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AN IRIDOID FROM *RANDIA DUMETORUM*

O. P. SATI*, D. C. CHAUKIYAL, M. NISHI†, K. MIYAHARA† and T. KAWASAKI†

Department of Chemistry, University of Garhwal, Srinagar (U.P.) 246174, India; †Faculty of Pharmaceutical Sciences, Setsunan University, 45-1, Nagaotoge-cho, Horakata, Osaka, 573-01, Japan

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Key Word Index—*Randia dumetorum*; Rubiaceae; iridoid glycoside; two-dimensional NMR.

Abstract—10-Methylixoside, a new iridoid glucoside, has been isolated and characterized from *Randia dumetorum* leaves by FAB and negative-ion mass spectrometry and ^{13}C NMR and ^{1}H NMR (normal mode, COSY and NOE, J relation 2D).

INTRODUCTION

Randia dumetorum Lamk. has been reported as an emetic and antidysenteric agent [1]. Different workers [2–9] have isolated saponins and sapogenins from the fruits and bark of this plant. However, no iridoid has been reported. Herein we report the isolation of 10-methylixoside (**1**), a new iridoid glucoside from the leaves of the title plant. The same compound has also been isolated from the bark of *R. dumetorum*. We were interested in the new iridoids following the report [10] of the algicidal, bernicidal, and antitumor activities of these compounds [11].

RESULTS AND DISCUSSION

An aqueous ethanolic extract of the leaves on repeated column chromatography afforded **1**. The M_r of **1** is 402, as concluded from the FAB mass spectrum which showed peaks at *m/z* 403 $[M+H]^+$, 425 $[M+Na]^+$, and cluster ions at *m/z* 565 $[M+H+\text{glucose}]^+$, 642 $[M+H+\text{aglycone}]^+$ and 805 $[2M+H]^+$. The EI mass spectrum (negative ions) showed peaks at *m/z* 240 [aglycone], 222 [aglycone $-H_2O$] and 194 [aglycone $-CO$]. Its UV spectrum showed an intense absorption band at 220 nm and the IR spectrum showed bands at 1710 and 1645 cm^{-1}. These data show the presence of a conjugated carbonyl function. The ^{1}H NMR spectrum (normal mode, 400 MHz) showed a doublet ($J = 3.5$ Hz) for the C-1 proton at δ6.74 and a broad singlet for the C-3 proton, characteristic of iridoids, at 7.87 [12]. The interpretation of the proton spin-spin coupling pattern was done with the aid of 2D NMR, viz. homonuclear correlation spectroscopy (HOMCOR or COSY) [13], and is explained in Fig. 1. This gives more unequivocal results and is tabulated in Table 1.

Comparison of the ^{1}H NMR spectrum of **1** with that of ixoside [14], 11-methylixoside [15] and other glycosides confirmed the presence of a β-D-glucose moiety and an ixoside nucleus; the chemical shifts and the intensities of the signals are in good agreement which is further supported by the ^{13}C NMR spectra (Fig. 2). The methyl ester formed at the C-10 carboxylic group is derived from the NOE spectra. As shown and explained in Fig. 2, NOE is observed with 1-H, 7-H and 9-H. The presence of a β-linked D-glucose moiety is also confirmed by the results of enzymatic hydrolysis.

The bark of *R. dumetorum* also afforded compound **1**; identity confirmed by co-TLC, mmp and superimposable IR.

EXPERIMENTAL

Mps are uncorr. FAB MS: solvent glycerol, accelerating voltage 2 kV, gas Xe. NMR: 400 MHz for ^{1}H NMR and 25 MHz for ^{13}C NMR, solvent C_5D_5N, values in TMS. CC was on silica gel (Merck) and TLC on Kieselgel 60 G (Merck). Spots on TLC were visualized by spraying with 20% H_2SO_4 and heating at 120° for a few min.

