Four New Nor-Diterpenoid Alkaloids from *Aconitum brachypodum*

by **Yong Shen**[a])[b]), **Ai-Xue Zuo**[a])[b]), **Zhi-Yong Jiang***[a]), **Xue-Mei Zhang**[a]), **Hong-Ling Wang**[a])[b]), and **Ji-Jun Chen***[a])

[a]) State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, P. R. China (phone: +86-871-5223265; fax: +86-871-5223265; e-mail: chenjj@mail.kib.ac.cn, jiangzy@mail.kib.ac.cn)

[b]) Graduate University of the Chinese Academy of Sciences, Beijing 100039, P. R. China

Four new C_{19}-nor-diterpenoid alkaloids, named brachyaconitines A–D (**1**–**4**), were isolated from the roots of *Aconitum brachypodum* DIELS. Their structures were elucidated as 3-*O*-acetyl-20-deethyl-20-formylaconitine (**1**), 3-*O*-acetyl-19,20-didehydro-20-deethylaconitine (**2**), 3-*O*-acetyl-8-de(acetyloxy)-7,8,17,20-tetradehydro-20-deethyl-7,17-secoaconitine (**3**), and 1-*O*-methylflavaconitine (**4**) by means of MS, IR, 1D- and 2D-NMR analyses. The structure of compound **1** was confirmed by an X-ray diffraction experiment.

Introduction. – *Aconitum brachypodum* DIELS., a commonly used folk-medicinal herb, is mainly distributed in Yunnan and Sichuan Provinces of China [1]. Its dried roots, 'Xue-Shang-Yi-Zhi-Hao' in the Chinese Pharmacopoeia [2], is widely used in traditional Chinese medicine for the treatment of rheumatism and pains [3]. As part of our ongoing phytochemical investigation on *A. brachypodum*, four new diterpenoid alkaloids, named brachyaconitines A–D (**1**–**4**; *Fig. 1*), were isolated from the

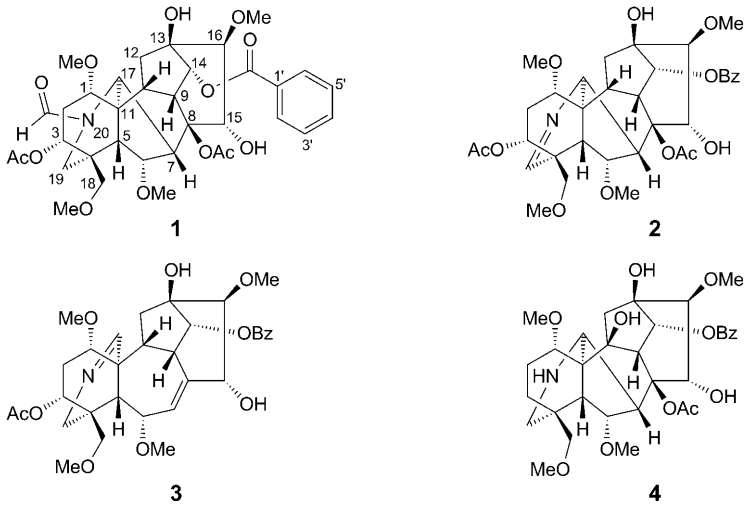

Fig. 1. *Compounds* **1**–**4**, *isolated from* Aconitum brachypodum DIELS.

95% EtOH extract of its roots, together with the five known compounds bullatine A [4], aconitine = (1α,3α,6α,14α,15α,16β)-20-ethyl-1,6,16-trimethoxy-4-(methoxymethyl)-aconitane-3,8,13,14,15-pentol 8-acetate 14-benzoate [5], neoline [6], hypaconitine [7], and songorine [8]. All of the isolated compounds showed a positive reaction with *Dragendorff*'s reagent. This article describes the isolation and structural elucidation of the four new compounds.

