

FLAVONOIDS FROM *BRICKELLIASTRUM FENDLERI*

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Our systematic investigation of *Brickellia* (Compositae, Tribe Eupatorieae, Subtribe Alomiinae) and its relatives (1-5) includes *Brickelliastrum fendleri* (A. Gray) R.M. King and H. Robinson, a monotypic genus segregated from *Brickellia* on morphological and cytological grounds (6).

In our current study we report seven non-6-methoxylated flavonoids: quercetin, its 3- $\beta$ -D-glucoside, 3- $\beta$ -D-galactoside, 3- $\beta$ -D-rhamnoside, and 3- $\beta$ -D-rutinoside, in addition to isorhamnetin 3- $\beta$ -D-glucoside and kaempferol 3,6,7-trimethyl ether. On the basis of these results, *Brickelliastrum* appears to be near *Brickellia coulteri* Gray from which we have isolated similar compounds and chemically distinct from the main evolutionary line of *Brickellia* in which 6-methoxylated flavonoids are common.

## EXPERIMENTAL

**PLANT MATERIAL.**—A voucher specimen (Norris #249) of *B. fendleri* collected in October 1982, in the Lincoln National Forest near Cloudcroft, New Mexico, is deposited in the Plant Resources Center at The University of Texas, Austin, Texas.

**EXTRACTION, ISOLATION, AND IDENTIFICATION OF FLAVONOIDS.**—Dried aerial parts of *B. fendleri* (285 g) were extracted three times with 80% and 50% aqueous MeOH. The concentrated extract (64 g) was partitioned against hexane, CH<sub>2</sub>Cl<sub>2</sub>, and EtOAc. The flavonoids, viewed under uv light on tlc and two-dimensional chromatograms, were detected in the EtOAc (9.5 g) and aqueous (47 g) fractions. The EtOAc extract was first chromatographed over a Polyclar column which was eluted with Eggar's solvent (CH<sub>2</sub>Cl<sub>2</sub>-MeOH-EtOAc-Me<sub>2</sub>CO, 20:10:5:1) with increasing amounts of MeOH. When the material in each of the resulting fractions was passed over a second Polyclar column using TBA (*t*-BuOH-HOAc-H<sub>2</sub>O, 3:1:1), rutin (220 mg), quercetin 3- $\beta$ -D-glucoside (40 mg), quercetin 3- $\beta$ -D-galactoside (39 mg), and quercetin (63 mg) were obtained.

The H<sub>2</sub>O fraction was placed on a Polyclar column and eluted sequentially with EtOAc, MeOH, and H<sub>2</sub>O. The flavonoid mixture thus obtained was further purified by streaking on Whatmann No. 3 paper developed with 40% HOAc. In addition to more of the compounds isolated from the EtOAc fraction, trace quantities of quercetin 3- $\beta$ -D-rhamnoside (9 mg), isorhamnetin 3- $\beta$ -D-glucoside (15 mg), and kaempferol 3,6,7-trimethyl ether (3 mg) were obtained. All compounds were cleaned on Sephadex LH-20 prior to analysis, and the flavonoids were identified before and after acid hydrolysis by uv, <sup>1</sup>H-nmr (as TMSi ethers), color reactions (7), and authentic sample comparisons. Mass spectra were recorded for quercetin, rutin, and penduletin. Details of the identifications are available from the senior author.

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