Pergamon

0031-9422(95)00967-1

Phytochemistry, Vol. 42, No. 3, pp. 899–901, 1996

0031-9422/96 $15.00 + 0.00

PRIONITISIDES A AND B, TWO PHENOLIC GLYCOSIDES FROM *SALVIA PRIONITIS*

LI-MIN ZHAO, XIAO-TIAN LIANG and LIAN-NIANG LI*

Institute of Materia Medica, Chinese Academy of Medical Sciences, Peking Union Medical College, 1 Xian Nong Tan Street, Beijing 100050, China

(*Received* 23 *October* 1995)

Key Word Index—*Salvia prionitis*; Labiatae; prionitiside A; prionitiside B; phenolic glycoside.

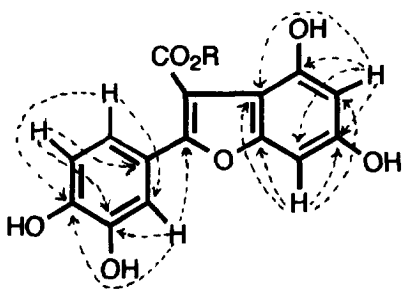
Abstract—Two new phenolic glycosides, named prionitiside A and prionitiside B, were isolated from the aqueous extract of *Salvia prionitis*, together with seven known phenolic acids.

INTRODUCTION

During the last 10 years, several water-soluble phenolic acids have been isolated from the genus *Salvia* [1–8]. We now report the isolation of two new phenolic glycosides, together with seven known phenolic acids, from *Salvia prionitis*, used as a herbal medicine in the southern provinces of China for the treatment of cold and fever, acute tonsillitis, pneumonia, enteritis, dysentery and abdominal pain [9].

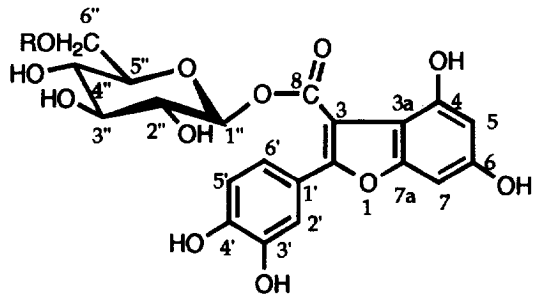
RESULTS AND DISCUSSION

Systematic separation of the aqueous extract of *S. prionitis* yielded rosmarinic acid as the major component, together with salvianolic acids A, B and C, isosalvianolic C, methyl rosmarinate, *R*-(+)-β-(3,4-dihydroxyphenyl)lactic acid and two new phenolic glycosides, prionitiside A (**1**) and prionitiside B (**2**). Compound **1**, an amorphous yellowish powder, showed positive tests with ferric ferricyanide and Molisch reagents. UV absorption at λ_{max}^{MeOH} nm (log ε) 206 (4.54), 257 (4.26) and 356 (4.16) suggested the presence of a highly conjugated system in the structure. A relative molecular mass of 464 was deduced from its FAB-mass spectrum, which showed *m/z* 487 $[M+Na]^+$ and 503 $[M+K]^+$. The ^1H and ^{13}C NMR spectra revealed the presence of 20 protons and 21 carbons; it thus had a molecular composition of $C_{21}H_{20}O_{12}$. Acid hydrolysis of **1** on TLC [10] yielded β-D-glucose, which was in agreement with the ^1H and ^{13}C NMR data [11, 12]. The conformation of the sugar moiety was supported by the coupling constants $J_{1'',2''}$, $J_{2'',3''}$, $J_{3'',4''}$ and $J_{4'',5''}$ of acetyl-prionitiside A, which indicated that all these protons were in *trans*-axial positions. Besides the signals of the sugar moiety, the ^{13}C NMR spectrum of **1** showed the presence of one carbonyl and 14 aromatic carbons, among which six were oxygen-bearing carbons. Its ^1H NMR spectrum showed one set of ABX and one set of AB aromatic proton signals. Acetylation of **1** yielded an amorphous product with *m/z* 823 $[M+Na]^+$ and 839 $[M+K]^+$, so there should be eight hydroxyl groups in the structure of **1**. Four of these belonged to the aglycone moiety. The remaining two oxygen-bearing carbons in the aglycone should be linked to one oxygen. Based on the above evidence, the aglycone should possess a benzofuranoid skeleton with a phenyl group and a glucosyloxy carbonyl group on the furan ring. HMBC analysis of **1** showed correlation between H-2′ (δ 7.56) and C-2 (δ 155.96), so the phenyl group was linked to C-2 (Scheme 1). The fact that the three oxygen-bearing carbons in the benzofuran appeared in a relatively low field (δ 156.44, 161.33 and 165.80) while the proton-bearing carbons were in a relatively high field (δ 98.97 and 93.67) indicated that these three oxygen-bearing carbons should be in a *meta*-position [12, 13]. This was in agreement with the results of the HMBC.