Results and Discussion. – Compound **1** was obtained as colorless prisms from pyridine. Its HR-ESI-MS exhibited a *quasi*-molecular-ion peak at *m*/*z* 710.2771 ([*M* + Na]$^+$), corresponding to the molecular formula $C_{35}H_{45}NO_{13}$ with 14 degrees of unsaturation. The IR spectrum showed the absorption bands for OH (3500 cm^{-1}), conjugated-ester C=O (1721 cm^{-1}), amide C=O (1664 cm^{-1}), and aromatic-ring functions (1602 and 1451 cm^{-1}). In the ^{1}H-NMR spectrum (*Table 1*), four MeO groups

Table 1. *^{1}H-NMR Data* ($CDCl_3$) *of Compounds* **1**–**4**. δ in ppm, *J* in Hz.

	1[a])	**2**[a])	**3**[a])	**4**[b])
CH(1)	3.14–3.18[c])	3.20–3.25[c])	3.22–3.27[c])	4.01 (*d*, *J* = 6.2)
CH_2(2)	1.37 (*dd*, *J* = 12.7, 10.4), 2.47–2.52 (*m*)	1.73–1.79 (*m*), 2.00–2.06 (*m*)	1.14 (*dd*, *J* = 12.1, 12.1), 2.29–2.32 (*m*)	1.36–1.43[c]), 1.91–1.94 (*m*)
CH(3) or CH_2(3)	4.41 (*dd*, *J* = 13.0, 5.4)	5.12 (*d*, *J* = 6.3)	4.92 (*dd*, *J* = 15.3, 8.7)	1.36–1.43[c]), 1.77–1.80 (*m*)
CH(5)	2.51 (*d*, *J* = 6.8)	2.31 (*d*, *J* = 6.9)	2.21–2.28[c])	2.55 (*d*, *J* = 6.5)
CH(6)	4.16 (*d*, *J* = 7.0)	3.99 (*d*, *J* = 7.1)	4.52 (*dd*, *J* = 10.6, 7.7)	4.52 (*d*, *J* = 5.2)
CH(7)	2.68 (br. *s*)	2.90 (br. *s*)	5.66 (*d*, *J* = 5.6)	2.80 (br. *s*)
CH(9)	2.85 (*dd*, *J* = 6.7, 5.8)	2.72 (*t*, *J* = 4.8)	2.31–2.35[c])	2.75 (*d*, *J* = 5.0)
CH(10)	2.17 (*dd*, *J* = 6.9, 5.9)	2.15–2.19[c])	2.45–2.52[c])	–
CH_2(12)	2.05–2.31 (*m*), 2.94 (*dd*, *J* = 11.6, 5.2)	2.15–2.19 (*m*), 2.35–2.39 (*m*)	2.45–2.52[c])	2.17 (br. *s*), 2.51 (br. *s*)
CH(14)	4.87 (*d*, *J* = 5.0)	4.89 (*t*, *J* = 4.7)	5.10 (*t*, *J* = 4.1)	5.39 (*d*, *J* = 5.1)
CH(15)	4.47 (*d*, *J* = 5.1)	4.48 (*d*, *J* = 4.3)	4.86 (*d*, *J* = 4.3)	3.70 (br. *s*)
CH(16)	3.32 (*d*, *J* = 5.1)	3.40–3.46[c])	3.27–3.33[c])	3.37 (*d*, *J* = 5.2)
CH(17)	4.03 (br. *s*)	4.17 (br. *s*)	7.85 (br. *s*)	2.88 (br. *s*)
CH_2(18)	3.08 (*d*, *J* = 8.9), 3.94 (*d*, *J* = 8.9)	3.40–3.46[c]), 4.05 (*d*, *J* = 8.5)	2.98 (*d*, *J* = 8.8), 4.02 (*d*, *J* = 8.8)	3.01 (*d*, *J* = 8.3), 3.58 (*d*, *J* = 8.4)
CH_2(19) or CH(19)	2.94 (*dd*, *J* = 13.9, 5.4), 4.02 (*d*, *J* = 13.2)	7.37 (br. *s*)	2.31–2.35[c]), 2.77–2.83[c])	2.16–2.20[c]), 3.22–3.27[c])
N–CHO	8.10 (br. *s*)	–	–	–
MeO–C(1)	3.14 (*s*)	3.06 (*s*)	3.21 (*s*)	3.14 (*s*)
MeO–C(6)	3.19 (*s*)	3.18 (*s*)	3.22 (*s*)	3.26 (*s*)
MeO–C(16)	3.20 (*s*)	3.25 (*s*)	3.24 (*s*)	3.29 (*s*)
MeO–C(18)	3.75 (*s*)	3.75 (*s*)	3.76 (*s*)	3.76 (*s*)
AcO–C(3)	2.03 (*s*)	2.06 (*s*)	2.07 (*s*)	–
AcO–C(8)	1.32 (*s*)	1.33 (*s*)	–	1.39 (*s*)
CH(2′,6′)	8.01 (*d*, *J* = 7.6)	8.01 (*d*, *J* = 7.6)	8.05 (*d*, *J* = 7.2)	8.01 (*d*, *J* = 7.2)
CH(3′,5′)	7.45 (*dd*, *J* = 7.6)	7.44 (*dd*, *J* = 7.5)	7.45 (*dd*, *J* = 7.2)	7.45 (*dd*, *J* = 7.3)
CH(4′)	7.57 (*t*, *J* = 7.6)	7.57 (*t*, *J* = 7.5)	7.57 (*t*, *J* = 7.3)	7.57 (*t*, *J* = 7.3)

