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Mogroside Via1, New Isomer of Mogroside VI Isolated From Luo Han Guo

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Abstract : *Two isomers of Mogroside VI, Mogroside VIa1 (**1**) and Mogroside VIa (**2**), were isolated from the extracts of Luo Han Guo. Compound **1** is a newly isolated isomer of Mogroside VI. We report here detailed structural confirmation of the structures of **1** and **2** as well as the sensory data for both compounds. Structure elucidation of both mogrosides were achieved by NMR analysis and the complete 1H and 13C NMR assignments of both mogrosides are described herein based on the NMR experiments (1H, 13C, COSY, HSQC-DEPT, HMBC, ROESY and 1D-TOCSY) and mass spectral data. The sensory properties of compounds **1** and **2** were measured.*

Keywords: *Mogroside, triterpene glycosides, Structure elucidation, NMR spectroscopy, Luo Han Guo, 1→6 glycoside linkage*

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I. Introduction

The high demand of non-caloric sweeteners from natural sources has attracted consumer interest in Stevia extracts from the leaves of Stevia rebaudiana [1] and Luo Han Guo extracts from the fruit of Siraitia grosvenori [2]. The food industry is therefore increasingly active in the development of sweet taste additives based on these products. Stevia extracts have been extensively studied and commercialized as zero-calorie high potency sweeteners in a variety of forms ranging from dried leaves to pure steviol glycosides. Luo Han Guo, grown in southern China and used locally as a traditional medicine, is also commercialized and is a generally recognized as safe (GRAS) as a non-nutritive sweetener, flavor enhancer, and food ingredient in the USA. The main sweet component of Luo Han Guo extracts is Mogroside V, a triterpene glycoside with a polycyclic cucurbitane core. Mogroside V is 250 times sweeter than sucrose [3,4]. In continuation of our discovery of new natural sweeteners from Luo Han Guo extracts [5,6], we report here the isolation and structure elucidation of one new (**1**) and one known (**2**) mogroside (Figure 1). Compounds **1** and **2** contain a central triterpene core and six glucoses similar to Mogroside VI [7], which is reported as highly sweet minor component in Luo Han Guo extract. Compound **2** has been previously reported [8,9] but its sensory properties are not reported. In this paper we describe the isolation, NMR structural assignment, and sensory property of compounds **1** and **2**.

