Vietnam Journal of Science and Technology ***57*** *(2) (2019) 170-178*

doi:10.15625/2525-2518/57/2/13098

STRUCTURAL ELUCIDATION OF GLYCOSIDES FROM THE SEEDS OF *ENTADA PHASEOLOIDES* GROWING IN THUA THIEN HUE

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Received: 14 September 2018; Accepted for publication: 13 March 2019

Abstract. *Entada phaseoloides* (L.) Merr. belongs to Fabaceae family and is widely distributed throughout Viet Nam, Thailand, Malaysia, Indonesia, Philippines, China, New Guinea, and Australia. In Vietnamese traditional medicine, the seeds of *Entada phaseoloides* were used for the treatment of stomachache, haemorrhoids and hernia diseases. In this article, we report the isolation and structural elucidation of four glycosides from the water extract of seeds of *E. phaseoloides* including phaseoloideside C (**1**), phaseoloideside E (**2**), acanthoside D (**3**), and 1-(3,4,5-trimethoxyphenyl)prop-7-en-9-ol-*O*-(6″*O*-*α*-L-arabinopyranosyl)-*β*-D-glucopyranoside (**4**). To the best of our knowledge, compounds **3**-**4** are isolated from *E. phaseoloides* for the first time.

Keywords: Entada phaseoloides, Fabaceae, saponin, phaseoloideside C, phaseoloideside E, and acanthoside D.

Classification numbers: 1.1.1; 1.1.6.

1. INTRODUCTION

Entada is a genus of the Fabaceae family comprising 30 species in the world and 3 species in Viet Nam (*Entada phaseoloides*, *Entada*, *pursaetha*, and *Entada glandulosa*) [1, 2]. *Entada phaseoloides* is a woody climber distributed throughout Viet Nam, Thailand, Malaysia, Indonesia, Philippines, China, New Guinea, and Australia. The seeds of *E. phaseoloides* have been used as the folk medicine to treat stomachache, haemorrhoids, and hernia [2]. Pharmacological studies on extracts and isolated compounds from this plant displayed cytotoxic [1, 3], antidiabetic [4, 5], antioxidant [6, 7], antimicrobial [6, 8], antivirus [9] and anti-

inflamatory [10] activities. Besides, studies on chemical constituents of *E. phaseoloides* showed the presence of triterpenoid saponins [1, 3, 10-14], sulfur-containing amides [15-17], phenylacetic acid derivatives [9, 18] and flavonoids [8]. Herein, we reported the isolation and chemical structural elucidation of four glycosides from the seeds of *E. phaseoloides*.

2. MATERIAL AND METHODS

2.1. Plant Materials

The seeds of *E. phaseoloides* (L.) Merr. were collected in Nam Dong, Thua Thien Hue, Viet Nam, in August 2017 and identified by Dr. Vu Tien Chinh, Vietnam National Museum of Nature, VAST. A voucher specimen (MISR-2017-03) was deposited at Mientrung Institute for Scientific Research, VAST.

2.2. General experimental procedures

All NMR spectra were recorded on a Bruker AM500 FT-NMR spectrometer (500 MHz for ^{1}H-NMR and 125 MHz for ^{13}C-NMR). The HR-ESI-MS spectra were obtained using an AGILENT 6550 iFunnel Q-TOF LC/MS system. Plant sample was extracted on a JP. Selecta 300867 sonicator. Column chromatography was performed using a silica gel (Kieselgel 60, 70-230 mesh and 230-400 mesh, Merck) or RP-18 resins (150 µm, Fuji Silysia Chemical Ltd.), thin layer chromatography (TLC) using a pre-coated silica-gel 60 F_{254} (0.25 mm, Merck) and RP-18 F_{254S} plates (0.25 mm, Merck).