[a]) 500 MHz. [b]) 400 MHz. [c]) Overlapped.

(δ(H) 3.14, 3.19, 3.20, and 3.75 (4*s*)) were observed together with two AcO groups (δ(H) 1.32 and 2.03 (2*s*)), and a Bz unit (δ(H) 7.45 (*dd*, $J = 7.6$, 2 H), 7.57 (*t*, $J = 7.6$, 1 H), and 8.01 (*d*, $J = 7.6$, 2 H)). Its ^{13}C-NMR (DEPT) spectrum (*Table 2*) displayed 35 C-atom signals including 6 Me, 4 CH_2, and 17 CH groups, and 8 quaternary C-atoms, suggesting that compound **1** might be an aconitine-type C_{19}-nor-diterpenoid alkaloid, bearing the following groups: one $C_{19}H_{19}$, two OH, four MeO, two AcO, one BzO, and one NCHO. Careful analyses of the ^{1}H- and ^{13}C-NMR data suggested that the structure of compound **1** was similar to that of 3-*O*-acetylaconitine [9]. The main difference between the two compounds is that compound **1** contains an *N*-formyl unit instead of a *N*-ethyl group in 3-*O*-acetylaconitine. The long-range HMBCs (*Fig. 2*) between the formyl H-atom (δ(H) 8.10 (br. *s*)) and C(17) and C(19) confirmed the location of the additional formyl group. Compound **1** was presumed to possess a similar relative

Table 2. *^{13}C-NMR Data* ($CDCl_3$) *of Compounds* **1**–**4**. δ in ppm.

