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Isolation of Adenosine from the Rhizomes of *Polygonatum sibiricum*

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Abstract □ The purine nucleoside, adenosine, mp. 233-4°, was isolated from the rhizomes of *Polygonatum sibiricum*. Its structure was characterized on the basis of spectral data.

Keywords □ *Polygonatum sibiricum*, Liliaceae, purine nucleoside, adenosine.

The rhizomes of *Polygonatum sibiricum* Redoute (Liliaceae) are one of the important traditional medicine in Korea. Recently we reported the isolation of two new steroidal saponins, sibiricosides A and B together with two known ones[1]. Further investigation on this plant led to the isolation of an additional compound, adenosine (**1**) as a minor component. The present paper describes the isolation and characterization of this compound.

EXPERIMENTAL

General experimental procedure

Instrumentation used and isolation procedure of **1** were as described previously[1].

Compound 1

Crystallized from aqueous MeOH as colorless needles: mp. 233-4℃, $[\alpha]_D^{25} = -59.5°$ ($c=0.5$, H_2O) [lit[10], mp. 233-5℃; $[\alpha]_D = -59.7°$]; IR ν_{max}^{KBr} cm^{-1} 3430, 3350 (NH_2), 3150 (OH), 1685, 1670, 1610 (NH), 1105 (C-N), 1032 (C-O), 825 (NH_2); UV λ_{max}^{MeOH} nm (log ε), 208 (4.03), 260 (3.83); ^{1}H-NMR (300 MHz, DMSO-d_6) and ^{13}C-NMR (75.5 MHz, DMSO-d_6): see Table I; MS (30 eV), *m/z* (rel. int.) 267 (M^+, 1.2), 250 (1.0), 238 (3.4), 237 (9.7), 220 (1.4), 194 (1.7), 179 (10.1), 178 (35.1), 165 (21.0), 164 (96.5), 137 (19.9), 136 (95.5), 135 (100), 134 (1.7), 121 (1.3), 119 (8.5), 109 (7.5), 108 (29.3), 81 (4.0), 73 (7.2).

RESULTS AND DISCUSSION

The compound (**1**), mp. 233-4℃, was positive to anisaldehyde-H_2SO_4 reagent and showed characteristic bands at 3150-3430 (OH and NH_2), 1685, 1670, 1610 (NH), 1105 (C-N), and 825 (NH_2) cm^{-1} in its IR spectrum. In the UV spectrum, it exhibited strong absorption peaks at 208 and 260 nm which was suggested that compound **1** was a purine nucleoside[2]. This result was further supported by the EI mass spectrum of **1**. The mass spectrum of **1** showed a molecular ion at *m/z* 267 along with a base peak at *m/z* 135. Other important peaks at *m/z* 237, 178, 164 and 136 with great relative abundance are characteristic of adenosine and its analogs[3-5]. The ^{1}H-NMR spectrum of **1** showed two aromatic singlet signals at δ 8.133 and 8.335. The ^{1}H-^{1}H COSY spectra of **1** enabled the complete assignment of all proton signals as indicated in Table I and were consistent with the structure assigned. Finally the ^{13}C-NMR spectral data of **1** confirmed the structure of compound **1**. Further confirmation of the assignment of the structure of **1** as adenosine was obtained by the direct comparison with an authentic sample (mmp and ^{1}H-NMR).

Adenosine is widely distributed in plants[6-9] and has been isolated as a platelet aggregation inhibitor from *Angelica acutiloba*[10], *Ganoderma lucidum*[11] and two *Allium* plants such as *A. bakeri* and *A. sativum*[12].

Table I. ^{1}H- and ^{13}C-NMR data for compound 1 in DMSO-d_6

Proton	δ H[multiplicity, J (Hz)]	^{1}H-^{1}H COSY	Carbon	δ C
H-2	8.133 s		C-2	152.34
H-8	8.335 s	H-1′	C-4	149.03
H-1′	5.879 d (6.2)	H-2′, H-8	C-5	119.36
H-2′	4.604 m	H-3′, H-1′	C-6	156.09
H-3′	4.147 m	H-4′, H-2′	C-8	139.90
H-4′	3.966 dd (6.6, 3.4)	H-5′ab, H-3′	C-1′	87.91
H-5′a	3.677 dt (3.6, 12.2)	H-5′b, H-4′	C-2′	73.42
H-5′b	3.588 ddd (3.4, 6.6, 12.2)	H-5′a, H-4′	C-3′	70.64
			C-4′	85.88
			C-5′	61.66

However, this is the first isolation from this plant.

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LITERATURE CITED

1. Son, K. H., Do, J. C. and Kang, S. S.: Steroidal saponins from the rhizomes of *Polygonatum sibiricum*. *J. Nat. Prod.* **53**, 333 (1990).
2. Sangster, A. W. and Stuart, K. L.: Ultraviolet spectra of alkaloids. *Chem. Rev.* **65**, 69 (1965).
3. Shaw, S. J., Desiderio, D. M., Tsuboyama, K. and McCloskey, J. A.: Mass spectrometry of nucleic acid components. Analogs of Adenosine, *J. Am. Chem. Soc.* **92**, 2510 (1970).
4. Porter, Q. N. and Baldas, J.: Mass spectrometry of heterocyclic compounds, Wiley-Interscience, New York, pp. 468-491 (1971).
5. Hignite, C.: In "Biochemical applications of mass spectrometry", ed. by Waller, G. R. and Dermer, O. C., John Wiley and Sons, New York, 1980, first supplimentary volume, Chapter 16, pp. 527-566.
6. Chiang Su New Medicinal College: Dictionary of Chinese crude drugs. Shanghai scientific technologic publisher, Shanghai, pp. 303-5 (1977).
7. Hiyama, C., Miyai, S., Yoshida, H., Tamazaki, K. and Tanaka, O.: Application of high-speed liquid chromatography and dual wave-length thin-layer chromatograph-densitometry to analysis of crude drugs. Nucleosides and free bases of nucleic acids in Ginseng roots. *Yakugaku Zasshi*, **98**, 1132 (1978).
8. Duke, J. A.: CRC Handbook of medicinal herbs, CRC press, Inc., Boca Raton, Florida, (1985).
9. Kariyone, T.: Annual index of the reports on plant chemistry in 1966. Hirokawa publishing company, Inc., Tokyo, p. 102 (1974).
10. Torhzuka, K., Nishiyama, P., Adachi, I., Kawashiri, N., Ueno, M., Terasawa, K. and Horikoshi, I.: Isolation of a platelet aggregation inhibitor from angelicae radix. *Chem. Pharm. Bull.* **34**, 5011 (1986).
11. Shimizu, A., Yano, T., Saito, Y. and Inada, Y.: Isolation of an inhibitor of platelet aggregation from a fungus, *Ganoderma lucidum*. *Chem. Pharm. Bull.* **33**, 3012 (1985).
12. Okuyama, T., fujita, K., Shibata, S., Hoson, M., Kawada, T., Masaki, M. and Yamate, N.: Effects of Chinese drugs "Xiebai" and "Dasuan" on human pletelet aggregation (*Allium bakeri, Allium sativum*). *Planta. Med.* **55**, 242 (1989).