6.20 (d, 1H, J = 10.0 Hz, H-3), 7.61 (d, 1H, J = 10.0 Hz, H-4), 7.35 (d, 1H, J = 8.5 Hz, H-5), 6.79 (q, 1H, J = 8.5; J_2 = 1.5 Hz, H-6), 6.79 (d, 1H, J = 1.5 Hz, H-8), 4.20 (d, J = 6.0 Hz, 2H, H-13′), 4.53 and 4.90 (s, each 1H, H-14′), 0.85 (s, 6H, H-11′, H-15′), 0.88 (s, 3H, H-12′), 4.55 (m, 1H, H-6′), 2.01 (s, 3H, H-2″) [2]

1. A. I. Ban'kovskii, N. E. Ermatov, M. E. Perel'son, L. Bubeva-Ivanova, and N. S. Pavlova, Khim. Prir. Soedin., 173 (1970).
2. Perel'son.



COLLADONIN

Colladonia triquetra

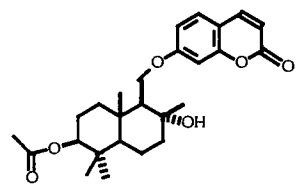
$C_{24}H_{30}O_4$, mp 158-160°, $[\alpha]_D$ –60° (chlf) [1]

UV: 222, 245, 254, 327

IR: 1715, 1560, 1620, 1660, 1515, 3200-3600

PMR: 6.18 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 7.29 (d, 1H, J = 8.5 Hz, H-5), 6.75 (q, 1H, J = 8.5; J_2 = 2.0 Hz, H-6), 6.75 (d, 1H, J = 2.0 Hz, H-8), 4.13 (m, 2H, H-13′), 0.78 (s, 3H, H-11′), 0.96 (s, 3H, H-12′), 0.74 (s, 3H, H-15′), 4.48 and 4.85 (br.s, 1H, H-14′), 3.25 (q, 1H, J = 9.5; J_2 = 2.0 Hz, H-6′) [2, 3]

1. A. I. Ban'kovskii, N. E. Ermatov, M. E. Perel'son, L. Bubeva-Ivanova, and N. S. Pavlova, Khim. Prir. Soedin., 173 (1970).
2. M. E. Perel'son, N. P. Kir'yalov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 244 (1975).
3. M. E. Perel'son, A. A. Kir'yanov, A. I. Ban'kovskii, N. P. Kir'yalov, and T. V. Bukreeva, Khim. Prir. Soedin., 442 (1976).



COLLADOCIN

Colladonia triquetra

$C_{26}H_{34}O_6$, M^+442

mp 219°, $[\alpha]_D$ –4.58° (alc)

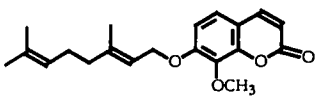
UV: 217; 243; 254; 295; 326 (lgε 4.15; 3.55; 3.38; 3.90; 4.19)

IR: 1735, 1720, 1620, 1515, 1250

PMR: 0.81; 0.84; 0.92 (s, each 3H, H-15′, H-11′, H-12′), 1.18 (s, 3H, H-14′), 1.98 (s, 3H, H-2″), 4.46 (m, 1H, W1/2 = 16 Hz, H-6′), 4.08 and 4.34 (q, each 1H, J_1 = 10.5 Hz, J_2 = 6.5 Hz, H-13′), 6.16 (d, 1H, J = 9.3 Hz, H-3), 7.54 (d, 1H, J = 9.3 Hz, H-4), 7.27 (d, 1H, J = 9.0 Hz, H-5), 6.77 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.5 Hz, H-6), 6.72 (d, 1H, J = 2.5 Hz, H-8) [1]

Abs. conf. [2]

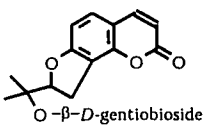
1. V. N. Borisov, A. I. Ban'kovskii, N. S. Pavlova, L. Bubeva-Ivanova, V. I. Sheichenko, and V. S. Kabanov, Khim. Prir. Soedin., 247 (1975).
2. A. I. Saikhodzhaev and V. M. Malikov, Khim. Prir. Soedin., 707 (1978).



COLLININ

Haplophyllum alberty
$C_{20}H_{24}O_4$, mp 67-68°

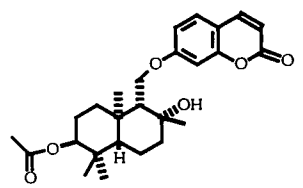
1. Murray.
2. L. I. Tikhomirova, G. A. Kuznetsova, and M. G. Pimenov, Khim. Prir. Soedin., 859 (1977).



COLUMBIANIN

Libanotis lehmanniana [3]
$C_{20}H_{24}O_9$, mp 275-276.5°, $[\alpha]_D^{23}$ +118° (water)
UV: 216, 269, 327
IR: 3584, 3509, 3425, 1730, 1620, 1518, 1470 [1, 2]

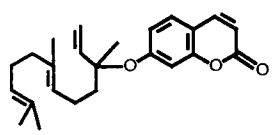
1. Murray.
2. Kuznetsova.
3. A. M. Aminov, K. B. Bizhanova, and G. K. Nikonov, Khim. Prir. Soedin., 246 (1975).



COCANIDIN

Ferula kokanica
$C_{26}H_{34}O_6$, M^+442
mp 189-191°, $[\alpha]_D$ –30° (alc)
UV: 219, 244, 254, 295, 327 (lgε 4.21; 3.15; 3.61; 3.56; 4.21)
IR: 3557, 1725, 1716, 1620, 1556, 1515
PMR: 6.17 (d, 1H, J = 9.5 Hz, H-3), 7.60 (d, 1H, J = 9.5 Hz, H-4), 6.71 (m, 2H, H-6, H-8), 7.33 (d, 1H, J = 9.0 Hz, H-5), 4.60 (br.s, 1H, $W_{1/2}$ = 7.0 Hz, H-6′), 4.32 (q, 1H, J_1 = 10.0 Hz, J_2 = 4.0 Hz, H-13′), 4.11 (q, 1H, J_1 = 10.0 Hz, J_2 = 3.0 Hz, H-13′), 2.03 (s, 3H, H-2″), 1.24 (s, 3H, H-14), 0.86; 0.91; 1.09 (s, each 3H, H-15′, H-11′, H-12′)

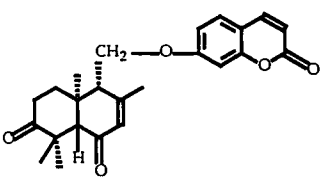
A. A. Nabiev, T. Kh. Khasanov, and V. M. Malikov, Khim. Prir. Soedin., 578 (1982).



COCANICIN

Ferula kokanica
$C_{24}H_{30}O_3$
mp 34-35°, $[\alpha]_D$ –3° (chlf)

N. P. Kir'yalov, Rastit. Resurs., Ser. V, No. 8, 7 (1961).

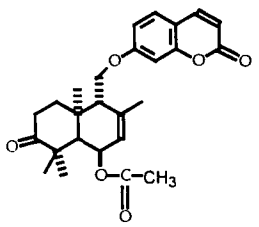


CONFERIDIONE

Ferula conocaula
$C_{24}H_{30}O_5$
mp 150-152°, $[\alpha]_D$ –51.9° (alc)

UV: 216, 235, 296; 322 (lgε 4.29; 4.18; 3.98; 4.23)
PMR: 1.24; 1.27; 1.39 (s, each 3H, H-15′, H-11′, H-12′), 1.94 (s, 3H, H-14′), 2.47 (s, 1H, H-10′), 2.64 (m, 1H, H-1′), 4.21 (m, 2H, H-13′), 5.91 (br.s, 1H, H-3′), 6.14 (d, 1H, J = 9.0 Hz, H-3), 7.50 (d, 1H, J = 9.0 Hz, H-4), 7.26 (d, 1H, J = 9.0 Hz, H-5), 6.77 (q, 1H, J = 9.0 Hz, J_2 = 2.0 Hz, H-6), 6.75 (d, 1H, J = 2.5 Hz, H-8)

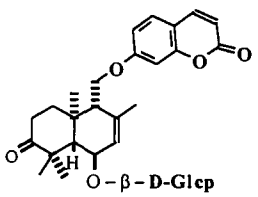
V. V. Vandyshev, Yu. E. Sklyar, M. E. Perel'son, and M. D. Moroz, Khim. Prir. Soedin., 658 (1974).



CONFERIN

Ferula conocaula
$C_{26}H_{30}O_4$, M^+438
mp 141-142°, $[\alpha]_D$ –124° (alc)
UV: 216, 243, 252, 296; 324 (lgε 4.35; 3.86; 3.68; 4.07; 4.32)
IR: 1731, 1715, 1655, 1615, 1564, 1518 cm^{-1}
PMR: 1.02; 1.10; 1.20 (s, each 3H, H-11′, H-12′, H-15′), 1.70 (br.s, 3H, W1/2 = 4.2 Hz, H-14′), 2.04 (s, 3H, H-2″), 4.10 (m, 2H, H-13′), 5.41 (br.s, 1H, W1/2 = 6.0 Hz, H-3′), 5.45 (m, 1H, ΣJ = 15 Hz, H-4′), 6.21 (d, 1H, J = 9.5 Hz, H-3), 7.57 (d, 1H, J = 9.5 Hz, H-4), 7.27 (d, 1H, J = 8.5 Hz, H-5), 6.76 (q, 1H, J = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.74 (d, 1H, J = 2.5 Hz, H-8) [1]

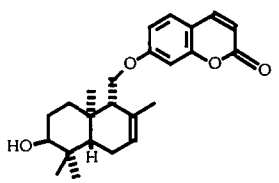
V. V. Vandyshev, M. E. Perel'son, Yu. E. Sklyar, and M. D. Moroz, Khim. Prir. Soedin., 658 (1974).



CONFEROSIDE

Ferula conocaula
$C_{30}H_{38}O_{10}$
mp 195-197°, $[\alpha]_D$ –110° (alc)
UV: 220, 242, 253, 297, 325 nm (lgε 4.27; 3.70; 3.63; 4.01; 4.22)
IR: 3430, 1733, 1712, 1617, 1560, 1520, 1100, 1080, 1040, 890 cm^{-1}
PMR: 1.04 (s, 3H, H-15′), 1.29 (s, 6H, H-11′, H-12′), 1.74 (s, 3H, H-14′), 3.05-5.40 (–H-glu, H-13′), 5.6 (br.s, 1H, H-3′), 6.15 (d, 1H, J = 9.5 Hz, H-3), 7.52 (d, J = 9.5 Hz, H-4), 7.26 (d, 1H, J = 8.5 Hz, H-5), 6.78 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.76 (d, 1H, J = 2.5 Hz, H-8)

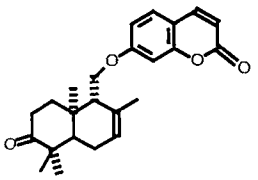
Z. A. Kuliev, T. Kh. Khasanov, and V. M. Malikov, Khim. Prir. Soedin., 477 (1977)



CONFEROL

Ferula conocaula, F. samarcandica, F. iliensis
$C_{24}H_{30}O_4$, M^+382
mp 137-138°, (hx-ea), $[\alpha]_D$ –51°(chlf)
UV: 218, 244, 290, 326
IR: 3500-3600, 1725, 1610, 1580, 1460
PMR: 0.82 (s, 6H, H-15′, H-11′), 0.87 (s, 3H, H-12′), 1.60 (br.s, 3H, H-14′), 3.41 (br.s, 1H, H-6′), 4.03 (q, 2H, J_1 = 10 Hz, J_2 = 4 Hz, H-13′), 5.48 (br.s, 1H, H-3′), 6.17 (d, 1H, J = 9.5 Hz, H-3), 7.53 (d, 1H, J = 9.5 Hz, H-4), 7.27 (d, 1H, J = 8.5 Hz, H-5), 6.15 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.68 (d, 1H, J = 2.5 Hz, H-8) [1, 2]

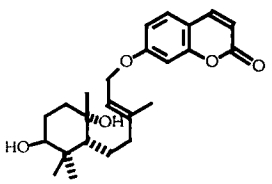
1. V. V. Vandyshev, Yu. E. Sklyar, M. E. Perel'son, M. D. Moroz, and M. G. Pimenov, Khim. Prir. Soedin., 670 (1972).
2. M. E. Perel'son, A. A. Kir'yanov, Yu. E. Sklyar, and V. V. Vandyshev, Khim. Prir. Soedin., 726 (1973).



