ALKALOIDS FROM *LINDERA UMBELLATA*, *LINDERA SERICEA*, AND THEIR VARIETIES

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The root bark and the stem of *Lindera umbellata* Thunb., *Lindera sericea* (Sieb. et Zucc.) Blume, and their varieties have been used in Chinese and Japanese folk medicine for treatment of beriberi, edema, bleeding, indigestion, abdominal pains, and some skin diseases. Kubo, *et al.* previously discussed the sources of the crude drug in the Japanese market by a study based on anatomical observations and analyses of their essential oils, and it was concluded that the tissues of the barks and the woods and the gc pattern of the essential oils of *L. umbellata* and *L. sericea* were very similar to those of *L. umbellata* Thunb. var. *membranacea* (Maxim.) Momiyama and *L. umbellata* Thunb. var. *lancea* Momiyama, respectively, while different results were obtained in the case of *L. sericea* (Sieb. et Zucc.) Blume var. *glabrata* Blume (1). Three aporphine alkaloids, laurolitsine, launobine, and boldine, were identified from the roots of the plants. The occurrence of laurotetanine and launobine[1] in the stem of *L. umbellata* was also proved.

Compound	Identified by	Reference
Laurolitsine	^{1}H nmr, [α]D, uv, co-tlc, picrolonate (mp, ir)	(2)
Launobine	mp, ir, [α]D	(2)
Boldine	mmp, ir, ^{1}H nmr, [α]D, uv, co-tlc	(4)
Laurotetanine	mp, ir, ^{1}H nmr, [α]D, uv	(5)

EXPERIMENTAL

PLANT MATERIALS.—*L. umbellata* was collected in Kyoto and Hyogo Prefecture, *L. umbellata* var. *membranacea* was collected in Ishikawa Prefecture, *L. umbellata* var. *lancea* was collected in Nara Prefecture, *L. sericea* and *L. sericea* var. *glabrata* were collected in Tokushima Prefecture. The plants were identified by Dr. G. Murata of Kyoto University, and voucher specimens are deposited in the herbarium of the Faculty of Pharmaceutical Science, Kinki University.

EXTRACTION AND ISOLATION.—Air-dried and cut roots of *L. umbellata* were extracted with boiling MeOH, and the extract was subjected to an isolation procedure based on the Stas-Otto method (3). The resulting phenolic alkaloid mixture was treated with Me_2CO, and launobine was obtained from the insoluble portion. Laurolitsine was isolated as its picrolonate from the Me_2CO soluble portion. From the mother liquor of the picrolonate, boldine was isolated by silica gel column chromatography. The same procedure was applied to the roots of *L. sericea* and *L. sericea* var. *glabrata*, and similar results were obtained. Both phenolic alkaloid mixtures from the roots of *L. umbellata* var. *membranacea* and *L. umbellata* var. *lancea* showed the same compounds on tlc.

Air-dried, cut stems of *L. umbellata* were similarly extracted by the foregoing procedure, and the phenolic alkaloid mixture was obtained. In addition to launobine,[1] laurotetanine was isolated as its picrolonate from the phenolic alkaloid mixture.

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

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ATRIPLEX NUMMULARIA, A SOURCE FOR THE TWO MOLLUSCICIDE SAPONINS: HEDERAGENIN-3-*O*-β-D-GLUCURONOPYRANOSIDE AND CALENDULOSIDE E

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As a part of an investigation of the phytochemistry of *Atriplex nummularia* Lindley (Chenopodiaceae), a 2-3 m high shrub common in the Nile Delta and oases of Egypt (1), we isolated the two monodesmosidic saponins hederagenin-3-*O*-β-D-glucuronopyranoside and oleanolic acid-3-*O*-β-D-glucuronopyranoside (calenduloside E) in a yield of 2% of dried plant material for each of the two glucuronides. Both of the saponins have previously been reported to be potent molluscicides (2). Thus, *A. nummularia* might be a potent tool for controlling schistosomiasis, which is considered to be one of the most significant and rapidly spreading parasitic diseases in many tropical and subtropical parts of Africa, the Middle East, the Far East, some Caribean Islands, and many parts of South America (3-5).

EXPERIMENTAL

PLANT MATERIAL.—Aerial parts of flowering *A. nummularia* were collected from the wild in the coastal region about 30 km from Alexandria. Identification was confirmed by Dr. Loutfy Pollus, Professor of Plant Taxonomy, Faculty of Science, Cairo University.

EXTRACTION AND ISOLATION.—Oven-dried plant material (500 g) was defatted (light petroleum ether bp 40-60°) and extracted in a Soxhlet apparatus for 24 h with EtOH. After concentration, a yellowish white deposit was isolated and washed with $CHCl_3$. An analytical sample (50 mg) of the deposit was chromatographed by hplc [LiChrosorp RP 18 (Knauer prepacked column, dimensions 250×8 mm, particle size 7 μm) eluent MeOH-0.5% aqueous HOAc (9:1), flow 2.5 ml/min] to give hederagenin-3-*O*-β-D-glucuronopyranoside (31 mg) $[\alpha]^{20}D$ 5 (*c* 0.13, EtOH) and oleanolic acid-3-*O*-β-D-glucuronopyranoside (12 mg) $[\alpha]^{20}D$ 14 (*c* 0.11, EtOH) (ref. 6: $[\alpha]^{20}D$ 14). The 270 MHz ^1H-nmr spectra of the sapogenins isolated after HCl (0.5 N) hydrolysis of the saponins were identical with those of authentic hederagenin and oleanolic acid, respectively. Full details of the ^1H- and ^{13}C-nmr spectra are available on request.

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