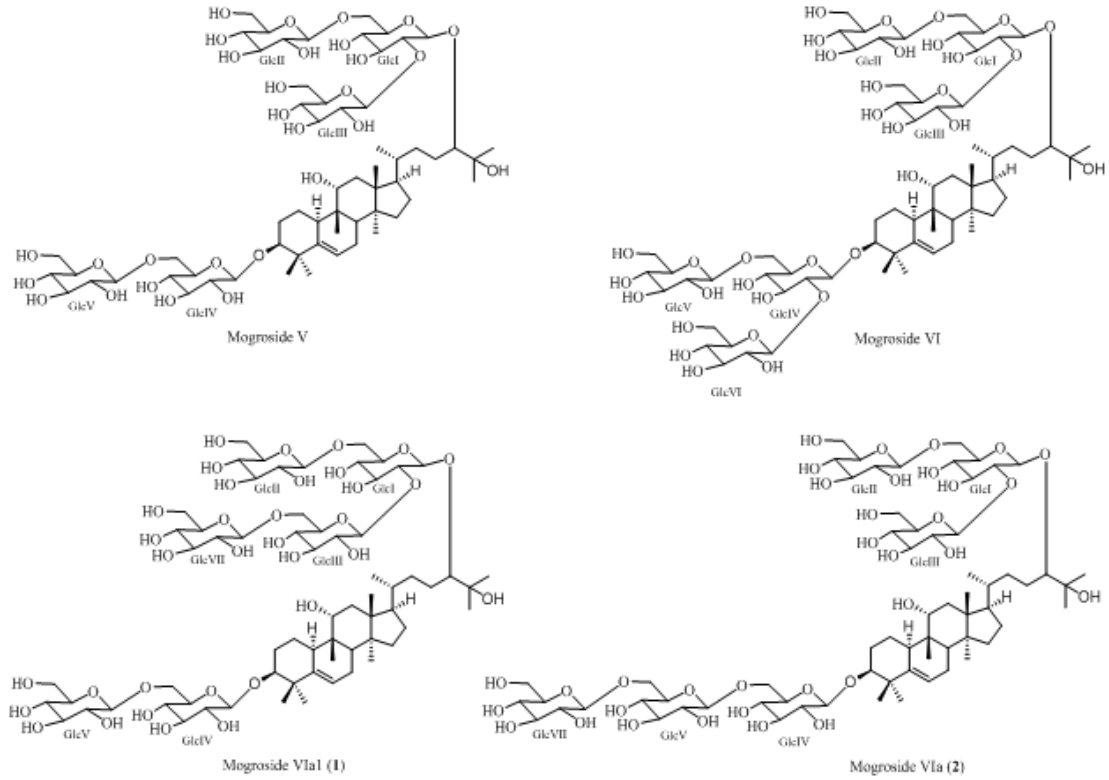

Figure 1. Structures of Mogroside V, Mogroside VI, Mogroside VIa1 (**1**) and Mogroside VIa (**2**)

II. Materials And Methods

The material used for the isolation of Mogroside was Luo Han Guo extract (MOV04/Go-Luo®50) from Layn Natural Ingredients, China.

1.1 General Methods

NMR samples were prepared in CD_3OD (~3 mg and ~5 mg for **1** and **2**, respectively/130 µL) and NMR data were acquired on Bruker Avance 500 MHz instruments with either a 2.5 mm inverse probe or a 5 mm broad band probe. The ^1H and ^{13}C NMR spectra were referenced to the solvent resonance at δ_H 3.30 ppm and δ_C 49.0 ppm, respectively. MS and MS/MS data were generated with a Waters Q-Tof Micro mass spectrometer equipped with an electrospray ionization source. The samples were analyzed by negative ESI. The samples (~0.1 mg) were diluted with 50:50 MeCN:H_2O and introduced via direct infusion.

1.2 Isolation and Purification

Fraction Analysis: Analysis of preparative purification fractions and final purity evaluation were performed using the following method: Phenomenex Polar RP 80A (250 × 4.6 mm, 4 µm); Column Temp: 55 °C; Mobile Phase A: water; Mobile Phase B: MeCN; Flow Rate: 1.0 mL/min; Injection volume: 20 µL. Detection was by UV (210 nm) and CAD. Primary fractions were analyzed using the following method: Gradient: 0–7 min (75A:25B), 17 min (70A:30B), 27 min (25A:75B), 27.5 min (5A:95B), 32.5 min (5A:95B), 35 min (95A:5B).

Isolation of **1** by Preparative HPLC: The purification was performed in three chromatographic steps. Primary processing used a Gemini NX C18 (150 × 30mm, 5 µm) column at ambient temperature (24-26 °C); Flow rate at 25 mL/min; detection by UV (210 nm). Mobile Phase A: water; Mobile Phase B: 90% MeCN in water; Gradient: 0 min (95A:5B), 0–20 min (70A:30B), 20-22 min (70A:30B), 22-26 min (10A:90B), 26-32 min (95A:5B); Injection load: 1 g of crude dissolved in 4 mL of water. The fraction of interest was pooled up and lyophilized using Labconco Lyophilizer, (collector temperature maintained at –44 °C under vacuum) and yielded 7.5 g, which was loaded "as it is" in the next purification step. The second processing used a XBridge BEH Prep OBD Amide (250 × 30 mm, 5 µm) column at ambient temperature (24-26 °C); Flow rate at 30 mL/min; detection by UV (210 nm). Mobile Phase A: water; Mobile Phase B: MeCN; Gradient: 0 min (15A:85B), 0–25 min (30A:70B), 25-40 min (30A:70B), 40-45 min (15A:85B); Injection load: 0.25 g of crude dissolved in 1 mL of water. The fraction of interest was pooled up and lyophilized using Labconco Lyopholizer, (collector temperature maintained at –44 °C under vacuum) and yielded 400 mg, which was loaded "as it is" in

