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FURANOCOUMARINS OF *HERACLEUM BRUNONIS*

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In a program (1) to screen high altitude (above 3200 m) plants of Himalayan glacier areas for active medicinal compounds and to investigate such plants chemically, *Heracleum brunonis* Benth. (Umbelliferae) was collected and found to be rich in furanocoumarins. Four known furanocoumarins have been isolated and identified.

EXPERIMENTAL

PLANT MATERIAL.—The roots of *H. brunonis* were collected in September 1984, at an altitude of 4,000 m from the Pindari glacier area in Kumaon Himalaya, U.P., India. Reference plant material is available in the Herbarium of the Forest Research Institute, Dehradun, No. FRI Dehradun (DD) Lace 1673.

EXTRACTION AND ISOLATION OF FURANOCOUMARINS.—The dried roots of the plant were pulverized, extracted with 80% MeOH, concentrated under vacuum, and partitioned between CHCl₃ and H₂O. The CHCl₃ layer was subjected to silica gel G tlc and observed under long wavelength uv light (365 nm). Six spots showed intense blue to yellow fluorescence and showed color changes characteristic of coumarins when sprayed with alcoholic KOH and alkaline hydroxylamine followed by FeCl₃.

On subjecting the CHCl₃ extract to silica gel G column chromatography and eluting with different proportions of combinations of petroleum ether/C₆H₆ and C₆H₆/EtOAc, six fractions were collected. The purity of each fraction was further ascertained by using a Waters Associates hplc fitted with a RCSS-Z module system and refractive index and variable wavelength (190-750 nm) uv detectors.

Out of the six fractions, four known coumarins, (+)-columbianetin, imperatorin, (+)-heraclenol and bergapten, were identified (2-6) by means of mp, mmp, co-hplc, uv, ir, ¹H-nmr, and ms methods as well as by comparisons with authentic samples.

Full details of the isolation and identification are available on request to the senior author.

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CONSTITUENTS OF *CHERSODOMA JODOPAPPA*

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No chemical investigations have been reported previously on the genus *Chersodoma* (Compositae, Senecioneae). As part of a systematic study of this genus, we report the isolation and identification of two sesquiterpene lactones of the eremophilanolide type and a secopyrrolizidine alkaloid from *Chersodoma jodopappa* (Sch. Bip.) Cabr., which grows in the vicinity of Toconce in the north of Chile. The dried and powdered aerial parts of *C. jodopappa* were extracted with petroleum ether and EtOH. The H_2SO_4 -soluble portion of the ethanolic extract yielded senkirkine (1), 6 β -hydroxy-8 β [H]-eremophila-7 (11)-en-8, 12-olide (6 β -hydroxyeremophilanolide) and 6 β , 8 β -dihydroxy-10 β [H]-eremophila-7 (11)-en-8, 12-olide (6 β , 8 β -dihydroxyeremophilanolide) (2,3).

The chemistry of this first *Chersodoma* species studied agrees with that of the other genera in the tribe Senecioneae (*Petasites*, *Ligularia*, and *Senecio*) (4).

EXPERIMENTAL

PLANT MATERIAL.—*C. jodopappa* was collected in the area of Toconce in the northern Andes of Chile (ca. 4000 m). A voucher specimen is on deposit at the University of Concepcion Herbarium (Chile).

EXTRACTION AND ISOLATION.—The air-dried, aerial parts (4.1 kg) were extracted with light petroleum and with EtOH (20 liters). The ethanolic extract was concentrated in vacuo to a volume of 2 liters, poured into 4% H_2SO_4 (8 liters) and filtered. The filtrate was extracted three times with Et_2O . After drying and evaporation of Et_2O , the yield gave 11.5 g of an "acidic extract" which was chromatographed on 400 g of silica gel. Further purifications of the C_6H_6 -EtOAc (4:1) eluates gave 6 β -hydroxy-8 β [H]-eremophila-7 (11)-en-8, 12-olide (300 mg). C_6H_6 -EtOAc (1:1) eluates yielded 6 β , 8 β -dihydroxy-10 β [H]-eremophila-7 (11)-en-8, 12-olide (318 mg).

After extraction with Et_2O the acidic aqueous layer was made alkaline with concentrated NH_3 to pH 10.5 and extracted five times with 400 ml of CHCl_3 . The concentrated CHCl_3 extract (2.81 g) was chromatographed on Al_2O_3 (150 g, activity I). The C_6H_6 -EtOH (2:1) eluates afforded senkirkine (83 mg).