ALKALOIDS AND FLAVONOIDS FROM *RICINUS COMMUNIS*

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As a part of our continuing studies on the isolation of fertility regulating compounds from plants, we have examined the leaves of *Ricinus communis* L. (Euphorbiaceae), which have been used ethnomedically in Africa, India, and the Americas as an emmenagogue (1-5).

The dried leaves of *R. communis* afforded two alkaloids, ricinine and *N*-demethylricinine, and six flavonol glycosides: kaempferol-3-*O*-β-D-xylopyranoside, kaempferol-3-*O*-β-D-glucopyranoside, quercetin-3-*O*-β-D-xylopyranoside, quercetin-3-*O*-β-D-glucopyranoside, kaempferol-3-*O*-β-rutinoside, and quercetin-3-*O*-β-rutinoside. The structures of these compounds were determined through spectroscopic analysis, chemical correlation, and chemical degradation.

The flavonoids from this plant are mostly common flavonol-3-glycosides, but it is of chemotaxonomic interest that the isolates are pairs of xylosides, glucosides, and rutinosides of kaempferol and quercetin. Matsuda (6) has previously reported the presence of rutin in *R. communis* leaves and recently Khafagy and co-workers (7) reported the presence of both rutin and hyperoside. We were unable to detect hyperoside in our sample of this plant.

The predominant alkaloid in this plant, ricinine (0.55% yield), has been of interest biosynthetically for a considerable time (8-11), and *N*-demethylricinine is known to be a metabolite of exogenous ricinine (12). Waller and co-workers (13-16) have carried out work on ricinine metabolism which suggests that *N*-demethylricinine is absent in the green leaves, i.e., that its *N*-methylation to ricinine is a very rapid process. Our finding of *N*-demethylricinine in the dried leaves at a moderate level (0.016%) is therefore of some interest. To confirm our observation, a fresh sample of *R. communis* leaves was examined. Although isolation was probably incomplete, the EtOAc soluble fraction yielded both ricinine (0.07% yield) and *N*-demethylricinine (0.008%). *O*-Demethylricinine could not be detected in any extracts of our sample of *R. communis* leaves.

EXPERIMENTAL

PLANT MATERIAL.—Samples of *R. communis* were collected in 1978 by one of us (DDS), in Dambulla District, Sri Lanka, approximately 200 m above sea level. Leaves and roots were separated and air dried. Voucher herbarium specimens (*Soejarto 4915*) are deposited in the Herbarium of the Field Museum of Natural History, Chicago, IL.

EXTRACTION AND FRACTIONATION.—Ground leaf material of *R. communis* (10.6 kg) was thoroughly percolated with MeOH and the extract concentrated in vacuo to a dark green semisolid (952 g). Successive partitioning yielded petroleum ether (239 g), a petroleum ether insoluble intermediate phase (25.9 g), Et_2O (38.7 g), EtOAc (83.4 g), *n*-BuOH(70.5) and H_2O soluble (238.7 g) fractions. The EtOAc fraction was further divided into MeOH soluble (52.4 g) and MeOH insoluble fractions (27 g).

SEPARATION AND ISOLATION.—The MeOH soluble portion of the EtOAc fraction (45 g) was chromatographed on a column of silica gel 60. Elution with $CHCl_3$-MeOH-H_2O (52:28:8, lower phase) afforded 19 fractions.

Fractions 5 and 8 were crystallized from MeOH to yield ricinine (0.55%) and *N*-demethylricinine (0.016%), respectively. Fractions 9-11 were combined and further chromatographed on a column of Sephadex LH-20. Elution with MeOH afforded kaempferol-3-*O*-β-D-xylopyranoside (0.0007%) and kaempferol-3-*O*-β-D-glucopyranoside. Chromatography of combined fractions 12 and 13 on silica gel 60 and elution with EtOAc-MeOH-H_2O (200:33:27) gave kaempferol-3-*O*-β-D-glucopyranoside (total 0.0018%) and quercetin-3-*O*-β-D-glucopyranoside (and similar treatment of fractions 14 and 15 afforded gallic acid and quercetin-3-*O*-β-D-glucopyranoside) (total 0.031%). Chromatography of the mother liquor from this isolation and fraction 16 on Sephadex eluting with MeOH gave quercetin-3-*O*-β-D-xylopyranoside (0.0004%) and kaempferol-3-*O*-β-rutinoside (0.0028%). Fractions 18 and 19 were crystallized from MeOH to yield quercetin-3-*O*-β-rutinoside (0.004%). Additional details of the spectral properties and reactions used to characterize the isolates may be obtained from the authors.

ISOLATION OF RICININE AND *N*-DEMETHYLRICININE FROM FRESH *R. COMMUNIS* LEAVES.—*R. communis* was cultivated at the Pharmacognosy Field Station, College of Pharmacy, University of Illinois at

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Chicago, Lisle, Illinois, in 1980. An herbarium sample documenting the collection has been deposited in the Herbarium of the Field Museum of Natural History, Chicago, IL.

The fresh green leaf material (30.2 kg) was extracted with MeOH, and the concentrated extract was fractionated to afford Et_2O, EtOAc (16.4 g), and H_2O soluble fractions. Chromatography of the EtOAc extract on silica gel 60 (600 g) eluting with $CHCl_3$-MeOH-7% HOAc (5:1:1, lower phase) afforded ricinine (0.07%) and *N*-demethylricinine (0.008%).

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C-GLYCOSYLPHENOLICS FROM *RHYNCHOSIA SUAVEOLENS*

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In our continuing chemical analysis (1-3) of *Rhynchosia* species, we report here the phenolics of the leaves of *Rhynchosia suaveolens* DC. (Leguminosae).

EXPERIMENTAL

PLANT MATERIALS.—The leaves of *R. suaveolens* were collected from Tirumala, Andhra Pradesh, India. The plant was identified by Dr. K.N. Rao, Lecturer in Botany, S.V. University, Tirupati, India. Vouchers (no. RSL-III) of the plant are deposited in the Herbarium of the Botany Department, S.V. University, Tirupati, India.

EXTRACTION AND ISOLATION OF PHENOLICS.—Dried leaves of *R. suaveolens* (1 kg) were extracted and processed by standard procedures (4-7). The compounds obtained were luteolin, orientin, isoorientin, vitexin, isovitexin, vicenin-2, mangiferin, isomangiferin, and a cyclitol, (+)-pinitol.