the next purification step. Tertiary processing used a Gemini NX C18 (250 × 30mm, 10 µm) column at ambient temperature (24-26^{o}C); Flow rate at 15 mL/min; detection by UV (210 nm). Mobile Phase A: water; Mobile Phase B: 90% MeCN in water; Gradient: 0 min (80A:20B), 0–40 min (70A:30B), 40-41 min (80A:20B), 41-45 min (80A:20B); Injection load: 25 mg of crude dissolved in 0.15 mL of water. The fraction of interest was pooled up and lyophilized using Labconco Lyopholizer, (collector temperature maintained at –44 °C under vacuum) and yielded 20 mg of compound **1** with purity of 94.6% and 64 mg of compound **2** with purity of 98.4%.

1.3 Sensory test procedures

400 ppm of each sample and the control was prepared in filtered water and cooled to 4° ± 1° C. Based on sample amount, 7 mL of compound was pipetted into 2 oz lidded soufflé cups. Samples were blinded with three-digit codes, served randomly to panelists (1-9 depending on sample), and evaluated in replicate. All panelists evaluated the samples by taking the entire sample, gently rolling in their mouth for 5 seconds, then rated sweetness and bitterness in mouth on a calibrated 15-point line scale. Then they expectorated, and rated sweetness and bitterness overtime (2 minutes) on a calibrated 15-point line scale to record sweetness and bitterness maximums and linger values overtime. A 5-minute break was given between each sample and panelists were instructed to cleanse their palate with unsalted cracker and water. Panelists evaluated no more than 4 samples per session.

III. Results and Discussions

Extensive analysis of 1D and 2D NMR data, such as ^{1}H, ^{13}C, 1D-TOCSY, ^{1}H-^{1}H COSY, ^{1}H-^{13}C HSQC-DEPT, ^{1}H-^{13}C HMBC, and ^{1}H-^{1}H ROESY data, confirmed that **1** and **2** were mogrol glycosides and both contained six sugar units attached to the central triterpene core (see Supporting Information for representative 1D and 2D NMR spectra) similar to Mogroside VI (see Supporting Information for ^{1}H and ^{13}C NMR assignments in CD_3OD).

Compound **1** was isolated as white solid. The 1D and 2D NMR data of **1** indicated that the triterpene mogrol core, has seven methyl singlets between δ_H 0.88 – 1.18 (H-18, H-19, H-26, H-27, H-28, H-29, and H-30), a methyl doublet (H-21), eight methylenes between δ_H 1.13 – 2.38 (H-1, H-2, H-7, H-12, H-15, H-16, H-22, and H-23), four methine protons between δ_H 1.44 – 2.49 (H-8, H-10, H-17, and H-20), three additional methines between δ_H 3.38-3.85 (H-3, H-11, and H-24), attached to carbons bearing oxygen groups, and a tertiary hydroxyl carbon at δ_c 74.0 (C-25). The triterpenoid aglycone central core for compound **1** was supported by ^{1}H-^{1}H COSY correlations of H-1/H-2; H-2/H-3; H-6/H-7; H-7/H-8; H-10/H-1; H-11/H-12; H-15/H-16; H-16/H-17; H-17/H-20; H-20/H-21; and H-23/H-24 and ^{1}H-^{13}C HMBC correlations of H-3/C-1, C-4, C-5; H-6/C-4, C-7, C-8, C-10; H-7/C-5, C-6; H-8/C-6, C-7, C-9, C-10, C-14; H-11/C-9, C-12, C-19; H-12/C-13, C-14, C-18; H-18/C-12, C-13, C-14, C-17; H-19/, , C-10, C-11; H-21/C-17, C-20, C-22; H-24/C-22, C-23, C-27; H-26 and H-27/C-24, C-25; H-28 and H-29/C-3, C-4, C-5 and H-30/C-8, C-13, C-14, C-15. The complete ^{1}H and ^{13}C NMR assignments of the aglycone of **1** was made on the basis of ^{1}H, ^{13}C, COSY, HSQC-DEPT and HMBC data and are given in Table 1. The key ^{1}H-^{1}H COSY and ^{1}H-^{13}C HMBC correlations used to assign the aglycone unit of **1** are provided in Figure 2.