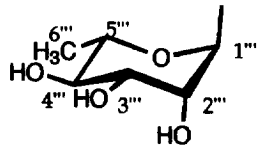
Scheme 1. HMBC of compound **1**.

*Author to whom correspondence should be addressed.



1: R = H

2: R =



Compound **2**, an amorphous yellowish powder, showed positive tests with ferric ferricyanide and Molisch reagents. Its FAB-mass spectrum showed *m/z* 633 $[M + Na]^+$, 649 $[M + K]^+$ and a fragment ion of *m/z* 464 $[M - 146]^+$. The ^1H NMR spectrum of **2** showed an additional methyl doublet at δ 0.97 (J = 6.5 Hz) and a proton singlet at δ 4.37 compared with that of **1**. Comparison of the ^{13}C NMR spectra of **1** and **2**, revealed that **2** possessed six additional carbon signals which were in agreement with the spectral data for α-L-rhamnose [11, 12]. The fact that the C-6″ signal in **2** was shifted 6 ppm downfield indicated an α-L-rhamnopyranosyl-(1→6)-β-D-glucopyranosyl linkage for the sugar moiety. The structure of **2** was thus as shown.

EXPERIMENTAL

General. CC: Sephadex LH-20, solvent MeOH. HPLC: ODS, solvent MeCN–H_2O–H_2PO_4 (25:75:0.04). TLC: silica gel GF_{254}, solvent $CHCl_3$–MeOH–HCO_2H (85:15:1). ^1H and ^{13}C NMR (500 MHz) with TMS as int. standard.

Plant material. Whole plants of *S. prionitis* Hance were collected in Guangxi province, China, and identified by Prof. Wan Zhi Song of the Department of Medicinal Plants in our Institute.

Extraction and isolation. Dried plant material (8 kg) was extracted with 95% EtOH and the residue boiled with H_2O. The aq. extract was concd and EtOH was added to the concentrate until the EtOH content was 70%. After filtering, the filtrate was concd, acidified with 10% HCl to pH 3–4 and successively extracted with EtOAc and *n*-BuOH. Evapn of the *n*-BuOH extract yielded 74 g of amorphous brown powder, which was applied to dry silica gel (2.2 kg) CC. After developing with $CHCl_3$–MeOH–HCO_2H (80:20:1), the column was cut into 8 sections, which were individually eluted with warm EtOH and numbered from the bottom to the top. Sections 4–7 were rechromatographed over Sephadex LH-20, yielding salvianolic acids A and B, **1** (36 mg), and 2 (20 mg). According to the same method as above, the EtOAc extract yielded salvianolic acids A and C, isosalvianolic acid C, rosmarinic acid, methyl rosmarinate and *R*-(+)-β-(3,4-dihydroxyphenyl) lactic acid.

Prionitiside A (**1**). Amorphous yellowish powder, UV λ_{max}^{MeOH} nm (log ε): 206 (4.54), 257 (4.26), 356 (4.16). FAB-MS: *m/z* 487 $[M + Na]^+$, 503 $[M + K]^+$. ^1H NMR (DMSO-d_6): δ 6.14 (*s*, *br*, H-5), 6.34 (*s*, *br*, H-7), 6.82 (*d*, J = 8.4 Hz, H-5′), 7.55 (*m*, H-6′), 7.56 (*s*, *br*, H-2′), 5.43 (*d*, J = 7.2 Hz, H-1″), 3.0–3.6 (*m*, H-2″, 3″, 4″, 5″, 6″). ^{13}C NMR: see Table 1.