CONFERONE

Ferula conocaula, F. iliensis
$C_{24}H_{28}O_4$, M^+380
mp 142-142.5°, $[\alpha]_D$ –51° (alc)
UV: 216, 242, 252, 326 nm (lgε 4.26; 3.71; 3.58; 4.31)
IR: 1721, 1610, 1566, 1508, 1710 cm^{-1}
PMR: 0.85 (s, 3H, H-11′), 0,89 (s, 3H, H-12′), 0.85 (s, 3H, H-15′), 1.63 (s, 3H, H-14′), 5.48 (br.s, 1H, H-3′), 4.05 (oct, 2H, J_1 = 9.7 Hz, J_2 = 3.6 Hz, $J_{2'}$= 5.7 Hz, H-13′), 6.17 (d, 1H, J = 9.5 Hz, H-3), 7.56 (d, 1H, J = 9.5 Hz, H-4), 7.31 (d, 1H, J = 8.5 Hz, H-5), 6.18 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.14 (d, 1H, J = 2.5 Hz, H-8)

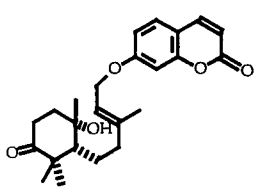
V. V. Vandyshev, Yu. E. Sklyar, M. E. Perel'son, M. D. Moroz, and M. G. Pimenov, Khim. Prir. Soedin., 669 (1972).



KOPEOLIN

Ferula kopetdaghensis, F. gummosa
$C_{24}H_{32}O_5$, M^+400
mp 146-147°, $[\alpha]_D$ –15.9° (alc)
UV: 244, 253, 327 (lgε 3.64; 3.59; 4.13)
IR: 3510-3450, 2935-2885, 1725, 1625, 1515, 1470
Mass: 400, 239, 163, 162
PMR: 0.73 and 0.97 (s, each 3H, H-11′, H-12′), 1.12 (s, 3H, H-15′), 1.72 (s, 3H, H-14′), 3.22 (q, 1H, H-6′), 4.49 (d, 2H, J = 7 Hz, H-13′), 5.42 (t, 1H, J = 7 Hz, H-1′), 6.14 (d, 1H, J = 10.5 Hz, H-3), 7.54 (d, 1H, J = 10.5 Hz, H-4), 6.72 (q, 1H, J_1 = 9.5 Hz, J_2 = 2.0 Hz, H-6), 7.28 (d, 1H, J = 9.5 Hz, H-5), 6.82 (d, 1H, J = 2 Hz, H-8) [1, 2]
Rel. conf. [3]

1. Kh. M. Kamilov and G. K. Nikonov, Khim. Prir. Soedin., 308 (1973).
2. A. I. Saikhodzhaev, D. U. Mukumova, Kh. M. Kamilov, V. M. Malikov, and M. G. Pimenov, Khim. Prir. Soedin., 283 (1991).
3. A. I. Saidkhodzhaev, Khim. Prir. Soedin., 437 (1979).

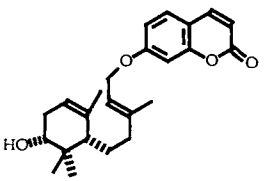


KOPEOLONE

Ferula kopetdaghensis
$C_{24}H_{32}O_5$, M^+398
mp 125-126°, $[\alpha]_D$ +70° (alc)
IR: 1742, 1712, 1620, 1561, 1515
Mass: 398, 380, 237, 219, 162, 161

PMR: 1.01 (s, 3H, H-15′), 1.12 (s, 3H, H-11′), 1.33 (s, 3H, H-12′), 1.74 (s, 3H, H-14′), 4.49 (d, 2H, J = 7 Hz, H-13′), 5.40 (t, 1H, J = 7 Hz, H-1′), 6.22 (d, 1H, J = 9.5 Hz, H-3), 7.61 (d, 1H, J = 9.5 Hz, H-4), 7.35 (d, 1H, J = 9.0 Hz, H-5), 6.84 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.5 Hz, H-6), 6.80 (d, 1H, J = 2.5 Hz, H-8) [1]

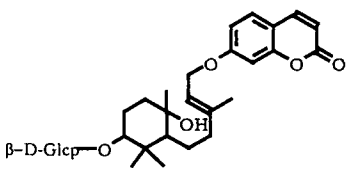
1. A. A. Nabiev, T. Kh. Khasanov, and V. M. Malikov, Khim. Prir. Soedin., 48 (1982).



KOPETDAGHIN

Ferula kopetdaghensis
$C_{24}H_{30}O_4$, M^+382
mp 128-125.5°, $[\alpha]_D$ +28° (chlf)
UV: 244, 255, 327 nm (lgε 3.22; 2.92; 3.15)
IR: 3450, 1690, 1610, 1560, 1510 cm^{-1}
Mass: 382, 220, 203, 202, 163, 162
PMR: 0.79 and 0.94 (s, each 3H, H-11′, H-12′), 1.66 and 1.73 (br.s, each 3H, H-14′, H-15′), 5.18 (t, 1H, J = 6 Hz, H-8′), 5.42 (t, 1H, J = 6 Hz, H-1′), 4.53 (d, 2H, J = 6 Hz, H-13′), 3.41 (q, 1H, J_1 = 10 Hz, J_2 = 5 Hz, H-6′), 6.15 (d, 1H, J = 9.0 Hz, H-3), 7.50 (d, 1H, J = 9.0 Hz, H-4), 7.28 (d, 1H, J = 8.5 Hz, H-5), 6.78 (q, 1H, J_1 = 8.5; J_2 = 2.5 Hz, H-6), 6.76 (d, 1H, J = 2.5 Hz, H-8)

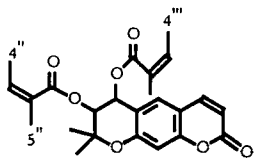
Kh. M. Kamilov and G. K. Nikonov, Khim. Prir. Soedin., 442 (1974).



KOPEOSIDE

Ferula kopetdaghensis
$C_{30}H_{42}O_{10}$
mp 177-178°, $[\alpha]_D$ –221° (alc)
IR: 893, 1018, 1060, 1085

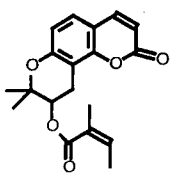
Kh. M. Kamilov and G. K. Nikonov, Khim. Prir. Soedin., 308 (1973).



XANTHALIN

Xanthogallum purpurascens
$C_{24}H_{26}O_7$, mp 111-113°
$[\alpha]_D^{20}$ –164.2° (alc)
UV: 222, 258, 323
IR: 1740, 1718, 1633, 1570, 1470, 1388, 1321, 1270, 1235, 1150
PMR: 6.28 (d, 1H, J = 10.0 Hz, H-3), 7.62 (d, 1H, J = 10.0 Hz, H-4), 6.79 (s, 1H, H-8), 7.36 (s, 1H, H-5′), 6.34 (d, 1H, J = 4.5 Hz, H-4′), 5.52 (d, 1H, J = 4.5 Hz, H-3′), 1.60-2.10 (m, 12H, H-4″, H5″, H-4‴, H-5‴), 1.46; 1.49 (s, each 3H, H-1′, H-5′), 6.10 (m, 2H, H-3″, H-3‴) [1, 2]

1. A. I. Sokolova, G. K. Nikonov, M. E. Perel'son, G. P. Syrova, and Yu. N. Sheinker, Khim. Prir. Soedin., 280 (1968).
2. Perel'son.



XANTHOGALIN

Xanthogallum purpurascens

$C_{19}H_{20}O_5$, M^+ 328, mp 100-102°

$[\alpha]_D^{16}$ –41.4° (chlf)

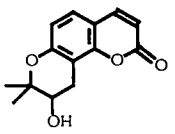
UV: 220, 257, 328

IR: 1722, 1610, 1580, 1495 [1, 3]

Mass: 328, 228, 213, 176, 175, 147, 83, 55 [4]

PMR: 6.24 (d, 1H, J = 10.0 Hz, H-3), 7.64 (d, 1H, J = 10.0 Hz, H-4), 6.79 (d, 1H, J = 8 Hz, H-6), 7.27 (d, 1H, J = 8.0 Hz, H-5), 3.20 (dd, 2H, J_1 = 18.0; J_2 = 5.5 Hz, H-4′), 5.21 (t, 1H, J = 5.5 Hz, H-3′), 1.39 (s, 6H, H-1′, H-5′), 1.87; 1.92 (s, each 3H, H-4″, H-5″), 6.10 (m, 1H, H-3″) [2]

1. G. K. Nikonov and D. I. Baranauskaite, Khim. Prir. Soedin., 139 (1965).
2. Perel'son.
3. Murray.
4. P. I. Zakharov, V. S. Kabanov, A. I. Ban'kovskii, G. K. Nikonov, and N. E. Ermatov, Khim. Prir. Soedin., 398 (1971).



XANTHOGALOL (LOMATIN)

Libanotis buchtarmensis, *Xanthogalum purpurascens*

$C_{14}H_{14}O_4$, mp 184-185°, $[\alpha]_D^{19}$ +14° (chlf) [1, 2]

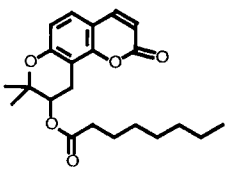
UV: 246, 257, 329

IR: 3500, 1700, 1600, 1487, 1281, 1075

Mass: 246, 231, 228, 213, 176, 175, 147, 131 [3]

PMR: 6.21 d (10 Hz; H-3), 7.61 d (10 Hz; H-4), 7.23 d (8.8 Hz; H-5), 6.77 d (8.8 Hz; H-6), 3.15 q (17.9; 5.1 Hz; H-4′), 2.96 q (17.9; 5.1 Hz, H-4′), 3.91 t (5.1 Hz; H-5′), 1.36; 1.41 s ($2CH_3$), 2.18 (OH) [4]

1. Kuznetsova.
2. N. E. Ermatov, A. I. Ban'kovskii, M. E. Perel'son, G. P. Syrova, and Yu. N. Sheinker, Khim. Prir. Soedin., 145 (1968).
3. P. I. Zakharov, V. S. Kabanov, A. I. Ban'kovskii, G. K. Nikonov, and N. E. Ermatov, Khim. Prir. Soedin., 398 (1971).
4. Perel'son.