The relative stereochemistry in the central triterpene core was assigned based NOE correlations observed in the ROESY experiment. In the ROESY spectrum of **1**, NOE correlations were observed between H-10 and H-28, H-10 and H-30 as well as between H-30 and H-17 indicating that H-10, H-17, H-28, and H-30 are on the same face of the rings. Similarly, NOE correlations were observed between H-8 and H-18 as well as between H-18 and H-11 indicating that H-8, H-11 and H-18 are on the same face of the rings. NOE correlations were not observed between H-8/H-11/H-18 and H-10/H-17/H-30 indicating that H-8, H-11 and H-18 were on the opposite face of the rings compared to H-10, H-17 and H-30. Although the relative stereochemistry of H-3 and H-19 could not be unambiguously assigned based on the ROESY data, they are expected to be same as in Mogroside V and Mogroside VI because ^{1}H and ^{13}C chemical shifts of central triterpene core for **1** are consistent with related Mogrosides [10]

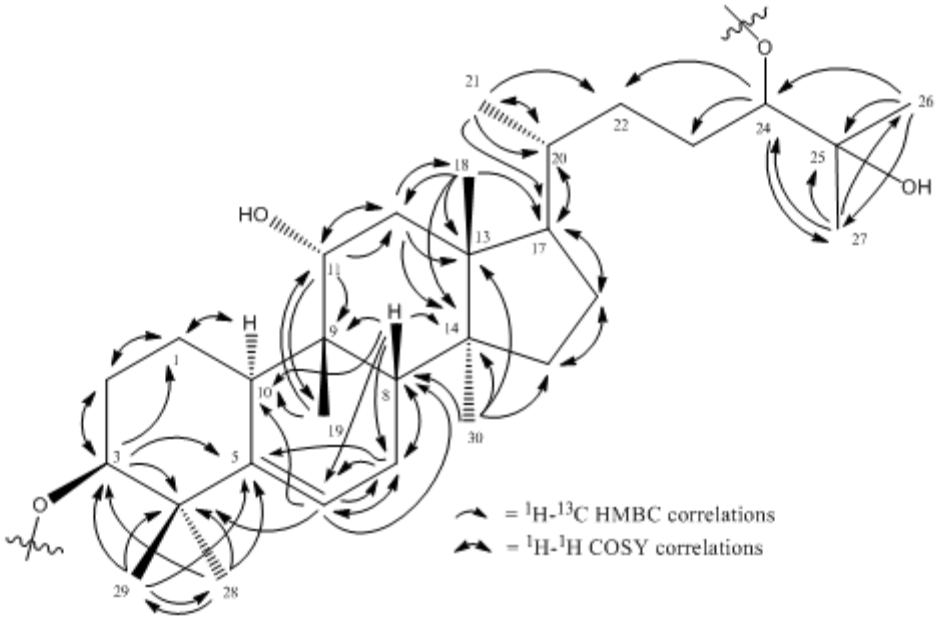

Figure 2. Key ^{1}H-^{1}H COSY and ^{1}H-^{13}C HMBC correlations used to assign the aglycone of Mogroside VIa1 (**1**).

The ^{1}H and ^{1}H-^{13}C HSQC-DEPT data for compound **1** confirmed the presence of six anomeric protons; one at δ_H 4.78 (δ_C 104.1), two at δ_H 4.43/δ_H 4.42 (δ_C 104.8 or 104.9), one at δ_H 4.42 (δ_C 104.0) and two at δ_H 4.28 (δ_C 106.4 and 104.5). All six anomeric protons had large couplings (7.7 – 7.8 Hz) indicating β-configurations.

