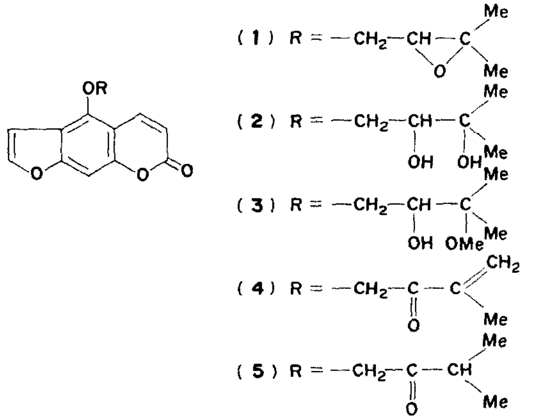
polyamide coumarin glycosides [1] and five non-glycosidic furanocoumarins: oxypeucedanin (**1**), oxypeucedanin hydrate (**2**) and three further 5-alkoxyfuranocoumarins to which structures 3 (mp 129–131°), **4** (mp 119–121°) and **5** (mp 143–147°) were assigned on the basis of TLC and spectral data. The UV spectra of the latter compounds are of 5-alkoxy-furanocoumarin type (λ_{max}^{MeOH} 240 sh, 249, 257, 265, 308 nm). The IR spectrum of compound **3** shows the presence of OH groups (band at 3420 cm^{-1}) spectra of **4** and **5** indicate a second C=O group (band at 1730 and 1740 cm^{-1} resp.) in addition to the typical band of the furanocoumarinic nucleus. Molecular weights (from MS): **3** 318 ($C_{17}H_{18}O_6$), **4** 284 ($C_{16}H_{12}O_5$), **5** 286 ($C_{16}H_{14}O_5$). The NMR spectra show all the characteristic signals for a 5-alkoxy-furanocoumarin nucleus: ($CDCl_3$, TMS as internal reference δ ppm) H3 6·24–6·28 *d*; H4 8·16–8·30 *d* ($J_{3,4}$ 9 cps); H8 7·24–7·22 *s*; H2′ 7·56–7·58 *d*; H3′ 6·82–6·98 *d* ($J_{2,3}$ 2 cps).

A compound having the same spectral properties as **3** has already been isolated by Kapoor *et al.* [3] from the roots of *Angelica glauca*. It was designated as tert-*O*-methyl-oxypeucedanin hydrate. The characteristics of compound **5** are consistent with those of isooxypeucedanin isolated earlier from other *Peucedanum* species (*P. cervaria, P. palustre*) [4] and *Prangos pabularia* [5]. Compound **4** is a new natural furocoumarin derivative and can be designated as pabulenon. (NMR: Me–C = 1·9 (3Hs); H_2C = 5·05 resp. 5·25 (each 1H *m*)).



Acknowledgement—The plant was kindly collected by F. Augscheller, St. Martin, South-Tyrol, Italy.

REFERENCES

1. Khaled, S. A., Szendrei, K., Reisch, J. and Novák, I. *Phytochemistry* (in press).
2. Reisch, J., Khaled, S. A., Szendrei, K. and Novák, I. *Phytochemistry* (in press).
3. Kapoor, S. K., Sharma, Y. N. and Zaman, A. (1972) *Phytochemistry*, **11**, 475.
4. Pimenov, M. G. (1971) *List of Coumarin-Bearing Plants*. Isdat. Nauka Leningrad (in Russian).
5. Basa, S. C., Chatterjee, J. and Chatterjee, A. (1971) *Tetrahedron Letters* 1977.

---

* Part 51 in the series "Natural Product Chemistry". For Part 50 see Reisch, J., Körösi, J., Szendrei, K., Novák, I. and Minker, E. *Phytochemistry* (in press).

Phytochemistry, 1975, Vol. 14, pp. 1890–1891. Pergamon Press. Printed in England.

BOEHMENAN, A NEW LIGNAN FROM THE ROOTS OF *BOEHMERIA TRICUSPIS*

T. TAKEMOTO, T. MIYASE and G. KUSANO

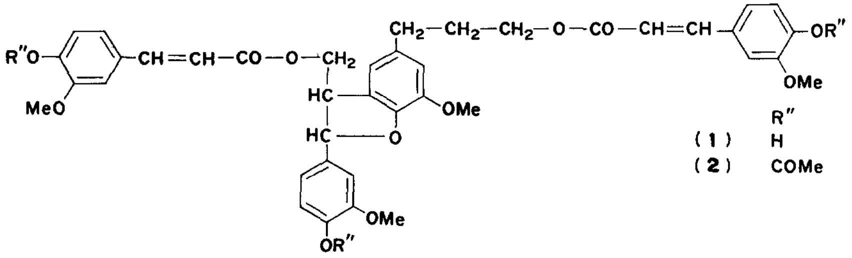
Faculty of Pharmaceutical Sciences, Tohoku University, Aobayama, Sendai, Japan

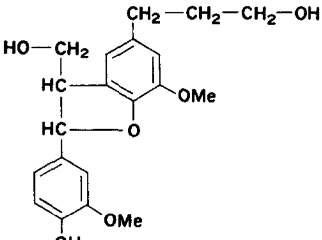
(*Received* 27 *December* 1974)

Key Word Index—*Boehmeria tricuspis*; Urticaceae; boehmenan.