3′-CAPRYLOYLOXYXANTHOGALOL

Libanotis lehmanniana

$C_{22}H_{28}O_5$, oil

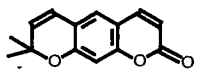
$[\alpha]_D$ +30.2° (chlf)

UV: 248, 255, 330, (lgε 3.51; 3.20; 3.12)

IR: 1738, 1650, 1610, 1500

PMR: 6.08 (d, 1H, J = 9.5 Hz, H-3), 7.54 (d, 1H, J = 9.5 Hz, H-4), 7.19 (d, 1H, J = 8.5 Hz, H-5), 6.77 (d, 1H, J = 8.5 Hz, H-6), 5.1 (t, 1H, $J_1 = J_2$ = 5.6 Hz, H-3′), 2.6-3.4 (q, J_1 = 18.0 Hz, J_2 = 5.0 Hz, H-4′), 1.33 (s, 6H, H-1′, H-5′)

A. M. Aminov, K. B. Bizhanova, and G. K. Nikonov, Khim. Prir. Soedin., 246 (1975).



XANTHYLETIN

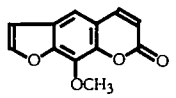
Haplophyllum dzhungaricum, H. multicaule

$C_{14}H_{12}O_3$, mp 127.5° [1]

UV: 224, 258, 265, 305, 348

PMR: 6.5 d (10 Hz; H-3), 7.55 d (10 Hz; H-4), 7.02 s (H-5), 6.88 s (H-8), 6.34 d (10 Hz; H-4′), 5.65 (10 Hz; H-5′) 1.44 s ($2CH_3$) [2]

1. Murray.
2. Perel'son.



XANTHOTOXIN

Ammi majus, Angelica dahurica, Dictamnus angustifolius, D. dasycarpus, Heracleum acaulis, H. aconitofolium, H. asperum, H. antasiaticum, H. cyclorpum, H. grandiflorum, H. leskovii, H. moellendorffii, H. sosnowskyi, Hippomorathrum caspicum, H. microcarpum, Pastinaca sativa, Prangos equisetoides, P. lipskyi, P. uloptera, Psoralea drupaceae, Seseli gracille, S. rigidum, Vicia sativa

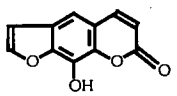
$C_{12}H_8O_4$, mp 145-146°

UV: 219, 250, 265, 300 [1, 2]

IR: 3144, 3117, 3068, 3007, 1726, 1624, 1594, 1550

PMR: 6.35 d (10 Hz; H-3), 7.77 d (10 Hz; H-4), 7.35 s (H-5), 6.82 d (2.3 Hz; H-4′), 7.64 d (2.3; H-5′), 4.28 s (OCH_3) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



XANTHOTOXOL

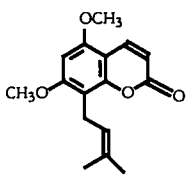
Cryptodiscus didymus

$C_{11}H_6O_4$, mp 252-253° [1]

UV: 300, 340

IR: 3302, 3144, 3111, 3068, 3007, 1713, 1653, 1600 [2]

1. Murray.
2. Perel'son.



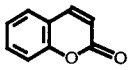
COUMURRAYIN (ISOPENTENYLLIMETTIN)

Seseli peucedanoides

$C_{16}H_{18}O_4$, mp 155-156°

PMR: 6.12 (d, 1H, J = 2.0 Hz, H-3), 7.98 (d, 1H, J = 10.0 Hz, H-4), 6.32 (s, 1H, H-6), 5.20 (t, 1H, J = 7.0 Hz, H-2′), 3.92 (s, 6H, $2OCH_3$), 3.43 (d, 2H, J = 7.0 Hz, H-1′), 1.61; 1.82 (s, each 3H, H-4′, H-5′)

A. Z. Abyshev and D. Z. Abyshev, Khim. Prir. Soedin., 248 (1984).



COUMARIN

Althaea armenica, *A. officinalis*, *Anethum graveolens*, *Artemisia martjanovii*, *A. obtusifolia*, *A. vulgaris*, *Matricaria recutita*, *Polygonum divaricatum*, *P. weyrichii*, *Potentilla erecta*, *Psoralea drupaceae*, *Scobiosa comosa*, *Sempervivum rethenicum*

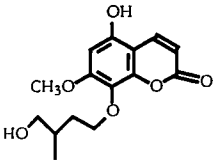
$C_9H_6O_2$, mp 67-68°

UV: 274, 309

IR: 3115, 3058, 3001, 1711, 1625, 1608, 1567 [1, 2]

PMR: 6.44 d (9.8; H-3), 7.76 d (9.8; H-4), 7.4-7.8 m (H-5; H-6; H-7; H-8) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



LACAROL

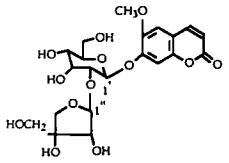
Artemisia laciniata

$C_{15}H_{18}O_6$ (M^+294), mp 103°

$[\alpha]_D^{20}$ –6.06° (alc)

UV: 265, 322

I. I. Chemesova, T. V. Bukreeva, and É. V. Boiko, Khim. Prir. Soedin., 115 (1990).



LARISIDE

Salsola laricifolia

$C_{21}H_{26}O_{13}$, mp 155-156°

UV: 229, 230, 260, 290, 340

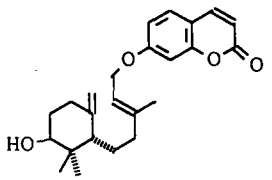
IR: 3210, 1730, 1630, 1590

PMR: (Py-d_5); 3.60 (s, 3H, OCH_3), 3.90-4.62 (m, protons of the sugar moiety), 4.78 (br.s, 1H, J = 3.5 Hz; H-1′), 5.60 (d, 1H, J = 7.5 Hz, H-1″), 6.06-6.58 (br.s, OH), 6.34 (d, 1H, J = 9.5 Hz, H-3), 7.00 (s, 1H; H-8), 7.34 (s, H-5), 7.70 (d, 1H, J = 9.5 Hz, H-4)

^{13}C NMR:

C-2	160.6	8	103.0	3′	77.1	1″	108.4
3	112.4	9	149.8	4′	70.0	2″	77.1
4	144.3	10	113.4	5′	76.1	3″	79.4
5	109.6	1′	98.1	6′	60.7	4″	74.0
6	146.0	2′	74.9			5″	64.5
7	149.0					OCH_3	56.1

S. Narantuya, D. Batsurén, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 288 (1986).



LATILOBINOL

Prangos latiloba

$C_{24}H_{30}O_4$

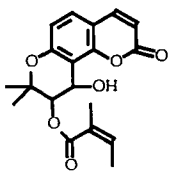
mp 121-122°, $[\alpha]_D$ –63° (c 0.92; chlf)

IR: 3460, 1700, 1600, 1560, 1510

PMR: 0.75 and 1.02 (s, each 3H, H-11′, H-12′), 1.77 (s, 3H, H-14′), 3.35 (q, 1H, J_1 = 10, J_2 = 5 Hz, H-6′), 4.60 (d, 2H, J = 6 Hz, H-13′), 4.63 and 4.84 (br.s, each 1H, H-15′), 5.40 (t, 1H, J = 6 Hz, H-1′), 6.15 (d, 1H, J = 9.0 Hz, H-3), 7.52 (d, 1H, J = 9.0 Hz, H-4), 7.28 (d, 1H, J = 9.0 Hz, H-5), 6.76 (q, 1H, J_1 = 9.0 Hz, J_2 = 2.0 Hz, H-6), 6.76 (d, 1H, J = 2.0 Hz, H-8) [1]

Abs. conf. [2]

1. A. Z. Abyshev, Khim. Prir. Soedin., 90 (1979).
2. A. Z. Abyshev, Khim. Prir. Soedin., 712 (1984).



LEHMANNIDIN

Libanotis lehmannae

$C_{19}H_{20}O_6$, M^+344

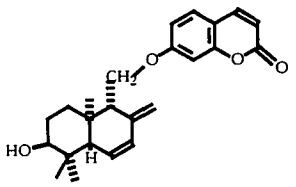
mp 148-150°, $[\alpha]_D$ –91.8° (chlf)

UV: 227, 261, 330

IR: 3500-3400, 1730, 1605, 1490, 1468, 910

PMR: 6.17 (d, 1H, J = 10.0 Hz, H-3), 7.80 (d, 1H, J = 10.0 Hz, H-4), 7.41 (d, 1H, J = 9.0 Hz, H-5), 6.73 (d, 1H, J = 9.0 Hz, H-6), 1.35 and 1.41 (s, each 3H, H-1′, H-5′), 5.28 (d, 1H, J = 10.0 Hz, H-3′), 4.98 (d, 1H, J = 10.0 Hz, H-4′), 1.82-1.98 (m, 6H, H-4″, H-5″), 6.05 (m, 1H, H-3″)

A. M. Aminov, K. B. Bizhanova, and G. K. Nikonov, Khim. Prir. Soedin., 216 (1975).



LEHMFERIDIN

Ferula lehmannii

$C_{24}H_{28}O_4$, M^+380

mp 173-174°

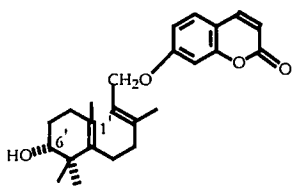
UV: 220, 237, 291 326, (lgε 4.11; 4.31; 3.92; 4.17)

IR: 3620-3580, 1720, 1610, 1570, 1515

Mass: 380, 218, 175, 162

PMR: 0.80 (s, 6H, H-11′, H-15′), 1.0 (s, 3H, H-12′), 3.41 (br.s, 1H, H-6′), 4.15 (m, 2H, H-13′), 4.80 and 4.90 (br.s, each 1H, H-14′), 5.61 (d, 1H, J = 12 Hz, H-3′), 6.12 (d, 1H, J = 12 Hz, H-4′), 6.16 (d, 1H, J = 9.5 Hz, H-3), 7.53 (d, 1H, J = 9.5 Hz, H-4), 7.27 (d, 1H, J = 8.5 Hz, H-5), 6.76 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.5 Hz, H-6), 6.74 (d, 1H, J = 2.0 Hz, H-8) [1]

G. V. Sagitdinova, A. I. Saidkhodzhaev, and V. M. Malikov, Khim. Prir. Soedin., 709 (1983).



LEHMFERIN

Ferula lehmannii

$C_{24}H_{30}O_4$, M^+ 382

mp 118-119°

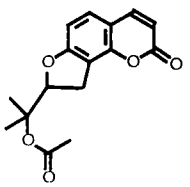
UV: 244, 255, 327, (lgε 3.21; 2.93; 4.17)

IR: 3455, 1695, 1615, 1565, 1510

Mass: 382, 220, 175, 162

PMR: 0.96 (s, 3H, H-11′), 1.02 (s, 3H, H-12′), 1.55 (s, 3H, H-15′), 1.73 (s, 3H, H-14′), 3.40 (m, 1H, H-6′), 4.51 (d, 2H, J = 7.5 Hz, H-13′), 5.38 (t, 1H, J = 7.5 Hz, H-1′), 6.18 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 7.30 (d, 1H, J = 8 Hz, H-5), 6.78 (q, 1H, J_1 = 8; J_2 = 2.0 Hz, H-6), 6.74 (d, 1H, J = 2.0 Hz, H-8)

