C-GLYCOSYLFLAVONOIDS AND OTHER COMPOUNDS FROM *PASSIFLORA CYANEA, P. OERSTEDII* AND *P. MENISPERMIFOLIA*

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Members of *Passiflora* and related genera in the Passifloraceae serve as larval food plants for about 65 species of neotropical butterflies (*Heliconius*). Many of the larvae will only feed on one plant species or a few closely related taxa of Passifloraceae (1).

In a continuation of our efforts to determine the chemical basis of this co-evolution, we report here the results of the first chemical investigations of *P. cyanea* Mast, *P. oerstedii* Mast., and *P. menispermifolia* HBK, three species which are fed upon by either mono- or oligophagous larvae. The leaves (180 g) of *P. cyanea* yielded 2″-xylosylvitexin (30 mg) and the coumarin esculetin (10 mg), while the leaves (44 g) of *P. oerstedii* afforded only one flavonoid, 2″-xylosylvitexin (10 mg) but contained considerable amounts of several sugars (120 mg), namely fructose, glucose, galactose, and saccharose. This latter species also contained β-sitosterol (35 mg) and its 3-β-D-glucoside (20 mg). Leaves (31 g) of *P. menispermifolia* were richer in flavonoids, containing 2 to 5 mg each of vitexin, orientin, 6-hydroxyluteolin 6,7-dimethyl ether (cirsiliol) and luteolin 7-β-D-glucoside as well as esculetin. We previously reported the presence of several C-glycosylflavonoids, namely, vitexin, isovitexin, orientin, 2″-xylosylvitexin, and 2″-xylosylisovitexin, from *P. serratifolia* (2).

EXPERIMENTAL[1]

PLANT MATERIAL.—The leaf material was collected from plants grown in Dr. L. E. Gilbert's greenhouse collection, Department of Zoology, University of Texas at Austin. The collection data for the rootstocks are as follows: *Passiflora cyanea* (Voucher No. 72245), Andrews Trace, Arima Pass, Trinidad; *P. oerstedii* (Voucher No. 73350), La Selva, Rio Puerto Viejo, Costa Rica; *P. menispermifolia* (Voucher No. 77492) from near Rincón, Osa Peninsula, Costa Rica.

EXTRACTION AND FRACTIONATION.—Powdered leaves of *P. cyanea* (180 g), *P. oerstedii* (44 g) and *P. menispermifolia* (31 g) were extracted separately with benzene, chloroform, and ethanol in a Soxhlet. Since two-dimensional paper chromatography showed that only the chloroform and alcohol extracts contained flavonoids, they were combined for each plant. The extract concentrates of *P. cyanea* and *P. menispermifolia* were fractionated on polyclar (4 X 50 cm) columns, while the extract concentrate of *P. oerstedii* was passed through a silica gel (2 X 50 cm) column. The first two columns were initiated with Egger's solvent (chloroform:methanol:methyl ethyl ketone; 12:2:1) and continued by decreasing the amount of chloroform. Elution of the silica gel column was initiated with benzene and continued with increasing amounts of chloroform up to 100% and finally ethanol up to 100%. All the flavonoids and the single coumarin were cleaned over Sephadex LH-20 packed in methanol.

IDENTIFICATION OF FLAVONOIDS.—All of the flavonoids as well as esculetin were identified by uv and ms (except for vitexin and orientin) and by tlc comparison with standard samples. In addition, pmr spectra were recorded for luteolin 7-glucoside and

[1]Uv spectra were recorded in a Varian Techtron model 635; pmr in a Varian 90 MHz; ms in a DuPont 21-491 instrument. Polyclar powder (GAF) precoated cellulose plates (E. Merck) and precoated polyamide plates (Macharey-Nagel).

2"-xylosylvitexin. Furthermore, the pmr spectrum of the acetyl derivative of 2"-xylosylvitexin lacked a signal at δ1.74 for an acetyl group in accord with the xylosyl moiety being attached to the 2" position of vitexin (3). The products from the acidic hydrolysate of the *O*-glycosides were identified by standard procedures.

OTHER COMPOUNDS.—The 9:1 and 1:1 chloroform-alcohol elutions from the silica gel column used for the extract concentrate of *P. oerstedii* yielded β-sitosterol (m.p. 137°) (ir, pmr and tlc comparison with an authentic sample) and sitosteryl 3-β-D-glucoside (mp 305°) (ir, ms of its acetyl derivative and tlc comparison with a standard sample), respectively. Alcohol elutions of the same column gave glucose, fructose, galactose, and saccharose.

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