	1[a])	**2**[a])	**3**[a])	**4**[b])
C(1)	78.9 (*d*)	80.3 (*d*)	79.7 (*d*)	82.9 (*d*)
C(2)	30.8 (*t*)	30.0 (*t*)	29.9 (*t*)	23.9 (*t*)
C(3)	70.5 (*d*)	72.9 (*d*)	71.7 (*d*)	28.9 (*t*)
C(4)	41.1 (*s*)	49.7 (*s*)	47.3 (*s*)	38.7 (*s*)
C(5)	46.5 (*d*)	44.3 (*d*)	42.6 (*d*)	39.6 (*d*)
C(6)	82.9 (*d*)	83.8 (*d*)	86.4 (*d*)	79.8 (*d*)
C(7)	51.0 (*d*)	50.2 (*d*)	131.2 (*d*)	48.5 (*d*)
C(8)	90.1 (*s*)	90.1 (*s*)	137.1 (*s*)	89.5 (*s*)
C(9)	43.0 (*d*)	42.4 (*d*)	41.3 (*d*)	52.7 (*d*)
C(10)	40.3 (*d*)	40.4 (*d*)	41.5 (*d*)	78.9 (*s*)
C(11)	48.5 (*s*)	49.5 (*s*)	42.2 (*s*)	55.0 (*s*)
C(12)	34.0 (*t*)	35.5 (*t*)	38.5 (*t*)	46.1 (*t*)
C(13)	74.1 (*s*)	74.0 (*s*)	75.3 (*s*)	74.7 (*s*)
C(14)	78.3 (*d*)	78.8 (*d*)	79.2 (*d*)	78.3 (*d*)
C(15)	78.7 (*d*)	78.5 (*d*)	73.8 (*d*)	78.8 (*d*)
C(16)	89.9 (*d*)	89.6 (*d*)	92.2 (*d*)	88.9 (*d*)
C(17)	57.7 (*d*)	60.7 (*d*)	165.0 (*d*)	57.3 (*d*)
C(18)	71.2 (*t*)	72.4 (*t*)	71.9 (*t*)	80.0 (*t*)
C(19)	39.2 (*t*)	163.0 (*d*)	52.1 (*t*)	49.7 (*t*)
N–CHO	163.1 (*d*)	–	–	–
*Me*O–C(1)	55.7 (*q*)	55.8 (*q*)	57.0 (*q*)	55.4 (*q*)
*Me*O–C(6)	57.8 (*q*)	57.4 (*q*)	58.2 (*q*)	58.0 (*q*)
*Me*O–C(16)	61.0 (*q*)	61.0 (*q*)	61.6 (*q*)	61.2 (*q*)
*Me*O–C(18)	58.9 (*q*)	58.9 (*q*)	58.7 (*q*)	59.1 (*q*)
*Ac*O–C(3)	170.1 (*s*), 21.0 (*q*)	170.4 (*s*), 21.0 (*q*)	170.1 (*s*), 21.2 (*q*)	–
*Ac*O–C(8)	172.2 (*s*), 21.2 (*q*)	172.0 (*s*), 21.2 (*q*)	–	172.0 (*s*), 21.2 (*q*)
*C*OO–C(14)	165.9 (*s*)	165.9 (*s*)	166.1 (*s*)	166.1 (*s*)
C(1′)	129.6 (*s*)	129.5 (*s*)	129.7 (*s*)	129.5 (*s*)
C(2′,6′)	129.6 (*d*)	129.5 (*d*)	129.9 (*d*)	129.6 (*d*)
C(3′,5′)	128.7 (*d*)	128.6 (*d*)	128.5 (*d*)	128.7 (*d*)
C(4′)	133.4 (*d*)	133.3 (*d*)	133.3 (*d*)	133.4 (*d*)

[a]) 125 MHz. [b]) 100 MHz.