Isolation. Fresh air-dried leaves (2.5 kg) collected from Ratura (Pauri), U.P., were defatted with petrol in a Soxhlet apparatus. The solvent-free leaves were exhaustively extracted with 90% EtOH until the extracts became colourless. The EtOH extract was evaporated to near dryness, then partitioned between H_2O and Et_2O. The organic phase was again evaporated to dryness and partitioned between H_2O–MeOH (2:1) and hexane and the two aq. phases were combined. The aq. extracts were concentrated to dryness and chromatographed on silica gel (500 g) with $CHCl_3$–MeOH (20:1–17:3) as eluant. This gave compound **1**, which was rechromatographed to give pure compound **1** (500 mg) which crystallized as colourless fine needles from MeOH, mp 215–217°. UV λ_{max}^{MeOH} nm: 220; IR γ_{max}^{CsI} cm^{-1}: 1715, 1655, 1620; ^{1}H NMR: Table 1; ^{13}C NMR: Fig. 2; FAB MS *m/z*: 805, 643, 565, 465, 425, 403, 385, 315, 251, 224, 193. EIMS (negative ions), 2 eV, *m/z*: 240, 222, 194, 149, 138. (Found: C, 50.63; H, 5.35. $C_{17}H_{22}O_{11}$ requires: C, 50.74; H, 5.47%.)

Enzymatic hydrolysis of **1**. This was carried out by incubating **1** (25 mg) in 0.1 M citrate buffer (pH 5.0, 25 ml) with β-glucosidase (25 mg) at 30° for 6 hr. PC examination of the soln identified glucose as the only monosaccharide produced.

*To whom correspondence should be addressed.