Acetyl prionitiside A. FAB-MS: *m/z* 839 $[M + K]^+$, 331. ^1H NMR ($CDCl_3$): δ 6.84 (*d*, J = 2.2 Hz, H-5), 7.30 (*d*, J = 2.2 Hz, H-7), 7.92 (*d*, J = 2.1 Hz, H-2′), 7.32 (*d*, J = 8.5 Hz, H-5′), 7.75 (*dd*, J = 2.1, 8.5 Hz, H-6′), 5.59 (*d*, J = 8.0 Hz, H-1″), 5.18 (*dd*, J = 8.0, 9.5 Hz, H-2″), 5.28 (*t*, J = 9.5 Hz, H-3″), 5.04 (*t*, J = 9.5 Hz, H-4″), 3.60 (*m*, H-5″), 3.94 (*dd*, J = 2.2, 12.3 Hz, H-6″), 4.01 (*dd*, J = 4.6, 12.3 Hz, H-6″), δ

Table 1. ^{13}C NMR spectral data for prionitisides A and B*

C	Prionitiside A	Prionitiside B	C	Prionitiside A	Prionitiside B
2	155.96	156.37	6′	121.53	121.57
3	133.28	133.31	1″	101.11	101.19
3a	103.44	103.84	2″	74.07	74.00
4	161.33	161.10	3″	77.,42	76.41
5	98.97	98.71	4″	69.90	69.93
6	165.80	164.27	5″	76.47	75.83
7	93.67	93.64	6″	60.94	66.96
7a	156.44	156.56	1‴		100.70
8	177.18	177.32	2‴		70.25
1′	121.06	121.12	3‴		70.50
2′	115.17	115.32	4‴		71.28
3′	144.79	144.71	5‴		68.19
4′	148.56	148.36	6‴		17.72
5′	116.08	116.23			

*Recorded in DMSO-d_6.

1.91, 1.99, 2.00, 2.11, 2.30, 2.34, 2.35, 2.44 (each *s*, CH_3COO–).

Prionitiside B (**2**). Amorphous yellowish powder. FAB-MS: *m/z* 649 $[M+K]^+$, 633 $[M+Na]^+$, 464 $[M-146]^+$. ^1H NMR (500 MHz, DMSO-d_6): δ 6.22 (*s*, *br*, H-5), 6.45 (*d*, $J=1.6$ Hz, H-7), 7.53 (*s*, *br*, H-2′), 6.87 (*d*, $J=9.0$ Hz, H-5′), 7.54 (*m*, H-6′), 5.32 (*d*, $J=7.2$ Hz, H-1″), 4.37 (*s*, H-1″), 3–3.7 (*m*, protons of sugars), 0.97 (*d*, $J=6.5$ Hz, H-6‴). ^{13}C NMR data: see Table 1.

Acknowledgements—Financial support was provided by the National Natural Sciences Foundation of China. We thank the Department of Instrumental Analysis of our Institute for UV and NMR measurements.

REFERENCES

1. Li, L. N., Tan, R. and Chen, W. M. (1984) *Planta Med.* 227.
2. Ai, C. B. and Li, L. N. (1988) *J. Nat. Prod.* **51**, 145.
3. Ai, C. B. and Li, L. N. (1992) *Planta Med.* **58**, 197.
4. Ai, C. B. and Li, L. N. (1991) *Chin. Chem. Letters* **2**, 17.
5. Zhang, H. J. and Li, L. N. (1993) *Chin. Chem. Letters* **4**, 501.
6. Qian, T. X. and Li, L. N. (1992) *Phytochemistry* **31**, 1068.
7. Zhang, H. J. and Li, L. N. (1994) *Planta Med.* **60**, 70.
8. Ai, C. B., Deng, Q. H., Song, W. Z. and Li, L. N. (1994) *Phytochemistry* **37**, 907.
9. *Compilation of Chinese Herb Medicine* (1975), Vol. 1, p. 278. People's Publishing House, Beijing.
10. Zhao, P. P., Li, B. M. and He, L. Y. (1987) *Acta Pharm. Sin.* **22**, 70.
11. Thierry, B. and Angenot, L. (1987) *Phytochemistry* **26**, 3331.
12. Markham, K. R., Ternai, B. and Stanley, R. (1978) *Tetrahedron* **34**, 1389.
13. Chakrabarti R., Das, B. and Banerji, J. (1986) *Phytochemistry* **25**, 557.