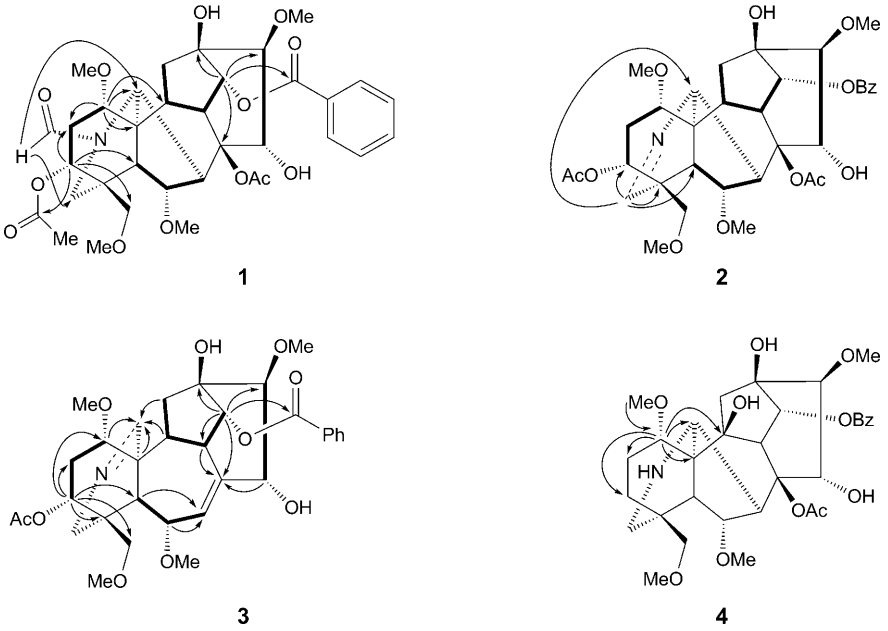

Fig. 2. *Selected* $^{1}H,^{1}H$*-COSYs* (—) *and HMBCs* (H → C) *of compounds* **1**–**4**

configuration as 3-*O*-acetylaconitine, based on their almost identical ^{1}H- and ^{13}C-NMR data (*Tables 1* and *2*) and the ROESY correlations (*Fig. 3*). The structure and relative configuration of **1** was confirmed by an X-ray crystallographic analysis (*Fig. 4*), and thus compound **1** was characterized as 3-*O*-acetyl-20-deethyl-20-formylaconitine (**1**).

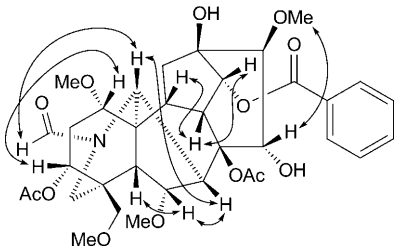

Fig. 3. *Selected ROESY correlations of compound* **1**

Compound **2** was isolated as colorless prisms and assigned the molecular formula $C_{34}H_{43}NO_{12}$ by analyses of the ESI-MS (*m*/*z* 658 ($[M+H]^+$)) and HR-ESI-MS (*m*/*z* 658.2846 ($[M+H]^+$)). The NMR data of **2** (*Tables 1* and *2*) were essentially identical with those of compound **1**, suggesting that **2** was also an aconitine-type C_{19}-nor-diterpenoid alkaloid. Compound **2** differed from **1** mainly at C(19) where a N=CH(19) moiety was deduced by comparing the NMR data with those of 20-demethyl-19,20-didehydrodelphinine [10]. The presence of a double bond between the N-atom and

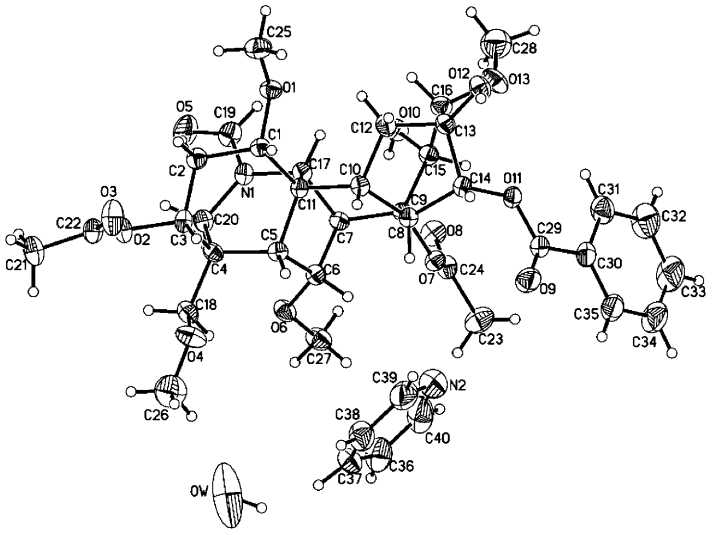

Fig. 4. *X-Ray crystal structure of compound* **1**. Arbitrary atom numbering.

C(19) was verified by the HMBCs (*Fig. 2*) between the olefinic H–C(19) (δ(H) 7.37 (br. *s*)) and C(3), C(4), C(5), C(17), and C(18). Consequently, brachyaconitine B (**2**) was defined as 3-*O*-acetyl-19,29-didehydro-20-deethylaconitine (**2**).