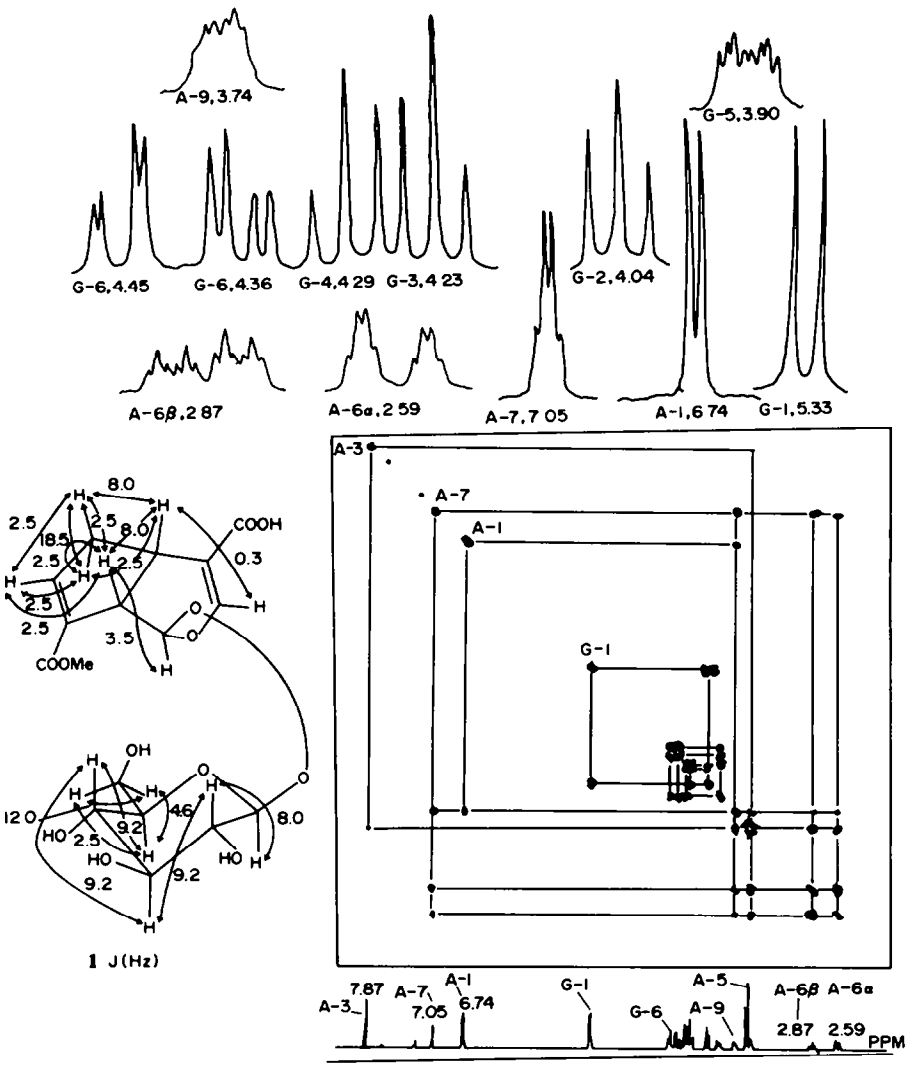

Fig. 1. 2D-J-correlated (COSY) spectrum of **1** with *J*-resolved A-1, A-6α, A-6β, A-7, G-2, G-3, G-4, G-5, G-6 and G-1 signals. A = aglycone; G = sugar.

Table 1. ^{1}H NMR chemical shifts (400.0 MHz) of **1** in pyridine

Aglycone		Sugar	
1	6.74 *d* 3.5	1	5.33 *d* (18.0)
3	7.87 *br s*	2	4.04 *dd* (9.2, 8.0)
5	3.55 *ddd* (8.0, 8.0, 2.5)	3	4.23 *dd* (9.2, 9.2)
6	2.59 *dddd* (18.5, 2.5, 2.5, 2.5)	4	4.29 *dd* (9.2, 9.2)
6	2.87 *dddd* (18.5, 8.0, 2.5, 2.5)	5	3.90 *ddd* (9.2, 4.6, 2.5)
7	7.05 *ddd* (4.5, 2.5, 2.5)	6	4.36 *dd* (12.0, 4.6)
9	3.74 *ddddd* (8.0, 3.5, 2.5, 2.5, 2.5)	6	4.45 *dd* (12.0, 2.5)
–OMe	3.60 *s*		

Values in parentheses are coupling constants in Hz.