Plant. Boehmeria tricuspis. Uses. None. *Source.* Miyagi Prefecture, Japan. *Previous work.* Flavonoids [1,2] and catechins [3].

Present work. The roots (102 kg) were extracted with hot MeOH. After removal of the solvent, the residue was suspended in warm H_2O and extracted with EtOAc and *n*-BuOH successively. Repeated chromatography of the EtOAc extract on Si gel gave boehmenan (**1**) as colorless powder (0·001% yield; UV(MeOH)λ_{max} nm (log ϵ): 234





(3)

(4·55), 290 (4·38) and 326 (4·51); IR ($CHCl_3$) ν_{max} cm^{-1}; 3550 (OH), 2850 (OMe), 1703, 1156, 1170 (ester), 1634, 1608, 1510 (aromatic). MS *m/e*: 712 (M^+), 518 (M^+-ferulic acid), 324 (M^+-2 × ferulic acid). NMR ($CDCl_3$) ppm: 2·00 (2H, *m*, Ar–CH_2–C$\underline{H}_2$–CH_2OR), 2·68 (2H, *m*, Ar–C$\underline{H}_2$–CH_2–), 3·77 (3H, *s*, OMe), 3·83 (9H, *s*, 3 × OMe), 3·85 (1H, Ar–CH(OR)–C$\underline{H}$(R')Ar), 4·21 (2H, *m*, –CH_2–C$\underline{H}_2$–OCO–), 4·48 (2H, *m*, >CH–C$\underline{H}_2$–OCO–), 5·46 (1H, *d*, *J* 7 Hz, Ar–C$\underline{H}$(OR)–CH<), 6·20 (1H, *d*, *J* 16 Hz, Ar–CH=C$\underline{H}$–COOR), 6·25 (1H, *d*, *J* 16 Hz, Ar'–CH=C$\underline{H}$–COOR'), 6·6–7·0 (11H, aromatic H), 7·47 (1H, *d*, *J* 16 Hz, Ar–C$\underline{H}$=CH–COOR), 7·57 (1H, *d*, *J* 16 Hz, Ar'–C$\underline{H}$=CH–COOR). **1** afforded triacetate (**2**) on treatment with Ac_2O in pyridine at room temp. The NMR spectrum of **2** revealed three acetyl groups (a singlet of 9H at 2·29 ppm) without any signal exhibited down field shift, that showed the presence of three phenolic hydroxyl groups in **1**. **1** (230 mg) was left in 4% NaOH at room temp. for 2 h to produce two main products, **3** (110 mg) and **4** (70 mg). **3**, needles from MeOH, mp 174·5–175·5°, M^+, 194 was identified as ferulic acid by comparison with a synthetic sample. **4**, amorphous powder, $C_{20}H_{20}O_6$, $[\alpha]_D^{18^\circ}$ −4·9° (acetone); UV(MeOH)λ_{max} nm (log ε): 230 (4·09), 282 (3·68); MS: M^+, 360·1581 (Calcd. 360·1572), M^+–H_2O, 342·1477 (342·1467); NMR (CD_3COCD_3) ppm: 1·78 (2H, *m*, Ar–CH_2–C$\underline{H}_2$–CH_2OH), 2·60 (2H, *m*, Ar–C$\underline{H}_2$–CH_2–), 3·58 (2H, *t*, *J* 6 Hz, –CH_2–C$\underline{H}_2$–OH), 3·6 (2H, >CH–C$\underline{H}_2$OH), 3·8 (1H, Ar–CH(OR)–C$\underline{H}$–),. 3·75, 3·81 (each 3H, *s*, 2 × OMe), 5·44 (1H, *d*, *J* 7 Hz, Ar–C$\underline{H}$(OR)–CH<), 6·61 (2H, *s*, $C_{2'}$–H, $C_{6'}$–H), 6·80 (2H, *d*, *J* 1·5 Hz, C_5–H, C_6–H), 6·88 (1H, *d*, *J* 1·5 Hz, C_2–H), was identified as dihydro-dehydrodiconiferyl alcohol by comparison of R_f values on TLC, IR, and NMR spectra with an authentic sample which has been obtained in the course of studies on the constituents of *Silybum marianum* by K. Weinges *et al.* [4]. The stereochemistry of the lignan of this composite has not been determined. The $[\alpha]_D$ values of our compound (**4**) differ from the *Silybum* product, which suggests some differences in stereochemistry.

Acknowledgement—We thank Professor Klaus Weinges for a gift of an authentic sample of the lignan from *Silybum marianum*.

REFERENCES

1. Takemoto, T. and Miyase, T. (1974) *Yakugaku Zasshi*, **94**, 1597.
2. Takemoto, T. Miyase, T. and Kusano, G. *Phytochemistry*, in press.
3. Takemoto, T. and Miyase, T. (1975) *Yakugaku Zasshi*, **95**, 180.
4. Weinges, K., Müller, R., Kloss, P. and Jaggy, H. (1970) *Ann. Chem.* **736**, 170.