G. V. Sagitdinova, A. I. Saidkhodzhaev, and V. M. Malikov, Khim. Prir. Soedin., 709 (1983).



LIBANORIDIN

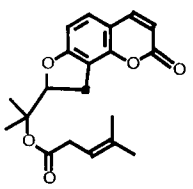
Libanotis schrenkiana

$C_{16}H_{16}O_5$, mp 125-126°

IR: 1738, 1730, 1623, 1581, 1489

PMR: 6.17 (d, 1H, J = 10 Hz, H-3), 7.62 (d, 1H, J = 10 Hz, H-4), 6.72 (d, 1H, J = 8.5 Hz, H-6), 7.25 (d, 1H, J = 8.5 Hz, H-5), 1.49; 1.56 (s, each 3H, H-1′, H-3′), 1.97 (s, 3H, H-2″), 3.30 (d, 2H, J = 6.5 Hz, H-5′), 5.14 (t, 1H, J = 6.5 Hz, H-4′)

A. I. Ban'kovskii, N. E. Ermatov, and M. E. Perel'son, Khim. Prir. Soedin., 52 (1969).



LIBANORIN

Libanotis schrenkiana, *Peucedanum hystrix*, *Phlojodicarpus turczaninovii*

$C_{19}H_{20}O_5$, mp 78-79°

$[\alpha]_D$ +213° (chlf)

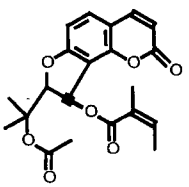
UV: 250, 261, 327

IR: 1730, 1652, 1623, 1581, 1488

Mass: M^+328

PMR: 6.17 (d, 1H, J = 9.3 Hz, H-3), 7.62 (d, 1H, J = 9.3 Hz, H-4), 6.72 (d, 1H, J = 8.7 Hz, H-6), 7.26 (d, 1H, J = 8.7 Hz, H-5), 5.19 (t, 1H, J = 8.6 Hz, H-5′), 3.32 (d, 2H, J = 8.6 Hz, H-4′), 1.51; 1.59 (s, each 3H, H-1′, H-3′), 5.55 (br.s, 1H, H-3″), 1.80; 1.88 (s, each 3H, H-4″, H-5″) [1, 2]

1. N. E. Ermatov, A. I. Ban'kovskii, and M. E. Perel'son, Khim. Prir. Soedin., 222 (1969).
2. L. I. Shagova, G. A. Kuznetsova, L. P. Markova, and V. M. Vinogradova, Khim. Prir. Soedin., 518 (1981).



LIBANOTIN (CNIDIMIN, EDULTIN)

Cnidium monnieri, Libanotis transcaucasica, Seseli foliosum, S. grandivittatum

$C_{21}H_{22}O_7$, mp 156-159°

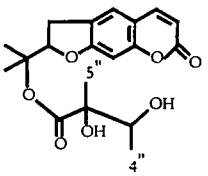
$[\alpha]_D^{20}$ +75° (chlf)

UV: 245, 260, 335

IR: 3103, 3060, 1731, 1632, 1581, 1494

PMR: 6.22 (d, 1H, J = 10.0 Hz, H-3), 7.64 (d, 1H, J = 10.0 Hz, H-4), 6.86 (d, 1H, J = 8.5 Hz, H-6), 7.44 (d, 1H, J = 8.3 Hz, H-5), 5.29 (d, 1H, J = 6.5 Hz, H-5′), 7.08 (d, 1H, J = 6.5 Hz, H-4′), 1.60; 1.68 (s, each 3H, H-1′, H-3′), 1.85 (br.s, 3H, H-5″), 1.99 (q, 3H, J = 8.5 Hz, J_2 = 1.5 Hz, H-4″), 6.06 (m, 1H, H-3″), 2.02 (s, 3H, OAc)

A. A. Savina, V. V. Vandyshev, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 116 (1971).



LINDIOL

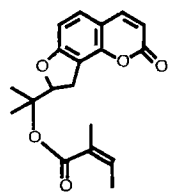
Prangos ferulaceae

$C_{19}H_{22}O_7$, mp 112°

IR: 3400, 1725, 1625, 1585, 1390, 1350

PMR: 6.17 (d, 1H, J = 10.0 Hz, H-3), 7.55 (d, 1H, J = 10.0 Hz, H-4), 6.69 (s, 1H, H-8), 7.15 (s, 1H, H-5), 5.37-6.65 (m, H-5′), 3.29 (d, 2H, J = 8.0 Hz, H-4′), 1.64; 1.73 (s, each 3H, H-4″, H-5″), 1.24 (s, 6H, H-1′, H-3′)

A. Z. Abyshev, Khim. Prir. Soedin., 568 (1974).



LINORIN

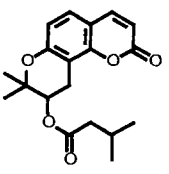
Phlojodicarpus turczaninovii

$C_{19}H_{20}O_5$, mp 78-79°

$[\alpha]_D$ +197° (alc)

PMR: 6.08 (d, 1H, J = 9.5 Hz, H-3), 7.55 (d, 1H, J = 9.5 Hz, H-4), 6.66 (d, 1H, J = 8.5 Hz, H-6), 7.19 (d, 1H, J = 8.5 Hz, H-5), 5.17 (t, 1H, J = 8.5 Hz, H-5′), 3.29 (d, 2H, J = 8.5 Hz, H-4′), 1.41; 1.52 (s, each 3H, H-1′, H-3′), 1.78; 2.05 (br.s, each 3H, H-4″, H-5″), 5.54 (m.s, 1H, H-3″)

N. V. Veseloskaya, Yu. E. Sklyar, and M. G. Pimenov, Khim. Prir. Soedin., 828 (1980).

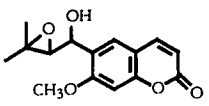


LOMATIN ISOVALERATE

Haplophyllum komalenskyi, H. tenue

$C_{19}H_{22}O_5$, oil [1, 2]

1. A. Z. Abyshev, N. Ya. Isaev, and Yu. B. Kerimov, Khim. Prir. Soedin., 800 (1980).
2. F. Bohlmann and K. M. Rode, Chem. Ber., **101**, 2741 (1968).



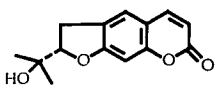
LOPHOPTEROL

Prangos lophoptera

$C_{15}H_{16}O_5$, M^+276, mp 183-184°

PMR: 6.27 (d, 1H, J = 10.0 Hz, H-3), 7.66 (d, 1H, J = 10.0 Hz, H-4), 6.83 (s, 1H, H-8), 7.66 (s, 1H, H-5), 2.90 (d, 1H, J = 8.0 Hz, H-2′), 4.85 (d, 1H, J = 8.0 Hz, H-3′), 3.89 (s, 3H, OCH_3), 2.32 (s, 1H, OH), 1.28; 1.41 (s, each 3H, H-4′, H-5′)

A. Z. Abyshev, Khim. Prir. Soedin., 708 (1974); 253 (1976).



MARMESIN

Ammi majus, *Angelica dahurica*, *Heracleum sosnowskyi*, *Prangos acaulis*, *P. alata*, *P. aris-romanae*, *P. equisetoides*, *P. ispairamica*, *P. lamellata*, *P. latiloba*, *P. lipskyi*, *Seseli campestre*, *S. grasille*, *S. rigidum*

$C_{14}H_{14}O_4$, mp 189.5-190°, $[\alpha]_D$ +26.8° (chlf)

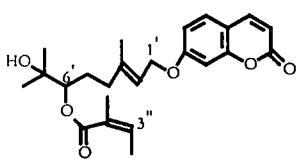
UV: 225, 248, 259, 300, 332

IR: 3460, 3085, 3046, 1709, 1630, 1571, 1429 [1, 2]

Mass: 246, 231, 230, 229, 228, 202, 201, 200, 199, 189, 175, 161, 160, 159, 158, 103, 102, 77, 73, 71 [3]

PMR: 6.17 d (10 Hz; H-3), 7.58 d (10 Hz; H-4), 7.17 s (H-5), 6.65 s (H-8) 3.24 d (9.1 Hz; H-4′), 4.74 t (9.1 Hz; H-5′) 1.23; 1.37 s ($2CH_3$), 2.08 s (OH) [4]

1. Murray.
2. Kuznetsova.
3. P. I. Zakharov, P. B. Terent''ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 431 (1972).
4. Perel'son.



MARMIN MONOANGELATE

Ferula malacophylla

$C_{24}H_{30}O_6$

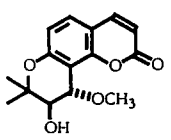
$[\alpha]_D$ +9° (c 2.88; chlf)

UV: 218, 244, 254, 326 nm (lgε 4.37; 3.83; 3.67; 4.12)

IR: 3490, 1740, 1722, 1615, 1560, 1515 cm^{-1}

PMR: 1.26 (s, 6H, H-8′, H-9′), 1.75 (s, 3H, H-10′), 1.90 and 1.98 (s, each 3H, H-4″, H-5″), 4.56 (d, 2H, J = 6 Hz, H-1′), 4.88 (q, 1H, J_1 = 9; J_2 = 4 Hz, H-6′), 6.03 (q, J_1 = 7; J_2 = 2 Hz, H-3″), 6.15 (d, 1H, J = 9.0 Hz, H-3), 7.52 (d, 1H, J = 9.0 Hz, H-4), 7.28 (d, 1H, J = 8.5 Hz, H-5), 6.76 (q, 1H, J_1 = 8.5; J_2 = 2.5 Hz, H-6), 6.78 (d, 1H, J = 2.5 Hz, H-8)

T. Kh. Khasanov, V. M. Malikov, and U. Rakhmankulov, Khim. Prir. Soedin., 226 (1979).



4′-O-METHYL-*trans*-KHELLACTONE

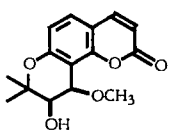
Phlojodicarpus sibiricus

$C_{15}H_{16}O_5$, M^+276, mp 161-162°

UV: 245, 258, 325

PMR: 6.23 (d, 1H, J = 9.5 Hz, H-3), 7.59 (d, 1H, J = 9.5 Hz, H-4), 6.78 (d, 1H, J = 8.6 Hz, H-6), 7.31 (d, 1H, J = 8.5 Hz, H-5), 1.44; 1.49 (s, each 3H, H-1′, H-5′), 3.92 (dd, 1H, J_1 = 7 Hz, J_2 = 5 Hz, H-3′), 4.56 (d, 1H, J = 5.0 Hz, H-4′), 2.15 (d, 1H, J = 7.0 Hz, –OH), 3.66 (s, 3H, OCH_3)

D. Gatimur, A. I. Syrchina, and A. A. Semenov, Khim. Prir. Soedin., 108 (1986).



4′-O-METHYL-*cis*-KHELLACTONE

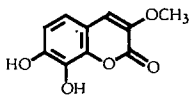
Phlojodicarpus sibiricus

$C_{15}H_{16}O_5$, M^+276, mp 136-137°

UV: 245, 258, 328

PMR: 6.26 (d, 1H, J = 9.5 Hz, H-3), 7.63 (d, 1H, J = 9.5 Hz, H-4), 6.76 (d, 1H, J = 8.6 Hz, H-6), 7.32 (d, 1H, J = 8.6 Hz, H-5), 1.44 (s, 6H, H-1′, H-5′), 3.88 (dd, 1H, J_1 = 7 Hz, J_2 = 5 Hz, H-3′), 4.71 (d, 1H, J = 5 Hz, H-4′), 2.95 (d, 1H, J = 7.0 Hz, –OH), 3.88 (s, 3H, OCH_3)