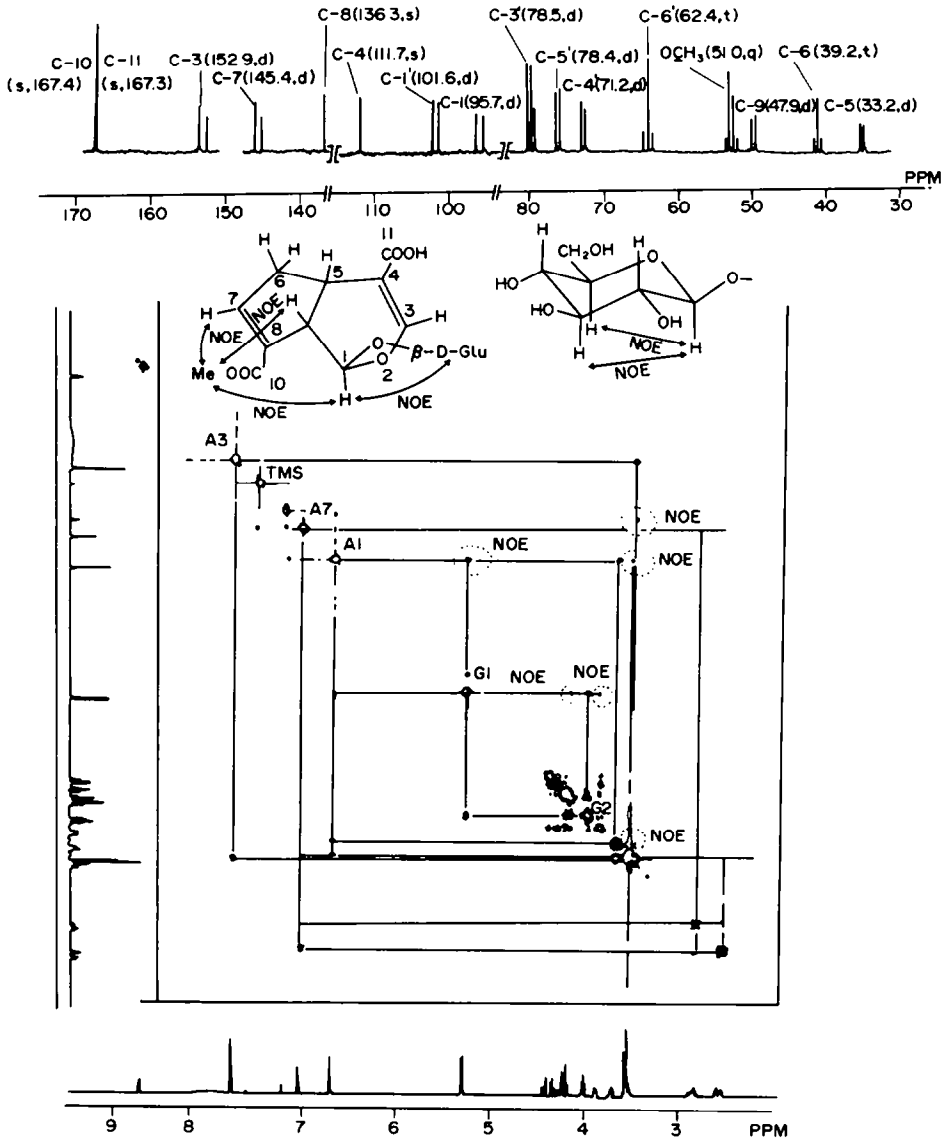

Fig. 2. ^{13}C NMR spectrum of 1 (off-resonance).

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REFERENCES

1. Kirtikar, K. R. and Basu, B. D. (1918) *Indian Medicinal Plants*, p. 648. Periodical Experts, Delhi.
2. Vogtherr, M. (1894) *Arch. Pharm.* **232**, 489.
3. Gedeon, J. (1952) *Arch. Pharm.* **288**, 127.
4. Yan-Tung, L., Bin-Lo, T. and Wune-Ten, T. (1954) *J. Chin. Chem. Soc.* **1**, 57.
5. Varshney, I. P. and Sannie, Ch. (1956) *Compt. Rend.* **242**, 2393.
6. Atal, C. K. and Lamba, S. S. (1970) *Indian J. Pharm.* **22**, 120.
7. Tandon, J. S., Agrawal, K. P. and Dhar, M. M. (1966) *Indian J. Chem.* **4**, 483.
8. Varshney, I. P., Pal, R. and Srivastava, H. C. (1978) *J. Indian Chem. Soc.* **55**, 39.
9. Saharia, G. S. and Seshadri, V. (1980) *Indian J. For.* **3**, 6.
10. Coppen, J. J. W. (1983) *Phytochemistry* **22**, 179.
11. Aszalos, A. (1982) *Antitumor Compounds of Natural Origin: Chemistry and Biology*, p. 147. CRC Press, Boca Raton, FL.
12. Uesato, S., Ali, E., Nishimura, H., Kawamura, I. and Inouye, H. (1982) *Phytochemistry* **21**, 353.
13. Ave, W. P., Bartholdi, E. and Ernst, R. R. (1976) *J. Chem. Phys.* **64**, 2239.
14. Takeda, Y., Nishimura, H. and Inouye, H. (1975) *Phytochemistry* **14**, 2645.
15. Bailleul, F., Rabaron, A., Koch, M. and Delaveau, P. (1979) *Planta Med.* **37**, 316.