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NEW QUASSINOID GLYCOSIDES AND HEMIACETALS FROM *PICRASMA AILANTHOIDES* PLANCHON. PICRASINOSIDE-B,-C,-D,-E,-F, AND -G, AND PICRASINOL-A AND -B

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New quassinoid glucosides, picrasinoside-B,-C,-D,-E,-F, and -G, and quassinoid hemiacetals, picrasinol-A and -B, were isolated from the bark of *Picrasma ailanthoides* PLANCHON, and their structures are established by spectral analysis and chemical transformations.

Recently, potent antileukemic quassinoid glycosides have been isolated from *Brucea javanica*$^{1)}$ and *Brucea antidysenterica*.$^{2)}$ Although many quassinoids were obtained from *Picrasma ailanthoides* PLANCHON (= *P. quassioides* BENNETT),$^{3,4)}$ the isolation of their glycosides from the plant were not reported except picrasinoside -A$^{5)}$ which we lately obtained. We now report the isolation and the structural elucidation of new six quassinoid glucosides, picrasinoside-B (1),$^{6)}$ -C (2),-D (3),-E (4),-F (5), and -G (6), and two quassinoid hemiacetals, picrasinol-A (7) and -B (8) from the bark of *P. ailanthoides*.

Half dried barks (3.1 kg) of *P. ailanthoides*, collected at Iwate prefecture in June of 1982, were extracted with methanol at room temperature. Nonpolar components were removed from the extract by using hexane and then polar ones were obtained by chloroform extraction. The polar components (40.5 g) were subjected to silica gel column chromatography, preparative TLC, and preparative HPLC (Radial-PAK C_{18}) in turn to give picrasinoside-B (0.0042%), -C (0.0062%), -D(0.0011%), -E (0.0022%), -F (0.0006%), and -G (0.0009%), and picrasinol-A (0.032%) and -B (0.029%). These compounds were characterized as shown in Tables 1 and 2.

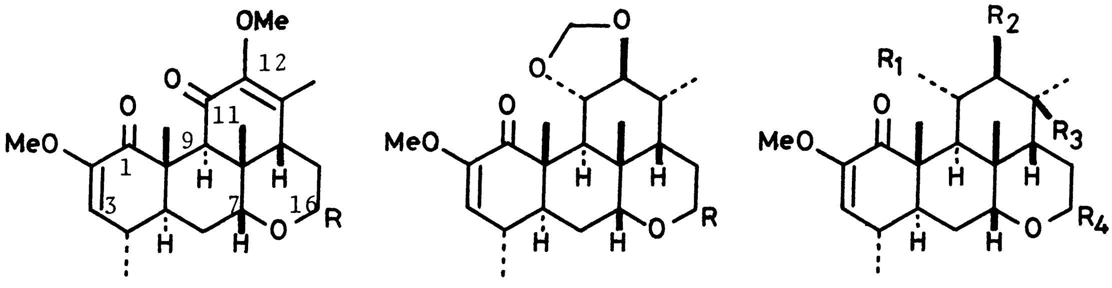
Table 1. Physical and spectral data of glucosides and hemiacetals

Compound	Mp/°C	$[\alpha]_D$	λ_{max}^{EtOH} (ε)	ν_{max}/cm^{-1}
1	153-153.5	-15.1°	255 (11300)	3400, 1085, 1040, 1690, 1675(sh), 1640
2	163.5-164	-41.1°	261 (4400)	3400, 1090, 1035, 2740(sh), 1700, 1640
3	144-144.5	+3.3°	262 (3800)	3400, 1075, 1030, 1735, 1245, 1705, 1640
4	163-164	-14.7°	262 (3500)	3400, 1070, 1030, 1730, 1250, 1705, 1640
5	153-154	-8.2°	271 (4400)	3400, 1070, 1040, 1670, 1640
6	162-163	+24.2°	271 (6100)	3400, 1070, 1040, 1670, 1645
7	122-124	+49.6°	261 (3800)	3450, 1730, 1245, 1710, 1700, 1640
8	205-206	+12.1°	262 (4600)	3450, 2740, 1710, 1700, 1640

