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CINNCASSIOL E, A DITERPENE FROM THE BARK OF *CINNAMOMUM CASSIA*

TOSHIHIRO NOHARA, YOSHIKI KASHIWADA* and ITSUO NISHIOKA*

Faculty of Pharmaceutical Sciences, Kumamoto University, 5-1 Oe-honmachi, Kumamoto 862, Japan; *Faculty of Pharmaceutical Sciences, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812, Japan

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Key Word Index—*Cinnamomum cassia*; Lauraceae; diterpene; cinncassiol E.

Abstract—Cinncasiol E, a hexacyclic diterpene of a new skeletal type, was isolated from a fraction with antiallergic activity obtained from a water extract of Cinnamomi cortex. Its structure was deduced by spectroscopic methods.

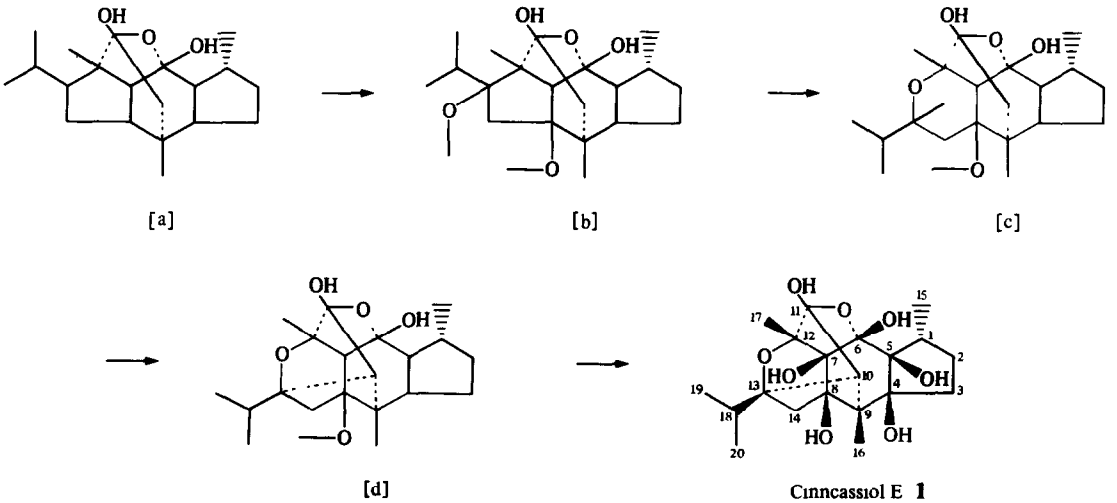
INTRODUCTION

We have recently reported the isolation of a series of diterpenes [1–8], Cassia Diterpenes, from a fraction with antiallergic activity [9, 10] isolated from Cinnamomi cortex (Kannan Keihi, the dried bark of *Cinnamomum cassia* BLUME: one of the most widely used of oriental medicinal plants).

RESULTS AND DISCUSSION

Further study of the antiallergic fraction led to the isolation of a new diterpene, named cinncassiol E (**1**), as colourless plates (MeOH), mp 195–198°, $[\alpha]_D$ −20.4° (*c* 2.01, MeOH). Cinncassiol E (**1**) was found to have a molecular formula $C_{20}H_{30}O_8$ by means of FD-MS (*m/z* 421 $[M+Na]^+$ and 399 $[M+1]^+$), high resolution EI-MS (*m/z* 380.183 $[M-H_2O]^+$) and elemental analysis. The 50 MHz ^{13}C NMR spectrum (CD_3OD) of **1** showed a total twenty carbons (δ12.6, 14.2, 16.9, 17.3, 17.9, 29.8, 35.3, 38.1, 38.8, 47.4, 51.9, 55.7, 79.1, 83.3, 85.8, 87.2, 87.8, 90.4, 107.2, 107.5) suggesting that **1** had neither a ketone nor a double bond function and was a hexacyclic diterpene with two acetal carbons (δ107.2, 107.5) and six oxygen-bearing carbons (between δ79.1–90.4). Its ^1H NMR spectrum (pyridine-d_5) contained signals for three secondary methyl groups (δ1.07, 1.14 and 1.73), two tertiary methyl groups (δ1.76, 2.36), one methylene (ABq, δ2.13, 2.65) and one methine (*s*, δ2.61). There were no signals at lower field than δ2.8.

A detailed comparative study of the NMR spectral data of **1** with those of the known Cassia diterpenes hitherto obtained afforded the following facts with regard to the structure of **1** (Scheme 1): (a) It was derived from a skeleton of the cinncassiol D type [6–8]. The substitution of the hydroxyl at C-6 forming one additional acetal centre. (b) The AB quartet signal in the ^1H NMR spectrum suggested that the C-14 methylene was isolated



Scheme 1.

and therefore the neighbouring C-13 and C-8 must be substituted by oxygen functions. (c) The signal at δ2.36 attributed to the C-12 methyl group was shifted to lower field by 0.65 ppm in comparison with that of cinncassiol D_4 [6–8] indicating the presence of an ether bond between C-12 and C-13. (d) The bond formation between C-13 and C-10 accounted for one isolated methine proton at δ2.61 attributable to the methine at C-10.