The anomeric proton observed at δ_H 4.28 showed an HMBC correlation to C-3 which indicated that it corresponded to the anomeric proton of GlcIV. A reciprocal HMBC correlation from H-3 to the anomeric carbon of GlcIV (δ_C 106.4) was also observed confirming this linkage. The COSY and 1D-TOCSY data allowed the complete proton assignments in GlcIV as H-2 (δ_H 3.19), H-3 (δ_H 3.31), H-4 (δ_H 3.30), H-5 (δ_H 3.41), and H-6 (δ_H 3.80 and 4.05) and the HSQC-DEPT data then allowed the assignments of the carbons as C-2 (δ_C 75.2-75.6), C-3 (δ_C 78.1), C-4 (δ_C 71.6), C-5 (δ_C 77.2) and C-6 (δ_C 69.8). These assignments were further confirmed by HMBC correlations of H-1/C-2 and C-3; H-2/C-1 and C-3; H-3/C-2 and C-4; H-4/C-3, C-5 and C-6 and H-6/C-4. The relatively higher frequency chemical shift of GlcIV C-6 (δ_C 69.8) implied substitution at position 6 same as in Mogroside VI. An HMBC correlation from one of the anomeric protons observed at δ_H 4.42/4.43 to GlcIV C-6 (δ_C 69.8) and conversely correlation from GlcIV methylene protons at δ_H 3.80 and 4.05 to the anomeric carbon of GlcV (δ_C 104.8/104.9) confirmed placement of GlcV at this position and thus a 1→6 linkage between GlcV and GlcIV. The ^{1}H and ^{13}C assignments for GlcV were done as described above for GlcIV and thus the proton spin system were established through COSY and 1D-TOCSY data and ^{13}C NMR chemical shift assignments were based on HSQC-DEPT and HMBC data. The NMR data did not indicate any further sugar linkages to Glc IV and Glc V and thus indicated that GlcVI linked to GlcIV in Mogroside VI was not present in compound **1**. The larger coupling constant for the anomeric proton of GlcIV (δ_H 4.28, d, J^3 = 7.7 Hz) and GlcV (δ_H 4.42, d, J^3 = 7.7 Hz or δ_H 4.43, d, J^3 = 7.8 Hz) indicated β-configuration for their linkages. The complete ^{1}H and ^{13}C NMR assignments of GlcIV and GlcV was done based on extensive analysis of 1D and 2D NMR data and are provided in Table 2 while the key COSY and HMBC correlations are provided in Figure 3.

Further analysis of the 1D and 2D NMR data allowed the assignment of the remaining four sugars in **1**. Another anomeric proton observed at δ_H 4.42 showed long range HMBC correlations to a carbon at δ_C 92.7 (C-24) and established its connectivity to the central triterpene core at C-24 and allowed its assignment as the anomeric proton of GlcI. HMBC correlation from H-24 (δ_H 3.38) to the anomeric carbon of GlcI (δ_C 104.0) was also observed confirming the attachment of GlcI at C-24. The ^{1}H coupling sequence from GlcI anomeric proton (δ_H 4.42) to H-2 (δ_H 3.69) through H-3 (δ_H 3.58), H-4 (δ_H 3.35), H-5 (δ_H 3.49) and the oxymethylene protons, H-6 (δ_H 4.23 and 3.62), was established using a combination of COSY and 1D-TOCSY data. As done above for GlcIV and GlcV, the carbon assignments in GlcI were completed based on the HSQC-DEPT and HMBC data and are provided in Table 2. The relatively higher ^{13}C NMR chemical shifts of the C-2 and C-6 positions suggested glycosyl substituents at these positions in GlcI which was confirmed by HMBC correlations. Thus long range ^{1}H-^{13}C correlations in the HMBC experiment from GlcI H-2 and GlcI H-6 to the anomeric carbons at δ_C 104.1 (GlcIII, C-1) and δ_C 104.5 (GlcII, C-1), respectively, as well as from the anomeric protons at δ_H 4.78

