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Received 10 March 1987

ACTIVE CRYSTALLINE PRINCIPLES FROM *HERACLEUM BRUNONIS*

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Naturally occurring coumarins form an important group of plant products with a wide range of physiological actions (1). Xanthotoxin, bergapten, imperatorin, and angelicin are among the best dermal photosensitizers used for the treatment of leucoderma (2). Imperatorin has been regarded as the best antifungal agent (3) among the coumarins, whereas xanthotoxin has been found to exhibit tuberculostatic activity (4). Xanthotoxin and bergapten have also been reported to show molluscicidal activity against *Biomphalaria biossi* (5).

The presence of these bioactive coumarins in *Heracleum brunonis* Benth. (Umbelliferae), in addition to other compounds as reported in our earlier (6,7) and present communication, bring this Himalayan plant to light as an active herb possessing antidermal, antifungal, tuberculostatic, and molluscicidal properties.

EXPERIMENTAL

GENERAL EXPERIMENTAL PROCEDURES.—Spectra were recorded with the following instruments: uv, Hitachi model 220; ir, Perkin-Elmer model 298; ^{1}H nmr, 80 MHz, Varian CFT-20; and ms, JEOL JMS-D 300, mass spectrometer.

PLANT MATERIAL.—The roots of *H. brunonis* were collected from glacier regions of Kumaon Himalaya, U.P., India, at an altitude of 4000 m in September 1984. The plant material, with voucher No. herb. FRI (DD) Lace 1673, is available in the herbarium of the Forest Research Institute, Dehradun, where the plant material was identified.

EXTRACTION AND ISOLATION.—The dried roots (700 g) of *H. brunonis* were powdered, extracted with 80% MeOH, concentrated under reduced pressure, and re-extracted with $CHCl_3$-H_2O (1:1). The $CHCl_3$ layer was separated, concentrated, and further extracted with petroleum ether (60-80°). The petroleum ether extract was chromatographed on a column of Si gel G and eluted with different proportions of petroleum ether, C_6H_6, and EtOAc. Apart from the furanocoumarins, bergapten, imperatorin, (+)-heraclenol, columbianadin and (+)-columbianetin reported in our earlier communication (6,7), four additional compounds have been isolated by repeated column chromatography, tlc, and reverse phase hplc methods. Three of them were fluorescent compounds (365 nm, uv light) that gave positive tests for coumarins (8), and one was an anthraquinone (9,10); the compounds have been identified (8,10-13) as xanthotoxin (120 mg), angelicin (90 mg), pimpinellin (70 mg), and chrysophenol (35 mg) by means of mp, mmp, uv, ir, ^{1}H nmr, ^{13}C nmr, and ms as well as by comparisons with authentic samples.

The absence of pyranocoumarins is also of chemotaxonomic significance in the genus *Heracleum* (8,14-16).

Isolated compounds and full details of the isolation and identification are available on request to the senior author.

ACKNOWLEDGMENTS

The authors are grateful to DST (Grant No. HCS/DST/1006) and UGC New Delhi for financial support and to Dr. D.S. Bhakuni, RSIC, Central Drug Research Institute, Lucknow, for nmr and ms results.

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Received 16 April 1987