Compound **3** was obtained as a white powder. The molecular formula $C_{32}H_{41}NO_{10}$ was deduced by ESI-MS (*m*/*z* 600 ($[M+H]^+$)) and HR-ESI-MS (*m*/*z* 600.2786 ($[M+H]^+$)). Comparison of its 1D-NMR spectra (*Tables 1* and *2*) with those of secokaraconitine [11] showed high similarity (karaconitine = (1α,2α,6α,14α,15α,16β)-20-ethyl-1,6,16-trimethoxy-4-(methoxymethyl)aconitane-2,8,13,14,15-pentol 8-acetate 14-benzoate), except that there was an additional AcO group in compound **3** (δ(H) 2.07 (*s*, 3 H); δ(C) 170.1 (*s*) and 21.2 (*q*)). The AcO group was determined to be linked at C(3) by the HMBCs between δ(H) 4.92 (*dd*, *J* = 15.3, 8.7, H–C(3)) and δ(C) 170.1 (AcO, C=O)), C(2), C(4), C(5), and C(19). The full NMR data assignments of compound **3** were performed with the aid of the ^{1}H,^{1}H-COSY, HSQC, and HMBC data. Consequently, the structure of compound **3**, named 3-*O*-acetyl-8-de(acetyloxy)-7,8,17,20-tetradehydro-20-deethyl-7,17-secoaconitine (**3**), was elucidated as shown in *Fig. 1*.

Compound **4** had the molecular formula $C_{32}H_{43}NO_{11}$ as derived from ESI-MS (*m*/*z* 618 ($[M+H]^+$)), HR-ESI-MS (*m*/*z* 618.2912 ($[M+H]^+$)), and the ^{13}C-NMR data (*Table 2*). Compound **4** had a MeO rather than a OH group at C(1) as deduced from the comparison of its 1D-NMR (*Tables 1* and *2*) and MS data with those of flavaconitine (= (1α,6α,14α,15α,16β)-6,16-dimethoxy-4-(methoxymethyl)aconitane-1,8,10,13,14,15-hexol 8-acetate 14-benzoate) [6]. The position of this MeO group was established by the correlation of *Me*O–C(1) to C(1) in the HMBC spectrum (*Fig. 2*). Hence, compound **4** was defined as 1-*O*-methylflavaconitine (**4**).

This work was financially supported by the *973 Project of the Ministry of Sciences and Technology* (No. 2009CB941300). The authors are grateful to the staff of the analytical group of the State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Sciences, for the measurements of all spectra.

Experimental Part

General. Column chromatography (CC): silica gel (SiO_2; 200–300 mesh, *Qingdao Meigao Chemical Ltd.*, Qingdao, P. R. China); Al_2O_3 (*Shanghai Wusi Chemical Reagents Company, Ltd.*); *Sephadex LH-20* (*Pharmacia Fine Chemical Co., Ltd.*, Germany). M.p.: *XRC-1* micro melting-point apparatus; uncorrected. Optical rotations: *Horiba-SEPA-300* polarimeter. UV Spectra: *Shimadzu-UV-2401A* spectrophotometer; λ_{max} (log ε) in nm. IR Spectra: *Bio-Rad-FTS-135* spectrometer; $\tilde{\nu}$ in cm^{-1}. 1D- and 2D-NMR Spectra: *Bruker-AM-400* and *-DRX-500* spectrometers; chemical shifts δ in ppm with reference to the solvent signals, *J* in Hz. EI- and ESI-MS: *VG-Autospec-3000* spectrometer at 70 eV; in *m/z* (rel. %). HR-ESI-MS: *API-Qstar-Pulsar-1* spectrometer; in *m/z* (rel. %).

Plant Material. The roots of *Aconitum brachypodum* DIELS. were collected in Dongchuan of Yunnan Province, P. R. China, in November 2006, and authenticated by Prof. Dr. *Li-Gong Lei* from Kunming Institute of Botany. A voucher specimen (No. KIB 2006-11-03) had been deposited with the Group of Anti-virus and Natural Medicinal Chemistry, Kunming Institute of Botany, Chinese Academy of Sciences.