(GlcIII, H-1) to the carbon at δ_C 80.7 (GlcI, C-2) and δ_H 4.28 (GlcII, H-1) to the carbon at δ_C 70.2 (GlcI, C-6) supported glycoside linkages at positions 2 and 6 and established the 2,6-*O*-branched-D-glucodiosyl substituent in GlcI same as that present in Mogroside VI. The complete ^{1}H and ^{13}C assignments for GlcII and GlcIII were done as described above for GlcIV and GlcV. While the NMR data did not indicate any further sugar linkages in GlcII, the relatively higher ^{13}C NMR chemical shift of C-6 in GlcIII indicated a glycoside linkage at position 6 in GlcIII. As described above for GlcI, long range ^{1}H-^{13}C correlations in the HMBC experiment from GlcIII H-6 to the anomeric carbon δ_C 104.8/104.9 (GlcVII, C-1) and from the anomeric proton at δ_H 4.42/4.43 (GlcVII, H-1) to the carbon at δ_C 70.4 (GlcIII, C-6) confirmed a third 1→6 linkage in the structure. The large coupling constant for the anomeric proton of GlcI (δ_H 4.42, d, J^3 = 7.7 Hz), GlcII (δ_H 4.28, d, J^3 = 7.7 Hz), GlcIII (δ_H 4.78, d, J^3 = 7.8 Hz), and GlcVII (δ_H 4.42, d, J^3 = 7.7 Hz or δ_H 4.43, d, J^3 = 7.8 Hz) indicated β-configuration for their linkages. The complete ^{1}H and ^{13}C assignments of GlcI, GlcII, GlcIII and GlcVII was done based on extensive analysis of 1D and 2D NMR data and are provided in Table 2 while the key COSY and HMBC correlations are provided in Figure 3. Thus from the NMR data it was established that **1** differs from Mogroside VI by a 1→6 sugar linkage between GlcVII and GlcIII which was not present in Mogroside VI. The structure of **1** was further supported by mass spectrometry data. Accurate mass measurement of **1** provided an exact mass of *m/z* 1447.6967 in the negative ESI-TOF mass spectrum. This corresponded to a molecular formula of $C_{66}H_{111}O_{34}$ (calcd for $C_{66}H_{111}O_{34}$: 1447.6957). The MS/MS spectrum of **1**, selecting the $[M\text{-}H]^-$ ion at *m/z* 1447.7 for fragmentation, indicated sequential loss of six hexose units at *m/z* 1285.6445, 1123.6304, 961.4815, 799.4346, 637.4218, and 475.3743 confirming the presence of six hexose sugar units in the structure.

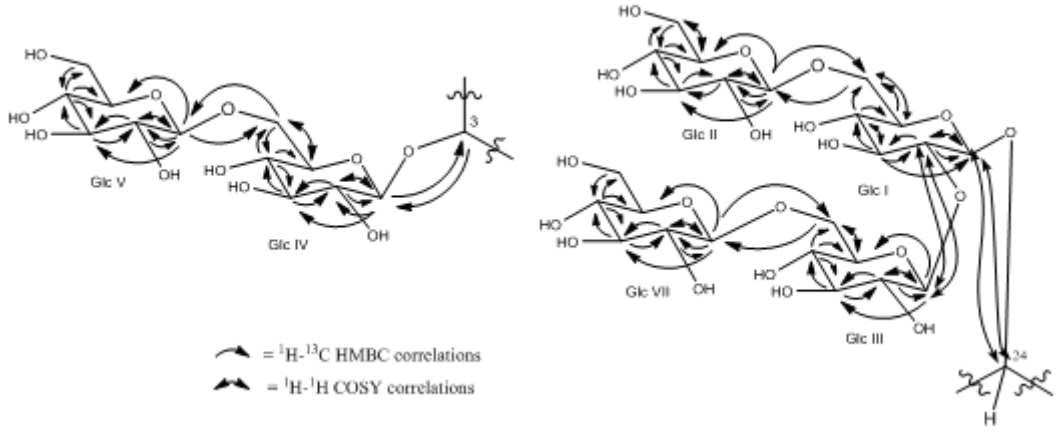

Figure 3. Key ^{1}H-^{1}H COSY and ^{1}H-^{13}C HMBC correlations used to assign glycoside regions at C-3 and C-24 of Mogroside VIa1 (**1**).

Compound **2** was also isolated as white solid. The structure elucidation of **2** was based on a similar analysis of 1D and 2D NMR data and was supported by mass spectral data. Our independent work established that **2** is an isomer of Mogroside VI, it differed from Mogroside VI by a 1→6 sugar linkage between GlcVII and GlcV instead of a 1→2 linkage between GlcVI and GlcIV. Compound **2** has been previously been reported and NMR data was reported in pyridine-d_5 [8,9]. The complete ^{1}H and ^{13}C chemical shifts for the central core and the glycosides at C-3 and C-24 of compound **2** are presented in Tables 1 and 2, respectively.