D. Gatimur, A. I. Syrchina, and A. A. Semenov, Khim. Prir. Soedin., 108 (1986).



7,8-DIHYDROXY-3-METHOXYCOUMARIN

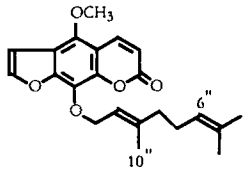
Haplophyllum schelkovnikovii

$C_{10}H_8O_5$, mp 221-222°

IR: 3500, 1700, 1620, 1530

PMR: 7.45 (s, 1H, H-4), 6.69 (d, 1H, J = 8.5 Hz, H-6), 7.41 (d, 1H, J = 8.5 Hz, H-5), 3.83 (s, 3H, OCH_3)

A. Z. Abyshev, P. P. Denisenko, N. Ya. Isaev, and Yu. B. Kerimov, Khim. Prir. Soedin., 654 (1978).



8-GERANYLOXY-5-METHOXYCOUMARIN

Komarovia anisospermum

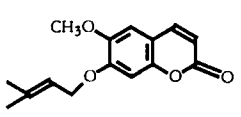
$C_{22}H_{24}O_5$, mp 53-54°

UV: 222, 242, 249, 269, 274, 315

IR: 3125, 3152,1718, 1608, 1509

PMR: 5.99 (d, 1H, J = 9.5 Hz, H-3), 7.85 (d, 1H, J = 9.5 Hz, H-4), 6.88 (d, 1H, J = 2.0 Hz, H-4′), 7.48 (d, 1H, J = 2.0 Hz, H-5′), 4.08 (s, 3H, OCH_3), 4.69 (d, 2H, J = 7 Hz, H-1″), 5.46 (t, 2H, J = 7.0 Hz, H-2″, H-6″), 1.89 (s, 2H), 1.93 (s, 2H) (H-4″, H-5″), 1.47; 1.55; 1.60 (s, each 3H, H-8″, H-9″, H-10″)

A. I. Sokolova, Yu. E. Sklyar, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 166 (1976).



7-DIMETHYLALLYLOXY-6-METHOXYCOUMARIN

Haplophyllum obtusifolium

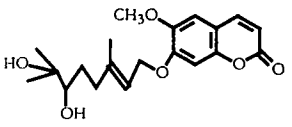
$C_{15}H_{16}O_7$, mp 81-82°

UV: 232, 261, 298, 348

IR: 1733, 1622, 1570, 1520, 859, 825, 789, 755

Mass: 260 (M^+), 192, 177, 164, 149, 121, 79, 69, 53, 41
PMR: 1.71 (br.s, 6H, H-4′, H-5′), 3.79 (s, 3H, OCH_3), 4.56 (d, 2H, J = 6.5 Hz, H-1′), 5.42 (m, 1H, H-2′), 6.16 (d, 1H, J = 9.5 Hz, H-3), 6.73 (s, 1H, H-8), 6.81 (s, 1H, H-6), 7.56 (d, 1H, J = 9.5 Hz, H-4) [1, 2]

1. A. D. Matkarimov, É. Kh. Batirov, and V. M. Malikov, Khim. Prir. Soedin., 565 (1980)
2. N. F. Gashimov, A. Z. Abyshev, A. A. Kagramanov, and L. I. Rozhkova, Khim. Prir. Soedin., 15 (1979).

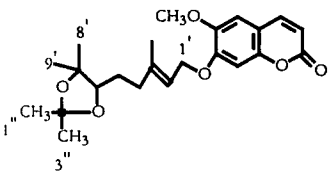


6-METHOXYMARMIN

Haplophyllum pedicellatum
$C_{20}H_{26}O_6$, mp 119.5-120°
$[\alpha]_D^{19}$ +17.6° (alc)

UV: 230, 252, 297, 345
IR: 3420, 1710

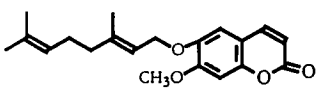
G. A. Kuznetsova and N. F. Gashimov, Khim. Prir. Soedin., 666 (1972).



6-METHOXYMARMIN ACETONIDE

Haplophyllum pedicellatum
$C_{23}H_{30}O_6$, mp 103-104°
$[\alpha]_D^{20}$ +25.7° (alc)
IR: 1712, 1620, 1560, 1520
PMR: 1.10; 1.22; 1.30; 1.40 (s, each 3H, H-8′, H-9′, H-1″, H-3″), 1.80 (s, 3H, H-10′), 3.62 (m, 1H, H-6′), 2.20 (m, 4H, H-4′, H-5′), 4.68 (d, 2H, J = 6.0 Hz, H-1′), 5.52 (t, 1H, J = 6.0 Hz, H-2′)

A. A. Kagramanov, N. F. Gashimov, A. Z. Abyshev, and L. I. Rozhkova, Khim. Prir. Soedin., 88 (1979).

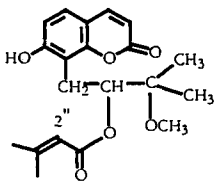


6-GERANYLOXY-7-METHOXYCOUMARIN

Haplophyllum pedicellatum

$C_{20}H_{24}O_4$, mp 66.5-68°
IR: 1720, 1615, 1565, 1510
PMR: 6.33 (d, 1H, J = 10.0 Hz, H-3), 7.68 (d, 1H, J = 10.0 Hz, H-4), 6.91 (s, 2H, H-5, H-8), 3.95 (s, 3H, OCH_3), 1.62; 1.66; 1.80 (s, each 3H, H-8′, H-9′, H-10′), 2.11 (br.s, 4H, H-4′, H-5′), 5.11; 5.55 (t, each 1H, J = 7.0 Hz, H-2′, H-6′), 4.72 (d, 2H, J = 7.0 Hz, H-1′)

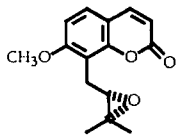
A. Z. Abyshev and N. F. Gashimov, Khim. Prir. Soedin., 846 (1979).



METHOXYFERUDIOL

Prangos ferulaceae
$C_{20}H_{24}O_6$, (*l*)
IR: 3350, 1730, 1715, 1610, 1590, 1510, 1410, 1385
PMR: 6.68 (d, 1H, J = 8.0 Hz, H-5), 7.10 (d, 1H, J = 8.0 Hz, H-6), 6.05 (d, 1H, J = 9.0 Hz, H-3), 7.43 (d, 1H, J = 9.0 Hz, H-4), 5.24 (br.s, 1H, –OH), 4.86 (t, 1H, J = 8.0 Hz, H-2′), 3.59 (d, 2H, J = 8.0 Hz, H-1′), 3.36 (s, 3H, OCH_3), 5.51 (br.s, 1H, H-2″), 1.66; 1.82 (s, each 3H, H-4″, H-5″), 1.25; 1.30 (s, each 3H, H-4′, H-5′)

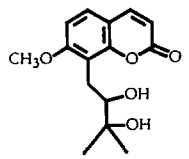
A. Z. Abyshev, Khim. Prir. Soedin., 568 (1974).



MERANZIN (AURAPTEN)

Prangos lamellata
$C_{15}H_{16}O_4$, mp 98°
$[\alpha]_D^{20}$ –33.4° (alc) [1, 2]

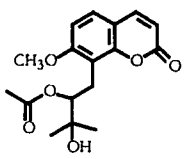
1. Kuznetsova.
2. T. Yu. Danchul, G. A. Kuznetsiva, E. A. Sokolova, and L. V. Kuz'mina, Khim. Prir. Soedin., 849 (1979).



MERANZIN HYDRATE

Prangos ferulaceae
$C_{15}H_{18}O_5$, mp 128°
$[\alpha]_D^{20}$ –53.03° (eth)
UV: 248, 258, 320-322
IR: 3500, 3075, 1700, 1615, 1575, 1500
PMR: 6.00 (d, 1H, J = 10.0 Hz, H-3), 7.38 (d, 1H, J = 10.0 Hz, H-4), 6.63 (d, 1H, J = 9.0 Hz, H-5), 7.10 (d, 1H, J = 9.0 Hz, H-6), 1.28 (s, 6H, H-4′, H-5′), 2.93 (d, 1H, J = 5.0 Hz, H-2′), 3.50 (d, 2H, J = 5.0 Hz, H-1′), 3.80 (s, 3H, OCH_3) [1, 2]

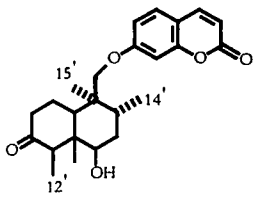
1. G. A. Kuznetsova and A. Z. Abyshev, Zh. Prikl. Khim., 2370 (1965).
2. Kuznetsova.



MERANZIN HYDRATE MONOACETATE

Prangos ferulaceae
$C_{17}H_{20}O_6$, M^+320, mp 135-137°
$[\alpha]_D^{20}$ +81.2° (chlf)
IR: 3545, 1725, 1605, 1565, 1495, 1405, 1380, 1365
PMR: 6.16 (d, 1H, J = 10.0 Hz, H-3), 7.82 (d, 1H, J = 10.0 Hz, H-4), 6.96 (d, 1H, J = 8.0 Hz, H-6), 7.47 (d, 1H, J = 8.0 Hz, H-5), 5.10 (q, 1H, J_1 = 8 Hz, J_2 = 4.5 Hz, H-2′), 3.10 (m, 2H, H-1′), 3.95 (s, 3H, OCH_3), 1.67 (s, 3H, OAc), 1.25 (s, 6H, H-4′, H-5′)

A. Z. Abyshev, P. P. Denisenko, N. P. Kostyuchenko, and A. I. Ermakov, Khim. Prir. Soedin., 608 (1972).



MICROLOBIN

Ferula microloba

$C_{24}H_{30}O_5$, M^+398, mp 150-154°, $[\alpha]_D$ +49° (alc)

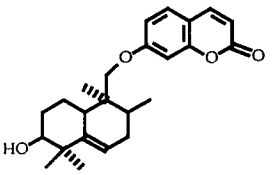
UV: 217, 244, 253, 295, 327 (lgε 4.16; 3.60; 4.42; 3.85; 4.14)

IR: 3540, 1730, 1720, 1620, 1570, 1515 cm^{-1}

Mass: 398, 380, 236, 218, 163, 162

PMR: 0.81 (s, 6H, H-11′, H-15′), 1.07 and 1.03 (d, J = 7 Hz, H-12′, H-14′), 3.71 (s, 2H, H-13′), 3.89 (q, 1H, J_1 = 11.5 Hz, J_2 = 5 Hz, H-4′), 6.13 (d, 1H, J = 10 Hz, H-3), 7.53 (d, 1H, J = 10 Hz, H-4), 6.71 (m, 1H, H-8), 6.77 (m, 1H, H-6), 7.39 (m, 1H, H-5)

A. A. Nabiev and V. M. Malikov, Khim. Prir. Soedin., 700 (1983).



MICROLOBIDEN

Ferula microloba

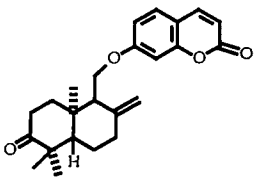
$C_{24}H_{30}O_4$, M^+ 382

mp 142-143°, $[\alpha]_D$ +56° (chlf)

IR: 3575, 1730, 1620, 1560, 1520

PMR: 0.90 (d, 3H, J = 7 Hz, H-14′), 0.99 (s, 3H, H-11′), 1.03 (s, 6H, H-15′, H-12′), 3.38 (br.s, 1H, W1/2 = 7 Hz, H-6′), 3.75 (s, 2H, H-13′), 5.37 (m, 1H, W1/2 = 7.5 Hz, H-4′), 6.14 (d, 1H, J = 10 Hz, H-3), 7.54 (d, 1H, J = 10 Hz, H-4), 6.70 (m, 1H, H-8), 6.74 (m, 1H, H-6), 7.30 (m, 1H, H-5)