Table 2. ^{1}H-NMR [δ(ppm) in CDCl$_3$] of glucosides, hemiacetals, and their derivatives

	t-Me	s-Me	-OMe	C$_9$-H	C$_{11}$-H	C$_{12}$-H	C$_7$-H	C$_3$-H	C$_{16}$-H	C$_{1'}$-H	Remarks
1	1.06s,1.85s	1.09d(J=6)	3.56s	3.18s	-----	-----	3.82m	5.31d	4.83dd	4.65d	
	1.52s		3.63s					(J=2)	(J=2.5,6)	(J=7)	
1a	1.06s,1.82s	1.11d(J=6)	3.57s	3.18s	-----	-----	a)	5.27d	4.78dd	-----	C$_{16\beta}$-OMe 3.35s
	1.52s		3.62s					(J=2.5)	(J=3,3)		
1b	1.04s,1.83s	1.11d(J=7)	3.56s	3.18s	-----	-----	a)	5.27d	4.36dd	-----	C$_{16\alpha}$-OMe 3.46s
	1.53s		3.63s					(J=2.5)	(J=2.5,9)		
2	1.15s	1.10d(J=6.5)	3.54s	2.74d(J=11)	a)	a)	3.82m	5.24d	4.73dd	4.61d	-O-CH$_2$-O- 4.96d(J=1)
	1.38s	1.12d(J=6)						(J=2)	(J=2.5,5)	(J=7)	5.13d(J=1)
8	1.14s	1.07d(J=6.5)	3.55s	2.76d(J=11)	a)	a)	3.94m	5.21d	4.69bm	-----	4.97d(J=1)
	(1.20s)$^{b)}$	(1.04d(J=6.5))$^{b)}$		(2.51d(J=11))$^{b)}$				(J=2.5)	(5.35m)$^{b)}$		5.15d(J=1)
	1.38s	1.08d(J=7)									
2a	1.14s	1.03d(J=7)	3.59s	2.51d(J=11)	a)	a)	a)	5.44d	4.73m	-----	C$_{16\beta}$-OMe 3.31s
	1.40s	1.12d(J=7)						(J=2.5)			
2b	1.12s	1.02d(J=7)	3.58s	2.51d(J=11)	a)	a)	a)	5.43d	4.28dd	-----	C$_{16\alpha}$-OMe 3.44s
	1.40s	1.12d(J=7)						(J=2.5)	(J=2,8)		
3	1.15s	0.99d(J=7)	3.39s	2.86d(J=11)	5.17dd	3.18dd	3.85m	5.12d	4.73bm	4.60d	-OAc 1.94s
	1.23s	1.06d(J=6.5)	3.54s		(J=9,11)	(J=9,11)		(J=2.5)	(12)$^{c)}$	(J=7)	
7	1.14s,1.25s	0.99d(J=6)	3.40s	2.87d(J=11)	5.18dd	3.14dd	3.86m	5.10d	4.70bm	-----	-OAc 1.94s
	(1.18s)$^{b)}$	1.06d(J=7)	3.54s		(J=9,11)	(J=9,11)		(J=2.5)	(5.34m)$^{b)}$		
4	1.21s,1.39s	1.07d(J=6.5)	3.50s	2.83d(J=11)	5.49dd	3.36d	3.87m	5.13d	4.72bm	4.60d	-OAc 1.96s
	1.23s		3.56s		(J=9,11)	(J=9)		(J=2.5)	(12)$^{c)}$	(J=8)	
5	1.10s	0.98d(J=7)	3.57s	2.46d(J=11)	a)	a)	3.83m	5.43d	4.71dd	4.60d	
	1.42s	1.10d(J=6)	3.58s					(J=2.5)	(J=2.5,6)	(J=7)	
6	1.19s, 1.44s	1.11d(J=7)	3.58s	2.48d(J=11)	a)	2.98d	3.83m	5.42d	4.71bm	4.60d	
	1.34s		3.67s			(J=9)		(J=2)	(12)$^{c)}$	(J=7)	

a) Not assigned. b) Signals due to the other isomer at C$_{16}$. c) Half width in Hz.



	R
1	--O-β-Glc
1a	▬OMe
1b	--OMe

	R
2	--O-β-Glc
8	H, OH
9	=O

	R_1	R_2	R_3	R_4
2a	OH	OH	H	▬OMe
2b	OH	OH	H	--OMe
3	OAc	OMe	H	--O-β-Glc
3a	OAc	OMe	H	▬OMe
3b	OAc	OMe	H	--OMe
4	OAc	OMe	OH	--O-β-Glc
4a	OAc	OMe	OH	▬OMe
4b	OAc	OMe	OH	--OMe
5	OH	OMe	H	--O-β-Glc
5a	OH	OMe	H	▬OMe
5b	OH	OMe	H	--OMe
6	OH	OMe	OH	--O-β-Glc
6a	OH	OMe	OH	▬OMe
6b	OH	OMe	OH	--OMe
7	OAc	OMe	H	H, OH
10	OAc	OMe	H	=O

Fig. 1. The glycosides and their derivatives.