The final structure deduced for cinncassiol E is that shown by **1**. Cinncassiol E (**1**) is noteworthy because it is a novel diterpene with a new skeleton. The stereochemical evidence was not clear, but the stereochemistry of cinncassiol E was tentatively assumed to be as shown in **1** because of its probable biogenetic relationship with the cinncassiol D types of compounds.

EXPERIMENTAL

Isolation of cinncassiol E. The extraction and separation was described in the preceding paper [1], where cinncassiol E (35 mg) is referred to as compound X.

Cinncassiol E (**1**). FD-MS *m/z*: 421 $[M+Na]^+$, 399 $[M+1]^+$; EI-MS *m/z*: 380 $[M-H_2O]^+$, 352, 290, 194, 169, 149; ^{1}H NMR (100 MHz, pyridine-d_5): δ1.07, 1.14 (each 3H, *d*, J = 6 Hz, 18-Me), 1.73 (3H, *d*, J = 6 Hz, 1-Me), 1.76 (3H, *s*, 9-Me), 2.36 (3H, *s*, 12-Me), 2.13, 2.65 (each 1H, *d*, J = 13 Hz, 14-H_2), 2.61 (1H, *s*, 10-H); (CD_3OD): δ1.00 (6H, *d*, J = 6 Hz, 18-Me_2), 1.28 (3H, *d*, J = 7 Hz, 1-Me), 1.32 (3H, *s*, 9-Me), 1.54, 2.26 (each 1H, *d*, J = 13 Hz, 14-H_2), 1.60 (3H, *s*, 12-Me), 1.98 (1H, *s*, 10-H).

REFERENCES

1. Yagi, A., Tokubuchi, N., Nohara, T., Nonaka, G., Nishioka, I. and Koda, A. (1980) *Chem. Pharm. Bull.* **28**, 1432.
2. Nohara, T., Nishioka, I., Tokubuchi, N., Miyahara, K. and Kawasaki, T. (1980) *Chem. Pharm. Bull.* **28**, 1969.
3. Nohara, T., Tokubuchi, N., Kuroiwa, M. and Nishioka, I. (1980) *Chem. Pharm. Bull.* **28**, 2682.
4. Kashiwada, Y., Nohara, T., Tomimatsu, T. and Nishioka, I. (1981) *Chem. Pharm. Bull.* **29**, 2686.
5. Nakano, K., Nohara, T., Tomimatsu, T. and Nishioka, I. (1981) *Yakugaku Zasshi* **101**, 1052.
6. Nohara, T., Kashiwada, Y., Tomimatsu, T., Kido, M., Tokubuchi, N. and Nishioka, I. (1980) *Tetrahedron Letters* **21**, 2647.
7. Nohara, T., Kashiwada, Y., Murakami, K., Tomimatsu, T., Kido, M., Yagi, A. and Nishioka, I. (1981) *Chem. Pharm. Bull.* **29**, 2451
8. Nohara, T., Kashiwada, Y., Tomimatsu, T. and Nishioka, I. (1982) *Phytochemistry* **21**, 2130.
9. Koda, A. and Nagai, H. (1974) *Proc. Symp. Wakan-Yaku* **18**, 13.
10. Nagai, H., Ichikawa, M., Watanabe, S. and Koda, A. (1978) *Proc. Symp. Wakan-Yaku* **11**, 51.

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KAURENIC ACID DERIVATIVES FROM *STEVIA EUPATORIA*

A. ORTEGA, F. J. MORALES and M. SALMÓN

Instituto de Química, Universidad Nacional Autónoma de México Circuito Exterior, Ciudad Universitaria, Coyoacán 04510, México, D F

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Key Word Index—*Stevia eupatoria*; Compositae; Eupatoriae; kaurenes; 12β-ethoxy-*ent*-kaur-9(11),16-dien-19-oic acid, 12α-hydroxy-*ent*-kaur-16-en-19-oic acid

Abstract—Two kaurene type diterpenes were isolated from the aerial part of *Stevia eupatoria*. Their structures and stereochemistry were established by carbon and ^{1}H NMR, chemical transformation and correlation with known compounds.

INTRODUCTION

Sweet diterpene glycosides isolated from *Stevia rebaudiana* [1, 2] and *S. paniculata* [3, 4] produce, by hydrolysis, several hydroxylated kaurenoic acid derivatives. Very few compounds of the latter type have been found in *Stevia* species which grow in Mexico. In this paper we describe the isolation and structure determination of 12β-ethoxy-*ent*-kaur-9(11),16-dien-19-oic acid (**1**) and the known 12α-hydroxy-*ent*-kaur-16-en-19-oic acid (**2**) from *S. eupatoria*.

RESULTS AND DISCUSSION

The less polar fraction of *S. eupatoria*, afforded the ethoxy diterpenic acid (**1**) $C_{22}H_{32}O_3$, $[M]^+$ at *m/z* 344. The IR spectrum revealed the presence of a hydroxyl