2.3. Extraction and isolation

The seeds of *E. phaseoloides* (7.5 kg) were extracted with methanol (15 L x 3 times) under sonication at 50 ^{0}C for 3 h to give the methanol extract (EP, 850 g), which was then suspended in water (2 L) and partitioned with dichloromethane and ethyl acetate to yield dichloromethane (EPD, 50.0 g), ethyl acetate (EPE, 8.0 g), and water (EPW, 792.0 g) extracts. The water extract (EPW) was chromatographed on a Diaion HP-20P column and eluted with water to remove sugars and ionic compounds, then with increasing concentration of methanol in water (25 %, 50 %, 75 %, and 100 %) to yield four fractions, EPW1-EPW4, respectively. The EPW2 fraction was chromatographed on a silica gel column and eluted with mixtures of dichloromethane/methanol (20/1 → 1/1, v/v) to yield five fractions, EPW2A- EPW2E. The EPW2C fraction was applied to a RP-18 column and eluted with acetone/water (1/2, v/v) to give two sub-fractions, EPW2C1-EPW2C2. Compound **1** (20 mg) was yielded by the purification of the EPW2C2 sub-fraction on a silica gel column using dichloromethane/methanol/water (2.5/1/0.1, v/v/v). The EPW2C1 sub-fraction was chromatographed on a silica gel column, eluted with dichloromethane/methanol/water (2/1/0.1, v/v/v) to obtain compound **2** (50.0 mg). The EPW2D fraction was separated by RP-18 column chromatography and eluted with methanol/water (1/2.5, v/v) to obtain three sub-fractions, EPW2D1-EPW2D3. The EPW2D1 sub-fraction continued to be chromatographed on silica gel column and eluted with dichloromathane/acetone/water (1/2.5/0.1, v/v/v) to yield compound **3** (8 mg). Finally, the EPW2D3 sub-fraction was further chromatographed on silica gel column and eluted with dichloromathane/acetone/water (1/2/0.1, v/v/v) to furnish compound **4** (6 mg).

Phaseoloideside C (1): White amorphous powder; HR-ESI-MS: *m/z* 1544.7095 $[M+H]^+$ ($C_{70}H_{113}NO_{36}$, M = 1544); ^{1}H-NMR (500 MHz, CD_3OD-d_4) and ^{13}C-NMR (125 MHz, CD_3OD-d_4) see Table 1.

Phaseoloideside E (2): White amorphous powder; HR-ESI-MS: 1586.7206 $[M+H]^+$ ($C_{72}H_{115}NO_{37}$, M = 1586); ^{1}H-NMR (500 MHz, CD_3OD-d_4) and ^{13}C-NMR (125 MHz, CD_3OD-d_4) see Table 1.

Acanthoside D (3): White amorphous powder; ^{1}H-NMR (500 MHz, CD_3OD-d_4 in D_2O), δ (ppm): 6.76 (4H, s, H-2, 2′, 6, 6′), 4.93 (2H, dd, *J* = 1.5, 7.0 Hz, H-7, 7′), 3.27 (2H, m, H-8, 8′), 4.00 (2H, dd, *J* = 3.0, 8.5 Hz, H_a-9, H_a-9′), 4.35 (2H, dd, *J* = 7.0, 8.5 Hz, H_b-9, H_b-9′), 4.85 (2H, d, *J* = 9.0, Glc-H-1, 1′), 3.27 (2H, m, Glc-H-2, 2′), 3.49 (2H, m, Glc-H-3, 3′), 3.55 (2H, m, Glc-H-4, 4′), 3.52 (2H, m, Glc-H-5, 5′), 3.78 (2H, dd, *J* = 2.0, 12.0 Hz, Glc-H_a-6, 6′), 3.72 (2H, dd, *J* = 5.0, 12.0 Hz, Glc-H_b-6, 6′), 3.88 (12H, s, OCH_3-3, 3′, 5, 5′); ^{13}C-NMR (125 MHz, CD_3OD-d_4 in D_2O), δ (ppm): 134.8 (C-1, 1′), 104.7 (C-2, 2′, 6, 6′), 154.0 (C-3, 3′, 5, 5′), 86.9 (C-7, 7′), 55.0 (C-8, 8′), 72.8 (C-9, 9′), 104.6 (Glc-C-1, 1′), 75.1 (Glc-C-2, 2′), 77.7 (Glc-C-3, 3′), 70.5 (Glc-C-4, 4′), 77.1 (Glc-C-5, 5′), 61.8 (Glc-C-6, 6′), 57.2 (OCH_3-3, 3′, 5, 5′).