The glycosides were heated with 1.5 M sulfuric acid - methanol (1 : 2, v/v) at 60 °C for 5 h (methanolysis) and every product obtained by extraction with chloroform showed two peaks in HPLC (Radial-PAK CN, hexane - ethylacetate 4 : 1, v/v) due to the formation of two methylated isomers. The glycosides and their derivatives isolated by HPLC are shown in Fig. 1. The aqueous layers were neutralized with anion exchange resin (Amberlite IRA-410), evaporated, and dried in a desiccator (P_2O_5) and converted to trimethylsilyl derivatives. The component of the aqueous layers was identified as D-glucose by comparison of their retention times (GC) with that of the authentic TMS derivative.

The structures of the glycosides were confirmed as follows. ^{1}H-NMR spectrum of 1 was similar to that of neoquassin.3) The product obtained by the methanolysis was a mixture of two methylated isomers (1a and 1b, 3 : 1) of neoquassin. Two ethylated and butylated isomers (3 : 1 each) were also obtained by the alcoholysis using ethanol and 1-butanol as solvents, respectively. These facts support the hemiacetal structure of neoquassin and the position of D-glucose as shown in Fig. 1. The linkage of D-glucose to C_{16} position of neoquassin was determined as α by C_{16}-H signal at δ 4.83 (dd, J=2.5 and 6 Hz). The sugar linkage attached to $C_{16\alpha}$-OH was confirmed as β by the $C_{1'}$-H signal at δ 4.65 (d, J=7 Hz) as shown in Table 1.

The compound 8 showed two peaks (37 : 63) in HPLC (Radial-PAK CN) due to the equilibrium of two hemiacetal structures. Oxidation of 8 using Jones' reagent at 0 °C gave picrasin D (9)4) which was identified by spectral comparison with the authentic sample obtained from *P. ailanthoides*. The ^{1}H-NMR spectrum of 2 was similar to that of 8 except for the additional sugar moiety and showed methylenedioxy proton signals at δ 4.96 and 5.13, while 8 showed the corresponding signals at δ 4.97 and 5.15 (Tabel 2). However, the methanolysis products (2a and 2b, 7 : 3) did not have the methylenedioxy group (Table 2). The compound 8 gave also the same products (2a and 2b) in the methanolysis condition. Therefore, the methylenedioxy ring of both 2 and 8 was decomposed by hydrolysis under the methanolysis condition to give diols (2a and 2b) which are two methylated isomers of nigakihemiacetal C.3) ^{13}C-NMR [δ(ppm) in pyridine-d_5] of 2 (198.7, 148.9, 115.3, 100.8, 100.1, 95.4, 83.1, 79.0, 78.6, 78.4, 78.1, 74.9, 71.5, 62.8, 54.7, 48.1, 47.2, 44.2, 39.1, 37.1, 33.3, 32.1, 28.8, 26.1, 22.1, 19.2, 14.8, 13.1) supports the structure of 2 in Fig. 1.

The compound 7 also showed two peaks (9 : 11) in HPLC (Radial-PAK CN) due to the equilibrium of two hemiacetal structures. The oxidation of 7 using Jones' reagent at 0 °C gave nigakilactone C (10),3) which was identified by comparison of its spectral data with those of the authentic sample obtained from *P. ailanthoides*. The ^{1}H-NMR spectrum of 3 was similar to that of 7 except for the additional sugar moiety. The methanolysis of 3 gave two isomers (3a and 3b, 8 : 3), which were also produced by treating 7 in the methanolysis condition.

The ^{1}H-NMR spectrum of 4 was similar to that of nigakihemiacetal D.3) The methanolysis of 4 gave also two isomers (4a and 4b, 2 : 1) and 4a was further converted to nigakihemiacetal D3) by treating it with 1.5 M sulfuric acid, which was identified by the spectral comparison.

The methanolysis of 5 gave also two isomers (5a and 5b, 7 : 3). The spectral data of 5a coincided with those of the product obtained by alkaline hydrolysis of 3a.

Two isomers (6a and 6b, 7 : 3) were also obtained by methanolysis of 6. The product 6a, one of the methylated isomers, was also obtained by alkaline hydrolysis of 4a, and it was identified by their spectral comparison.

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6) *In vitro* effect of 1 on P-388 lymphocytic leukemia cells was compared with that of 5-fluorouracil, and 1 was revealed to have antileukemic activity against the system. The testing of the other glycosides is in progress.

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