Extraction and Isolation. The roots of *A. brachypodum* (50 kg) were powdered and extracted three times with 90% EtOH under reflux for 2 h. After evaporation of the solvent, the crude extract was dissolved in 2% aq. HCl soln. (20 l) and then filtrated. The acidic soln. was basified to pH 9.0 with 25% NH_3 soln. and extracted with $CHCl_3$ and the org. phase concentrated to furnish a crude alkaloid extract (520 g). The extract was purified by CC (SiO_2 (5.2 kg; 200–300 mesh), petroleum ether/acetone/Et_2NH 15:1:1 → 3:1:1): *Fractions A–E. Fr. B* (45.1 g) was subjected to CC (SiO_2, petroleum ether/acetone/Et_2NH 15:1:1), followed by CC (Al_2O_3, petroleum ether/acetone 7:1) and finally CC (*Sephadex LH-20*, $CHCl_3$/MeOH 1:1): bullatine A (15.3 g), neoline (1.2 g), and songorine (18.5 g). *Fr. C* (50.9 g) was purified by CC (SiO_2, petroleum ether/acetone/Et_2NH 15:3:1) and further by CC (Al_2O_3, petroleum ether/acetone 5:1): **1** (80 mg), **2** (23 mg), **3** (33 mg), **4** (15 mg), aconitine (0.5 g), and hypaconitine (0.6 g).

Brachyaconitine A (= rel-*(1α,3α,6α,14α,15α,16β)-3,8-Bis(acetyloxy)-14-(benzoyloxy)-13,15-dihydroxy-1,6,16-trimethoxy-4-(methoxymethyl)aconitane-2D-carboxaldehyde*; **1**): Colorless prisms (pyridine). M.p. 232–233°. $[\alpha]_D^{23.0} = -44.35$ ($c = 3.74$, MeOH). UV (MeOH): 230 (4.17). IR (KBr): 3500, 2937, 2825, 1721, 1664, 1602, 1451, 1440, 1279, 713. NMR: *Tables 1* and *2*. ESI-MS (pos.): 710 ($[M+Na]^+$). HR-ESI-MS (pos.): 710.2771 ($[M+Na]^+$, $C_{35}H_{45}NNaO_{13}^+$; calc. 710.2789).

Brachyaconitine B (= rel-*(1α,3α,6α,14α,15α,16β)-19,20-Didehydro-1,6,16-trimethoxy-4-(methoxymethyl)aconitane-3,8,13,14,15-pentol 3,8-Diacetate 14-Benzoate*; **2**): Colorless prisms (pyridine). M.p. 150–151°. $[\alpha]_D^{23.7} = +69.50$ ($c = 0.94$, MeOH). UV (MeOH): 230 (4.15). IR (KBr): 3500, 2935, 1723, 1640, 1603, 1563, 1452, 1371, 1279, 1106, 712. NMR: *Tables 1* and *2*. ESI-MS (pos.): 658 ($[M+H]^+$). HR-ESI-MS (pos.): 658.2846 ($[M+H]^+$, $C_{34}H_{44}NO_{12}^+$; calc. 658.2864).

Brachyaconitine C (= rel-*(1α,3α,6α,14α,15α,16β)-7,8,17,20-Tetradehydro-1,6,16-trimethoxy-4-(methoxymethyl)-7,17-secoaconitane-3,13,14,15-tetrol 3-Acetate 14-Benzoate*; **3**): White powder. M.p. 216–217°. $[\alpha]_D^{23.7} = +11.49$ ($c = 0.24$, MeOH). UV (MeOH): 230 (4.19). IR (KBr): 3422, 2933, 1730, 1639, 1602, 1450, 1234, 1101, 719. NMR: *Tables 1* and *2*. EI-MS: 599 (2, M^+), 568 (21, $[M-MeO]^+$), 540 (37), 105 (100). HR-ESI-MS (pos.): 600.2786 ($[M+H]^+$, $C_{32}H_{42}NO_{10}^+$; calc. 600.2809).