A. A. Nabiev and V. M. Malikov, Khim. Prir. Soedin., 781 (1983).



MOGOLTADONE

F. samarcandica

$C_{24}H_{28}O_4$, M^+ 380

mp 132-133° (ee)

$[\alpha]_D$ –41.7° (chlf)

UV: 219, 243, 253, 325 (lgε 4.27; 3.60; 3.38; 4.38)

IR: 1735, 1690, 1620, 1560, 1510 [1]

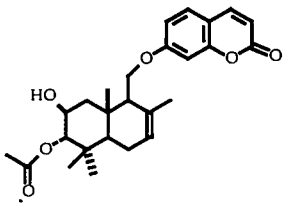
Mass: 380, 219, 191, 177, 163, 159, 149, 135, 121, 107, 95, 81, 69, 55 [2]

PMR: 0.97; 1.07; 1.13 (s, each 3H, H-11′, H-12′, H-15′), 4.00 and 4.30 (q, each 1H, J_1 = 10; J_2 = 6.6 Hz, H-13′), 4.66 and 4.76 (br.s, each 1H, H-14′), 6.15 (d, 1H, J = 9.5 Hz, H-3), 7.51 (d, 1H, J = 9.5 Hz, H-4), 7.25 (d, 1H, J = 8.5 Hz, H-5), 6.75 (q, 1H, J_1 = 8.5; J_2 = 2.5 Hz, H-6), 6.70 (d, 1H, J = 2.5 Hz, H-8) [1]

Abs. conf. [3]

1. T. Kh. Khasanov, A. I. Saidkhodzhaev, and G. K. Nikonov, Khim. Prir. Soedin., 29 (1974).
2. P. B. Terent'ev, L. I. Zakharov, G. K. Nikonov, T. Kh. Khasanov, and A. I. Saidkhodzhaev, Khim. Prir. Soedin., 207 (1977).
3. A. I. Saidkhodzhaev and V. M. Malikov, Khim. Prir. Soedin., 707 (1978).

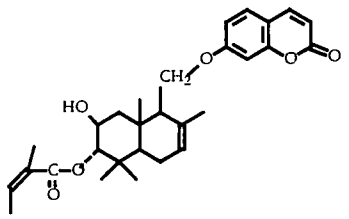
MOGOLTAVIN



Peucedanum mogoltavicum
$C_{26}H_{32}O_6$, M^+440
mp 196-197°, $[\alpha]_D$ –108° (chlf)
IR: 3440-3525 [1]
Mass: 440, 399, 398, 396, 384, 383, 379, 366, 365, 347, 320, 319, 279, 278, 261, 260, 249, 241, 237, 219, 218, 217, 205, 204, 203, 202, 201, 200, 191, 189, 188, 186, 185, 174, 173, 164, 163, 162, 161, 160, 159, 145 [2]

1. G. K. Nikonov, Khim. Prir. Soedin., 43 (1972).
2. P. I. Zakharov, P. B. Terent'ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 18 (1974).

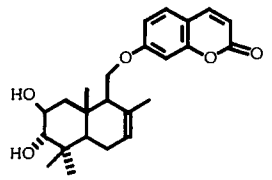
MOGOLTAVININ



Peucedanum mogoltavicum
$C_{29}H_{36}O_6$, M^+ 480
mp 180-182°, $[\alpha]_D$ –119.2° (chlf)
IR: 3530-3580, 2860-2850, 1620, 1560, 1465, 1710-1730 [1]
Mass: 480, 466, 464, 398, 382, 381, 380, 319, 318, 302, 219, 218, 203, 202, 201, 200, 199, 191, 189, 188, 187, 185, 177, 176, 175, 174, 164, 163, 162, 161, 160, 145 [2]
PMR: 0.87 and 0.95 (s, 3H, 6H, H-11′, H-12′, H-15′), 1.65 (s, 3H, H-14′), 3.8-4.3 (m, 3H, H-13′), 5.52 (m, 1H, H-3′), 1.90 and 1.99 (s, each 3H, H-4″, H-5″), 6.06 (m, 1H, H-4″), 6.18 (d, 1H, J = 10 Hz, H-3), 7.60 (d, 1H, J = 10 Hz, H-4), 7.28 (d, 1H, J = 8.0 Hz, H-5), 6.75 (d, J = 8 Hz, H-6), 6.74 (s, 1H, H-8) [1]

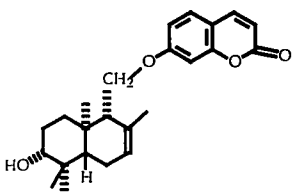
1. G. K. Nikonov, Khim. Prir. Soedin., 54 (1972).
2. P. I. Zakharov, P. B. Terent'ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 18 (1974).

MOGOLTIN



Peucedanum mogoltavicum
$C_{24}H_{30}O_5$, M^+ 398
mp 183-185°, $[\alpha]_D$ –68.3° [1]
Mass: 398, 397, 396, 383, 382, 381, 380, 365, 364, 237, 236, 219, 218, 203, 201, 192, 191, 188, 177, 176, 175, 174, 163, 162, 161, 159, 145 [2]
PMR: Py-d_5, 0.91; 0.99; 1.08 (s, each 3H, H-11′, H-12′, H-15′), 1.67 (s, 3H, H-14′), 3.78 (t, 1H, J_1 = 11.0; J_2 = 4.7 Hz, H-7′), 3.27 (d, 1H, J = 11.0 Hz, H-6′), 3.98 (q, 2H, J_1 = 4.5; J_2 = 1.0 Hz, H-13′), 5.78 (br.s, 1H, H-3′), 6.20 (d, 1H, J = 9.5 Hz, H-3), 7.59 (d, 1H, J = 9.5 Hz, H-4), 7.34 (d, 1H, J = 8.0 Hz, H-5), 6.79 (q, 1H, J_1 = 8.0 Hz; J_2 = 2.5 Hz, H-6), 6.83 (d, 1H, J = 2.5 Hz, H-8)

1. G. K. Nikonov, Khim. Prir. Soedin., 572 (1971).
2. P. I. Zakharov, P. B. Terent'ev, G. K. Nikonov, and A. I. Ban'kovskii, Khim. Prir. Soedin., 18 (1974).



MOSCHATOL (FESELOL)

Ferula moschata, F. iliensis

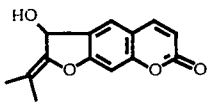
$C_{24}H_{30}O_4$, M^+382

mp 78-80°, $[\alpha]_D$ –77.4° (alc)

UV: 214, 242, 252, 325 (lgε 4.20; 3.62; 3.51; 4.14)

PMR: 0.79 (s, 3H, H-15′), 0.83 (s, 3H, H-11′), 0.92 (s, 3H, H-12′), 1.60 (s, 3H, H-14′), 3.14 (q, 1H, J_1 = 9; J_2 = 6 Hz, H-6′), 3.91 (q, 1H, J_1 = 10; J_2 = 6 Hz, H-13′), 4.09 (q, 1H, J_1 = 10; J_2 = 6 Hz, H-13′), 6.16 (d, 1H, J = 9.0 Hz, H-3), 7.52 (d, 1H, J = 9 Hz, H-4), 7.30 (d, 1H, J = 8.5 Hz, H-5), 6.76 (q, 1H, J = 9.5; 2.5 Hz, H-6), 6.74 (d, 1H, J = 2.5 Hz, H-8) [1, 2]

1. Yu. E. Sklyar, M. E. Perel'son, and M. G. Pimenov, Khim. Prir. Soedin., 428 (1973).
2. N. P. Kir'yalov and T. V. Bukreeva, Khim. Prir. Soedin., 425 (1973).



NACHSMYRIN

Smyrniopsis aucheri

$C_{14}H_{42}O_4$, mp 135-136°

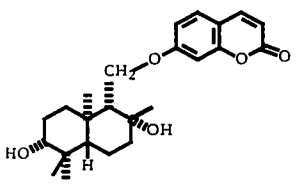
UV: 220, 225, 247, 253, 303

IR: 3500, 1730, 1620, 1585, 1455

Mass: 244(M^+), 227, 201, 198, 187, 158, 155, 131, 101

PMR: 6.18 (d, 1H, J = 10.0 Hz, H-3), 7.61 (d, 1H, J = 10.0 Hz, H-4), 6.77 (s, 1H, H-8), 7.19 (s, 1H, H-5), 2.93 (s, 1H, H-4′), 1.68 (s, 6H, H-1′, H-3′)

1. Z. R. Dzhaffarov, Z. A. Kuliev, A. D. Vdovin, A. A. Kuliev, V. M. Malikov, and N. M. Ismailov, Khim. Prir. Soedin., 754 (1988).



NEVSKIN

Ferula nevskyii

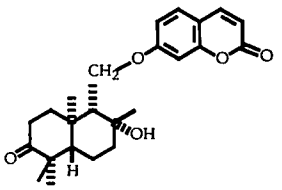
$C_{24}H_{32}O_5$, mp 193-194°, $[\alpha]_D$ –79° (chlf)

UV: 224, 255, 325

IR: 1720, 1615, 1560, 1520, 3200-3600 [1, 2]

PMR (of acetylnevskin): 6.25 (d, 1H, J = 9.2 Hz, H-3), 7.63 (d, 1H, J = 9.2 Hz, H-4), 7.35 (d, 1H, J = 8.5 Hz, H-5), 6.81 (q, 1H, J_1 = 8.5 Hz, J_2 = 2.0 Hz, H-6), 6.85 (d, 1H, J = 2.0 Hz, H-8), 4.36 (q, 1H, J_1 = 10.0 Hz, J_2 = 4.0 Hz, H-13′), 4.15 (q, 1H, J_1 = 10.0 Hz, J_2 = 3.0 Hz, H-13′), 4.50 (q, 1H, J_1 = 9.5; J_2 = 6.0 Hz, H-6′), 2.03 (s, 3H, O–CO–CH_3), 1.16 (s, 3H, H-14′), 1.14 (s, 3H, H-15′), 0.89 (s, 6H, H-11′, H-12′) [2, 3]

1. V. Yu. Bagirov and N. P. Kir'yalov, Khim. Prir. Soedin., 387 (1972).
2. V. Yu. Bagirov, V. I. Sheichenko, and A. I. Ban'kovskii, Khim. Prir. Soedin., 450 (1975)
3. A. I. Saidkhodzhaev, A. Sh. Kadyrov, and V. M. Malikov, Khim. Prir. Soedin., 308 (1979).