Nine trained panelists evaluated the sweetness of 400 ppm compound **2** in water against a calibrated scale using a Sip and Spit method. Compound **2** shows sweetness equivalent to a 7% sucrose solution. The bitterness of compound **2** in 400 ppm is lower than that of rebaudioside M in 400 ppm. Due to limited amount of compound **1**, one trained panelist evaluated the sweetness of 400 ppm compound **1**. The sweetness of 400 ppm compound **1** show lower than a 2% sucrose solution.

IV. Tables

Table 1. ^{1}H and ^{13}C NMR (500 and 125 MHz, CD_3OD), assignments for aglycone of **1** and **2**.

	1		**2**	
Position	^{13}C	^{1}H	^{13}C	^{1}H
1	27.2	1.48 m, 2.22 m	27.2	1.48 m, 2.22 m
2	29.6	1.89 m, 1.95 m	29.6	1.90 m, 1.97 m
3	88.2	3.46 m	88.2	3.46 m
4	42.9	---	42.8	---
5	145.1	---	145.1	---

6	119.6	5.48 brd (6.1)	119.6	5.48 brd (6.0)
7	25.1	1.81 m, 2.38 dd (18.3, 6.7)	25.1	1.80 m, 2.38 m
8	44.7	1.66 m	44.6	1.66 m
9	40.9	---	40.9	---
10	37.2	2.49 brd (11.5)	37.2	2.49 brd (12.1)
11	79.4	3.85 m	79.4	3.84 m
12	41.1	1.81 m, 1.87 m	41.1	1.81 m, 1.87 m
13	48.3	---	48.3	---
14	50.6	---	50.6	---
15	35.4	1.13 m, 1.21 m	35.3	1.13 m, 1.21 m
16	29.5	1.32 m, 1.98 m	29.4	1.32 m, 1.98 m
17	51.8	1.62 m	51.8	1.61 m
18	17.2	0.91 s	17.1	0.91 s
19	26.2 or 26.3	1.10 s	26.2 or 26.3	1.10 s
20	37.4	1.44 m	37.5	1.45 m
21	19.5	0.97 d (6.3)	19.3	0.97 d (6.2)
22	34.1	1.47 m, 1.56 m	34.1	1.47 m, 1.56 m
23	29.8	1.38 m, 1.56 m	29.9	1.39 m, 1.54 m
24	92.7	3.38 m	93.3	3.39 m
25	74.0	---	73.9	---
26	26.9†	1.11 s†	26.8†	1.11 s†
27	24.5†	1.16 s†	24.2†	1.14 s†
28	28.0	1.08 s	28.0	1.07 s
29	26.2 or 26.3	1.18 s	26.2 or 26.3	1.18 s
30	20.0	0.88 s	20.0	0.88 s

†Assignments can be interchanged.

Table 2. ^{1}H and ^{13}C NMR (500 and 125 MHz, CD_3OD), assignments for the glycosides of **1** and **2**.