Brachyaconitine D (= rel-*(1α,6α,14α,15α,16β)-1,6,16-Trimethoxy-4-(methoxymethyl)aconitane-8,10,13,14,15-pentol 8-Acetate 14-Benzoate*; **4**): Colorless prisms (MeOH). M.p. 165–166°. $[\alpha]_D^{22.1} = +23.81$ ($c = 0.80$, MeOH). UV (MeOH): 230 (4.15). IR (KBr): 3497, 2936, 1723, 1603, 1453, 1280, 1098, 716. NMR: *Tables 1* and *2*. ESI-MS (pos.): 618 ($[M+H]^+$). HR-ESI-MS (pos.): 618.2912 ($[M+H]^+$, $C_{32}H_{44}NO_{11}^+$; calc. 618.2914).

X-Ray Crystal Structure Data of Compound **1**. A colorless prismatic crystal was obtained from pyridine. Crystal data: $C_{35}H_{45}NO_{13}$, M_r 687.84; triclinic, space group *P*1; crystal dimensions: 0.20 × 0.20 ×

0.30 mm; unit-cell dimensions: $a = 8.854(18)$ Å, $b = 11.159(2)$ Å, $c = 11.544(2)$ Å, $\alpha = 106.89(3)^\circ$, $\beta = 105.27(3)^\circ$, $\gamma = 103.63(3)^\circ$, $V = 990.8(3)$ Å^3; $Z = 1$; $D_x = 1.315$ g/cm^3. Data were collected with a *MAC-DIP-2030K* diffractometer, a graphite monochromator (ω scan, $2\theta_{max} = 24.0^\circ$), and Mo$K_\alpha$ radiation. The total number of independent reflections was 3847, of which 3456 were observed $|F|^2 \geq 2\sigma|F|^2$. The structure was solved by a direct method, with SHELXS-97, expanded with difference *Fourier* techniques, and refined with NOMCSDP and full-matrix least-squares calculations. Final indices: $R_1 = 0.056$, $wR_2 = 0.145$, $S = 1.327$. CCDC-741409 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge *via* http://www.ccdc.cam.ac.uk/data_request/cif.

REFERENCES

[1] 'Zhongyao Da Cidian (The Dictionary of Chinese Crude Drugs)', Ed. Jiangsu New Medical College, Shanghai Science and Technology Press, Shanghai, China, 1977, pp. 2089–2090.
[2] China Pharmacopoeia Committee, 'Pharmacopoeia of China', People's Medical Publishing House, Beijing, China, 1977, p. 580.
[3] G. N. Li, 'Yunnan Zhiwu Zhi (Chinese Medicine Record of Yunnan)', Yunnan Science and Technology Press, Yunnan, China, 1990, pp. 472–473.
[4] L. S. Ding, E. F. Wu, Y. Z. Chen, *Nat. Prod. Res. Dev.* **1994**, *6*, 50.
[5] S. W. Pelletier, Z. Djarmati, *J. Am. Chem. Soc.* **1976**, *98*, 2626.
[6] S. Y. Chen, S. H. Li, X. J. Hao, *Acta Bot. Sin.* **1986**, *28*, 86.
[7] Y. G. Wang, Y. L. Zhu, R. H. Zhu, *Acta Pharm. Sin.* **1980**, *15*, 526.
[8] H. Hikino, Y. Kuroiwa, C. Konno, *J. Nat. Prod.* **1983**, *46*, 178.
[9] L. M. Liu, H. C. Wang, Y. L. Zhu, *Acta Pharm. Sin.* **1983**, *18*, 39.
[10] Y. Bai, H. K. Desai, S. W. Pelletier, *J. Nat. Prod.* **1994**, *57*, 963.
[11] M. N. Sultankhodzhaev, Atia-tul-Wahab, M. I. Choudhary, Atta-ur-Rahman, *Chem. Nat. Compd.* **2003**, *39*, 512.

Received August 12, 2009