NEVSKONE

Ferula nevskyi

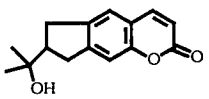
$C_{24}H_{30}O_5$

mp 180-181°

IR: 3510, 3470, 1720, 1705, 1613, 1560, 1510 cm^{-1}

PMR: 1.09 and 1.11 (s, each 3H, H-11′, H-12′), 1.22 (s, 3H, H-15′), 1.28 (s, 3H, H-14′), 4.36 (q, 1H, $J_1 = 10$; $J_2 = 4$ Hz, H-13′), 4.15 (q, 1H, $J_1 = 10$; $J_2 = 3$ Hz, H-13′), 6.20 (d, 1H, J = 9.5 Hz, H-3), 7.57 (d, 1H, J = 9.5 Hz, H-4), 7.28 (d, 1H, J = 8.5 Hz, H-5), 6.78 (q, 1H, $J_1 = 8.5$; $J_2 = 2.5$ Hz, H-6), 6.80 (d, 1H, J = 2.5 Hz, H-8)

V. Yu. Bagirov, Khim. Prir. Soedin., 652 (1978).



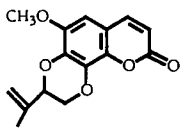
NODAKENETIN

Seseli peucedanoides

$C_{14}H_{14}O_6$, mp 189-191°, $[\alpha]_D^{22}$ –20.5° (chlf)

UV: 212, 248, 335 [1, 2]

1. Murray.
2. A. Z. Abyshev and D. Z. Abyshev, Khim. Prir. Soedin., 248 (1984).



OBTUSIN

Haplophyllum obtusifolium

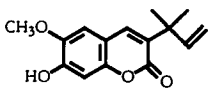
$C_{15}H_{14}O_5$, M^+ 274

mp 109-110°, $[\alpha]_D^{20}$ +48.6° (alc)

IR: 1725, 1620, 1580, 1510

PMR: 6.25 (d, 1H, J = 10.0 Hz, H-3), 7.65 (d, 1H, J = 10.0 Hz, H-4), 6.50 (s, 1H, H-5), 5.10; 5.22 (s, each 3H, H-3′), 3.87 (s, 3H, $-OCH_3$), 3.95-4.75 (m, 4H, H-4′, H-5′)

A. Z. Abyshev and N. F. Gashimov, Khim. Prir. Soedin., 403 (1979)



OBTUSIDIN

Haplophyllum obtusifolium

$C_{15}H_{16}O_5$, mp 165-167°

UV: 230, 259, 345

IR: 3455-3255, 1684, 1622, 1593

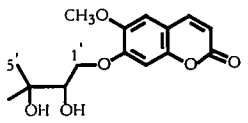
Mass: 276 (M^+), 261, 249, 248, 233, 221, 111, 109, 105, 97, 95, 85, 83, 81

PMR: 1.42 (s, 6H, H-4′, H-5′), 3.72 (s, 3H, OCH_3), 4.94 (d, 1H, J = 10.5 Hz, H-2′), 4.98 (d, 1H, J = 18.0 Hz, H-3′), 6.15 (dd, 1H, $J_1 = 18.0$ Hz; $J_2 = 10.5$ Hz, H-3′), 6.58 (s, 1H, H-5), 7.50 (s, 1H, H-4) [1]

^{13}C NMR [2]:

C-2	158.5	8	131.8	1′	40.0
3	129.2	9	138.4	2′	145.0
4	145.0	10	110.0	3′	111.2
5	99.9	OCH_3	56.1	4′	27.3
6	144.7			5′	27.3
7	141.4				

1. A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 173 (1982).
2. É. Kh. Batirov, A. D. Matkarimov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 780 (1982).



OBTUSININ

Haplophyllum obtusifolium

$C_{15}H_{18}O_6$, mp 136-137°

$[\alpha]_D^{20}$ +32.6° (met)

UV: 230, 253, 297, 347

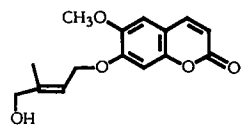
IR: 3500, 3385-3314, 1728, 1620, 1567, 1520, 930, 781, 748 [1]

PMR: 1.28; 1.32 (s, 6H, H-4′, H-5′), 3.82 (s, 3H, OCH_3), 3.75 (m, 1H, H-2′), 4.17 (m, 2H, H-1′), 6.19 (d, 1H, J = 10.0 Hz, H-3), 6.74 (s, 2H, H-8, H-5), 7.52 (d, 1H, J = 10.0 Hz, H-4)

^{13}C NMR[2]:

C-2	160.6	8	100.8	1′	71.0
3	112.5	9	149.5	2′	75.7
4	144.2	10	111.1	3′	71.3
5	109.1	OCH_3	56.3	4′	27.9
6	146.2			5′	24.2
7	152.4				

1. A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 328 (1980).
2. A. D. Vdovin, É. Kh. Batirov, A. D. Matkarimov, M. R. Yagudaev, and V. M. Malikov, Khim. Prir. Soedin., 796 (1987).



OBTUSINOL

Haplophyllum obtusifolium

$C_{16}H_{16}O_5$, mp 97-98°

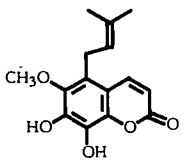
UV: 231, 261, 298, 347

IR: 3467, 1705, 1616, 1570, 1522

Mass: 276 (M^+), 193, 192, 177, 164, 149, 135, 69, 55

PMR: 1.83 (br.s, 3H, H-5′), 3.80 (s, 3H, OCH_3), 4.10 (br.s, 2H, H-1′), 4.62 (d, 2H, J = 6.5 Hz, H-1′), 5.59 (m, 1H, H-2′), 6.20 (d, 1H, J = 9.8 Hz, H-3), 6.78 (s, 2H, H-5, H-8), 7.55 (d, 1H, J = 9.8 Hz, H-4)

A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 565 (1980).



OBTUSIPRENIN

Haplophyllum obtusifolium

$C_{15}H_{16}O_5$, mp 139-140°

UV: 229, 262, 339

IR: 3395, 1698, 1637, 1603, 1580

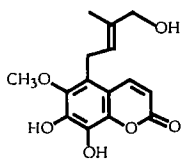
Mass: 276 (M^+), 261, 250, 246, 245, 243, 233, 229, 221, 220, 219, 209, 193, 192, 191, 190, 83, 69

PMR: 1.53; 1.65 (s, each 3H, H-4′, H-5′), 3.47 (d, 2H, J = 6.5 Hz, H-1′), 3.81 (s, 3H, OCH_3), 5.04 (m, 1H, H-2′), 6.18 (d, 1H, J = 10.0 Hz, H-3), 7.75 (d, 1H, J = 10.0 Hz, H-4)

^{13}C NMR:

C-2	159.3	7	141.4	1′	23.8
3	111.0	8	130.8	2′	122.9
4	142.7	9	140.7	3′	130.5
5	121.9	10	108.6	4′	18.0
6	142.4	OCH_3	60.3	5′	25.5

A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 173 (1982); 780 (1982).



OBTUSIPRENOL

Haplophyllum obtusifolium

$C_{15}H_{16}O_6$, mp 106-108°

UV: 229, 263, 340

IR: 3530, 3410-3290, 1702, 1617, 1588

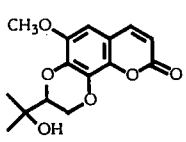
Mass: 292 (M^+), 261, 243, 229, 221, 225, 208, 207, 125, 123, 121, 120, 111, 109, 106, 97, 95, 93, 91, 85, 83, 81, 71, 69, 67, 57, 55

PMR: 1.85 (br.s, 3H, H-5′), 3.60 (d, 2H, J = 6.5 Hz, H-1′), 3.83 (s, 3H, OCH_3), 4.12 (br.s, 2H, H-4′), 5.60 (t, 1H, J = 6.5 Hz, H-2′), 6.09 (d, 1H, J = 10.0 Hz, H-3), 7.75 (d, 1H, J = 10.0 Hz, H-4)

^{13}C NMR:

C-2	159.3	7	142.4	1′	23.3
3	111.0	8	130.9	2′	121.8
4	142.7	9	140.5	3′	134.9
5	121.7	10	108.5	4′	14.0
6	142.4	OCH_3	60.5	5′	65.9

A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 795 (1981); 780 (1982).



OBTUSIFOL

Haplophyllum obtusifolium

$C_{15}H_{16}O_6$, mp 149.5-150°

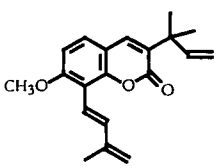
$[\alpha]_D^{19}$ +60.39° (chlf)

IR: 3420, 1720, 1702, 1618, 1575, 1510

Mass: 292 (M^+), 277, 234, 205, 59

PMR: 6.24 (d, 1H, J = 10.0 Hz, H-3), 7.56 (d, 1H, J = 10.0 Hz, H-4), 6.48 (s, 1H, H-5), 3.88 (s, 3H, OCH_3), 3.92-4.70 (m, 3H, H-3′, H-4′), 2.95 (br.s, 1H, –OH), 1.36; 1.42 (s, each 3H, H-1′, H-5′) [1, 2]

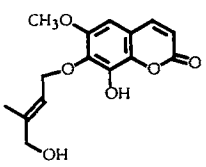
1. N. F. Gashimov and G. A. Kuznetsova, Khim. Prir. Soedin., 303 (1974).
2. A. Z. Abyshev and N. F. Gashimov, Khim. Prir. Soedin., 401 (1979).



OBTUSIFOLIN

Haplophyllum obtusifolium
$C_{20}H_{22}O_3$, mp 179-180°
IR: 1710, 1624, 1610, 1600, 1569
Mass: 310 (M^+), 295, 279, 267, 254, 237, 223, 211, 209, 165, 105, 69
PMR: 6.77 (d, 1H, J = 9.0 Hz, H-6), 7.20 (d, 1H, J = 9.0 Hz, H-5), 7.42 (s, 1H, H-4), 3.88 (s, 3H, OCH_3), 1.42 (s, 6H, H-4′), 1.96 (s, 3H, H-1′), 4.92-5.25 (m, 4H, H-2′, H-3′), 6.82 (d, 1H, J = 16.0 Hz, H-1″), 7.47 (d, 1H, J = 16.0 Hz, H-2″)

I. A. Bessonova, É. Kh. Batirov, and M. R. Yagudaev, Khim. Prir. Soedin., 167 (1988).

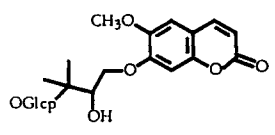


OBTUSICIN

Haplophyllum obtusifolium
$C_{15}H_{16}O_6$, mp 125-126°
UV: 229, 258, 315
IR: 3405-3250, 1696, 1614, 1577, 1510
Mass: 292 (M^+), 209, 208, 193, 180, 165, 137, 109, 95, 85, 84, 83
PMR: 1.77 (br.s, 3H, H-5′), 3.62 (s, 3H, OCH_3), 4.29 (br.s, 2H, H-4′), 4.86 (d, 2H, J = 7.0 Hz, H-1′), 5.68 (m, 1H, H-2′), 6.22 (d, 1H, J = 9.5 Hz, H-3), 6.46 (s, 1H, H-5), 7.52 (d, 1H, J = 9.5 Hz, H-4)
^{13}C NMR:

C-2	159.3	7	137.9	1′	56.0
3	113.8	8	137.9	2′	59.6
4	143.8	9	140.4	3′	121.3
5	99.8	10	113.8	4′	143.8
6	149.2	OCH_3	58.1	5′	21.3

A. D. Vdovin, É. Kh. Batirov, A. D. Matkarimov, M. R. Yagudaev, and V. M. Malikov, Khim. Prir. Soedin., 796 (1987).



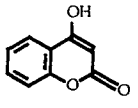
OBTUSOSIDE

Haplophyllum obtusifolium
$C_{21}H_{28}O_{11}$, mp 140-142°
$[\alpha]_D$ +10.4° (met)
UV: 230, 259, 297, 341
IR: 3540-3220, 1719, 1620, 1570, 1520, 1015-1100, 934, 860, 756
Mass: 456 (M^+), 346, 331, 316, 308, 295, 294, 276, 261, 194, 193, 192, 177, 168, 164, 153, 149, 137, 111, 97, 85, 73, 71, 69, 60, 59