	1		**2**	
Position	^{13}C	^{1}H	^{13}C	^{1}H
Glc_I-1	104.0	4.42[£] d (7.7)	104.1	4.43[£] d (8.1)
Glc_I-2	80.7	3.69 m	81.2	3.62 m
Glc_I-3	78.7	3.58 m	78.6	3.59 m
Glc_I-4	71.6[‡¥]	3.35 m	71.5-71.6[¥]	3.34 m
Glc_I-5	76.4	3.49 m	76.4	3.51 m
Glc_I-6	70.2	3.62 m, 4.23 br dd (8.9)[λ]	70.1	3.62 m, 4.23 brd (8.9)[λ]
Glc_{II}-1	104.5	4.28[¶] d (7.7)	104.4	4.28[¶] d (7.7)
Glc_{II}-2	75.2-75.6[¥]	3.21 m	75.0-75.5[¥]	3.22 m
Glc_{II}-3	77.7-78.0[§]	3.36 m	77.6-78.1[¥]	3.36 m
Glc_{II}-4	71.6[¥]	~3.28 m	71.5-71.6[¥]	~3.27 m
Glc_{II}-5	77.7-78.0[¥]	~3.26 m	77.6-78.1[¥]	~3.26 m
Glc_{II}-6	62.7-62.8[¥]	3.65 m, 3.85 m	62.7[¥]	3.65 m, 3.86 m
Glc_{III}-1	104.1	4.78 d (7.8)	104.5	4.77 d (7.8)
Glc_{III}-2	75.5 or 75.6	3.29 m	75.7	3.28 m
Glc_{III}-3	77.7-78.0[¥]	3.36 m	77.6-78.1[¥]	3.37 m
Glc_{III}-4	72.2	3.27 m	72.3	3.21 m
Glc_{III}-5	77.5	3.48 m	77.6-78.1[¥]	3.28 m
Glc_{III}-6	70.4	3.77 m, 4.12 dd (11.4, 2.0)	63.5	3.63 m, 3.86 m
Glc_{IV}-1	106.4	4.28[¶] d (7.7)	106.3	4.29[¶] d (7.7)
Glc_{IV}-2	75.2-75.6[¥]	3.19 m	75.0-75.5[¥]	3.20 m
Glc_{IV}-3	78.1	3.31 m	77.6-78.1[¥]	~3.31 m
Glc_{IV}-4	71.6[¥]	3.30 m	71.5-71.6[¥]	~3.31 m
Glc_{IV}-5	77.2	3.41 m	76.9 or 77.1	3.42 m
Glc_{IV}-6	69.8	3.80 m, 4.05 br dd (10.4)[λ]	70.1	3.81 m, 4.04 brd (10.7)[λ]
Glc_V-1	104.8 or 104.9	4.42[£] d (7.7) or 4.43[£] d (7.8)	104.9	4.41[£] d (8.1)
Glc_V-2	75.2-75.6[¥]	3.19 m or 3.21 m	75.0-75.5[¥]	3.20 m
Glc_V-3	77.7-78.0[¥]	3.36 m or 3.38 m	77.6-78.1[¥]	3.36 m
Glc_V-4	71.6[¥]	~3.28-3.29 m	71.5-71.6[¥]	3.35 m
Glc_V-5	77.7-78.0[¥]	~3.25-3.26 m	76.9 or 77.1	3.43 m
Glc_V-6	62.7-62.8[¥]	~3.66 m, ~3.85 m	69.8	3.75 dd (11.4, 5.6), 4.15 brd (9.8)[λ]
Glc_{VII}-1	104.8 or 104.9	4.42 d (7.7) or 4.43 d (7.8)	104.8	4.35 d (7.8)
Glc_{VII}-2	75.2-75.6[¥]	3.19 m or 3.21 m	75.0-75.5[¥]	3.22 m
Glc_{VII}-3	77.7-78.0[¥]	3.36 m or 3.38 m	77.6-78.1[¥]	3.36 m
Glc_{VII}-4	71.6[¥]	~3.28-3.29 m	71.5-71.6[¥]	3.30 m
Glc_{VII}-5	77.7-78.0[¥]	~3.25-3.26 m	77.6-78.1[¥]	3.28 m
Glc_{VII}-6	62.7-62.8[¥]	~3.66 m, ~3.85 m	62.7[¥]	3.67 m, 3.87 m

‡Chemical shifts could not be unequivocally assigned due to very close chemical shifts or overlapping resonances.
£Three anomeric protons partially overlap at 4.42 and 4.43 ppm.
¶Two anomeric protons overlap at 4.28 ppm.
λThe smaller coupling was not completely resolved.

V. Conclusion

This report describes complete NMR assignments for compound **1** and **2** through extensive NMR analysis. Compounds **1** and **2** share the same central triterpene core as mogrosides V and mogroside VI. However, the location of 6th glucose differentiates the sweetness of compound **1** and **2**. Sensory results suggest that their applications as sweeteners and/or taste modifiers justify further examination.

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