PMR: 1.41 (s, 3H, H-4′, H-5′), 3.52 (s, 3H, OCH_3), 3.55-4.55 (m, 2H, H-1′, H-2′), 4.93 (d, 1H, J = 7.0 Hz, H-1″), 6.05 (d, 1H, J = 9.5 Hz, H-3), 6.72 (s, 1H, H-8), 6.80 (s, 1H, H-5), 7.41 (d, 1H, J = 9.5 Hz, H-4)

A. D. Matkarimov, É. Kh. Batirov, V. M. Malikov, and E. Seitmuratov, Khim. Prir. Soedin., 831 (1980).

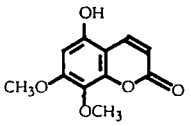
4-HYDROXYCOUMARIN



Psoralea drupaceae
$C_9H_6O_3$ [1]
UV: 268, 279, 305
IR: 3100, 1713, 1689, 1615, 1565, 1522 [2]

1. G. K. Nikonov and N. A. Artamonova, Khim. Prir. Soedin., 300 (1993).
2. Perel'son.

5-HYDROXY-7,8-DIMETHOXYCOUMARIN

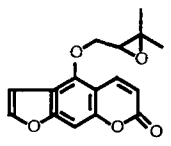


Artemisia lasiniata
$C_{11}H_{10}O_5$, M^+222, mp 242°
UV: 261, 318
PMR: 6.13 (d, 1H, J = 10.0 Hz, H-3), 8.06 (d, 1H, J = 10.0 Hz, H-4), 6.46 (s, 1H, H-6), 3.60; 3.80 (s, each 3H, OCH_3)
^{13}C NMR:

C-2	160.4	7	156.2
3	109.8	8	128.4
4	139.8	9	148.0
5	151.3	10	102.6
6	95.3	C_7-OCH_3	56.2
		C_8-OCH_3	60.88

I. I. Chemesova, T. V. Bukreeva, and É. V. Boiko, Khim. Prir. Soedin., 115 (1990).

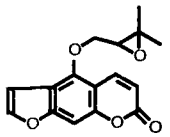
(–)-OXYPEUCEDANIN



Prangos ferulaceae, *P. lamellata*
$C_{16}H_{14}O_5$, mp 115-117°
$[\alpha]_D^{20}$ –18.5° (chlf) [1, 2]

1. A. Z. Abyshev, Khim. Prir. Soedin., 300 (1993).
2. T. Yu. Danchul, G. A. Kuznetsova, E. A. Sokolova, and L. V. Kuz'mina, Khim. Prir. Soedin., 849 (1979).

OXYPEUCEDANIN



Agasillis latiloba, Angelica dahurica, A. genuflexa, A. gmelinii, Archangelica decurrens, Cachrys odontalgica, Ferulago sylvatica, F. turcomanica, Hippomarathrum caspicum, H. microcarpum, Laser trilobum, Prangos acaulis, P. aris-romonae, P. alata, P. bucharica, P. equisetoides, P. ferulaceae, P. fedtschenkoi, P. isphairamica, P. lamellata, P. latiloba, P. lipskyi, P. pabularia, P. quasiperforata, P. sarawschanica, P. tschimganica, P. uloptera, Seseli gracile, S. krylovii, S. rigidum

$C_{16}H_{14}O_5$, mp 142-143°

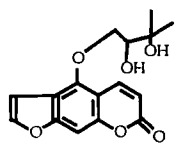
UV: 220, 249, 266, 306

IR: 3159, 3124, 3064, 1726, 1624, 1611, 1584 [1, 2]

PMR: 6.27 d (9.0 Hz; H-3), 8.17 d (9.0 Hz; H-4), 7.28 s (H-8), 6.92 d (2.5 Hz; H-4′), 7.60 d (2.5 Hz; H-5′), 4.44 q (11.2; 6.4 Hz; H-2″), 4.62 q (11.2; 4.6 Hz; H-1″), 1.32; 1.39 s ($2CH_3$) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.

(+)-OXYPEUCEDANIN HYDRATE (AVIPRIN)



Angelica gmelinii, Peucedanum palustre

$C_{16}H_{16}O_6$, mp 131-132°

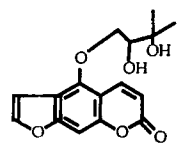
$[\alpha]_D^{14}$ +15.26° (ac)

UV: 222, 250, 268, 310

IR: 3408, 3100, 1705, 1619, 1610, 1579, 1546

G. K. Nikonov, R. K. Veremei, and M. G. Pimenov, Zh. Obshch. Khim., 1353 (1964).

OXYPEUCEDANIN HYDRATE (PRANGOL)



Angelica dahurica, A. decursiva, A. genuflexa, A. gmelinii, A. pachyptera, A. saxatilis, Ferulago sylvatica, F. turcomanica, *Heracleum sosnowskyi, Hippomarathrum caspicum, H. microcarpum, Peucedanum ruthenicum, Prangos acaulis, P. alata, P. aris-romonae, P. bucharica, P. equisetoides, P. fedtschenkoi, P. ferulaceae, P. isphairamica, P. latiloba, P. lamellata, P. lipskyi, P. lophoptera, P. quasiperforata, P. sarawschanica, P. tschimganica, P. uloptera, Seseli gracille, S. krylovii, S. rigidum*

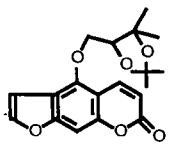
$C_{16}H_{16}O_6$, mp 132-134°

UV: 222, 244, 250, 260, 268, 310

IR: 3415, 3162, 3133, 3060, 1714, 1625, 1611, 1583, 1560 [1, 2]

PMR: 6.19 d (10.0 Hz; H-3), 8.30 d (10.0 Hz; H-4), 7.01 s (H-8), 7.14 d (2.5 Hz; H-4′), 7.71 d (2.5 Hz; H-5′), 4.34 q (10.0; 8.3 Hz; H-1″), 4.75 q (10.0; 2.3 Hz; H-1″), 3.81 q (8.3; 2.3 Hz; H-2″), 1.28; 1.32 s ($2CH_3$) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



OXYPEUCEDANIN HYDRATE ACETONIDE

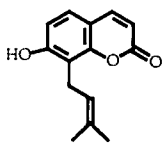
Peucedanum turcomanicum

$C_{19}H_{20}O_6$, mp 157.5-159°

IR: 1725, 1625, 1610, 1585, 1380, 1345

PMR: 6.29 (d, 1H, J = 10.0 Hz, H-3), 8.25 (d, 1H, J = 10.0 Hz, H-4), 7.25 (m, 1H, H-4′), 7.95 (m, 1H, H-5′), 7.00 (s, 1H, H-8), 1.22; 1.44 (s, each 3H, H-4″, H-5″), 1.44 (s, 6H, H-1‴, H-3‴), 4.20-4.51 (m, 3H, H-1′, H-2′)

A. Z. Abyshev, B. Azhdarov, and N. F. Gashimov, Khim. Prir. Soedin., 847 (1979).

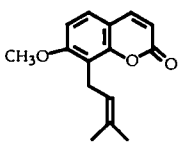


OSTHENOL

Prangos tschimganica

$C_{14}H_{14}O_3$, mp 124-125° [1, 2]

1. Murray.
2. A. Z. Abyshev, Khim. Prir. Soedin., 830 (1980).



OSTHOL

Angelica tschimganica, Cachrys odontalgica, Cnidium monnieri, Cryptodiscus didymus, Daucus carota, Ferulago turcomanica, Haplophyllum bungei, Heracleum aconitifolium, H. asperum, H. cyclocarpum, H. leskovii, H. pontica, H. sosnowskyii, H. wilhelmsii, Hippomarathrum caspicum, H. microcarpum, Prangos acaulis, P. aris-romonae, P. alata, P. bucharica, P. equisetoides, P. ferulaceae, P. lamellata, P. lipskyi, P. lophoptera, P. pobularia, P. quasiperforata, P. sarawschanica, P. tschimganica, P. uloptera, Pastinaca sativa, Seseli grandivittatum, S. foliosum

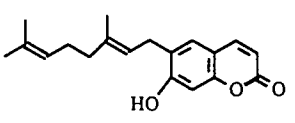
$C_{14}H_{14}O_3$, mp 124-125°

UV: 258, 322 [1, 2]

IR: 3115, 3083, 3033, 1730, 1618, 1571, 1509 [3]

PMR: 6.23 d (10 Hz; H-3), 7.61 d (10 Hz; H-4), 7.30 d (8.2 Hz; H-5), 6.83 d (8.2 Hz; H-6), 3.48 d (6.3 Hz; H-1'), 5.21 t (6.3 Hz; H-2'), 1.66; 1.84 s ($2CH_3$), 3.91 s (OCH_3) [3]

1. Murray.
2. Kuznetsova.
3. Perel'son.



OSTRUTHIN

Seseli krylovii

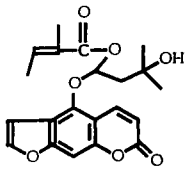
$C_{19}H_{22}O_3$, mp 117-119° [1, 2]

IR: 3200, 1690, 1620, 1575

PMR: 6.13 d (9.5 Hz; H-3), 7.60 d (9.5 Hz; H-4), 7.00 s (H-5), 7.09 s (H-8), 8.30 u.s (OH), 3.30 d (7.0 Hz; H-1′), 5.26 t (7.0 Hz; H-2′), 1.49; 1.58; 1.60 s ($3CH_3$), 1.98 u.s (H-4′; 5′), 5.03 u.s (H-7′) [3]

1. A. I. Sokolova, Yu. E. Sklyar, and L. I. Sdobnina, Khim. Prir. Soedin., 784 (1974)
2. Murray.
3. Kuznetsova.

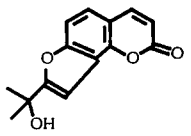
OSTRUTHOL



Xanthogallum purpurascens
$C_{21}H_{22}O_7$, mp 141-143°
$[\alpha]_D^{15}$ −18.3° (pyr) [1]
UV: 220, 250, 260, 267, 360
IR: 3170, 3128, 1697, 1630, 1609, 1585
PMR: 6.09 (d, 1H, J = 10.0 Hz, H-3), 7.89 (d, 1H, J = 10.0 Hz, H-4), 6.90 (s, 1H, H-8), 6.82 (d, 1H, J = 2 Hz, H-4′), 7.41 (d, 1H, J = 2.0 Hz, H-5′), 2.01; 1.84 (s, each 3H, H-4″, H-5″), 1.32 (s, 6H, H-4‴, H-5‴) [2]

1. A. I. Chatterjee and S. Dutta, Indian J. Chem., 415 (1968).
2. G. K. Nikonov, Zh. A. Moniava, and G. Yu. Pek, Khim. Prir. Soedin., 360 (1966).
3. Kuznetsova.

OROSELOL



Peucedanum hystrix
$C_{14}H_{12}O_4$, mp 156-157° [1, 2]
UV: 251, 301
IR: 3500, 1726
PMR: 6.34 d (10 Hz; H-3), 7.76 d (10 Hz; H-4), 7.34 s (H-5), 7.32 s (H-6), 6.92 s (H-4′), 1.71 ($2CH_3$) [3]

1. L. I. Shagova, G. A. Kuznetsova, L. P. Markova, and V. M. Vinogradova, Khim. Prir. Soedin., 518 (1984).
2. Murray.
3. Perel'son.