1-(3,4,5-Trimethoxyphenyl)prop-7-en-9-ol-*O*-(6″-*O*-*α*-L-arabinopyranosyl)-*β*-D-glucopyranoside (4): Colourless oil; ^{1}H-NMR (500 MHz, CD_3OD-d_4), δ (ppm): 6.76 (2H, s, H-2, 6), 6.65 (1H, d, *J* = 15.5 Hz, H-7), 6.32 (1H, dt, *J* = 6.0, 15.5 Hz, H-8), 4.34 (1H, dd, *J* = 6.0, 13.0 Hz, H-9a), 4.51 (1H, dd, *J* = 6.0, 13.0 Hz, H-9b), 4.39 (1H, d, *J* = 7.5 Hz, H-1′), 3.28 (1H, dd, *J* = 7.5, 9.0 Hz, H-2′), 3.33 (1H, m, H-3′), 3.82 (1H, m, H-4′), 3.38 (1H, m, H-5′), 4.13 (1H, dd, *J* = 2.0, 11.5 Hz, H-6′a), 3.76 (1H, dd, *J* = 6.0, 11.5 Hz, H-6′b), 4.36 (1H, d, *J* = 6.5 Hz, H-1″), 3.48 (1H, m, H-2″), 3.54 (1H, m, H-3″), 3.90 (1H, m, H-4″), 3.63 (1H, m, H-5″a), 3.55 (1H, m, H-5″b), 3.87 (6H, s, OCH_3-3, 5), 3.78 (3H, s, OCH_3-4); ^{13}C-NMR (125 MHz, CD_3OD-d_4), δ (ppm): 134.4 (C-1), 105.0 (C-2, 6), 154.6 (C-3, 5), 139.0 (C-4), 133.7 (C-7), 126.4 (C-8), 69.5 (C-9), 103.4 (C-1′), 75.1 (C-2′), 78.0 (C-3′), 71.7 (C-4′), 76.9 (C-5′), 69.4 (C-6′), 105.2 (C-1″), 72.4 (C-2″), 74.2 (C-3″), 70.8 (C-4″), 66.7 (C-5″), 56.7 (OCH_3-3, 5), 61.2 (OCH_3-4).

3. RESULTS AND DISCUSSION

Compound **1** was obtained as a white amorphous powder. Its molecular formula was determined as $C_{70}H_{113}NO_{36}$ from pseudo-molecular ion peak at *m/z* 1544.7095 $[M+H]^+$ (calcd. for $C_{70}H_{114}NO_{36}$, 1544.7121) in the HR-ESI-MS. The ^{1}H-NMR spectrum of **1** observed signals of the protons of seven tertiary methyl groups at δ_H 0.77, 0.87, 0.90, 0.98, 0.99, 1.00, and 1.34 (each, 3H, s); a trisubstituted olefinic proton at δ_H 5.44 (1H, brs), and two oxymethine groups at δ_H 3.87 (1H, brs) and 4.33 (1H, brd, *J* = 3.0 Hz), which suggested to be an entagenic acid aglycon [19, 20]. Besides, signals of seven anomeric protons were showed at δ_H 4.48 (1H, d, *J* = 8.0 Hz), 4.49 (1H, d, *J* = 7.5 Hz), 4.57 (1H, d, *J* = 6.5 Hz), 4.65 (1H, d, *J* = 8.0 Hz), 4.97 (1H, d, *J* = 3.0 Hz), 5.37 (1H, d, *J* = 3.5 Hz) and 5.43 (1H, d, *J* = 8.0 Hz), suggesting the presence of seven sugar moieties. The ^{13}C-NMR and DEPT of **1** showed the presence of 70 carbons including 2 carbonyls, 7 non-protonated, 36 methine, 17 methylene and 8 methyl carbons (Table 1). The signals of the carbonyl carbon (δ_C 173.2) and the methyl group (δ_H 1.96 (s), δ_C 23.2) in the HSQC spectrum suggested the presence of an acetyl group. The downfield chemical shift of C-3 (δ_C 91.1) and upfield chemical shift of C-28 (δ_C 176.8) were displayed in ^{13}C-NMR spectrum, which suggested that compound **1** was a bidesmosidic glycoside of entagenic acid with two oligosaccharides linked at C-3 and C-28 [21]. Complete assignments of each sugar proton system were accomplished by analysis of ^{1}H-^{1}H COSY spectrum, while the carbons were

assigned from HSQC and HMBC spectra (Table 1). The coupling constant and chemical shift of the protons and carbons of the sugar moieties suggested the presence of one 2-(acetylamino)-2-deoxy-*β*-glucopyranosyl (GlcNAc), one terminal *β*-glucopyranosyl (Glc1), one *α*-arabinopyranosyl (Ara), one terminal *β*-xylopyranosyl (Xyl), one *β*-glucopyranosyl (Glc2), one *α*-apiopyranosyl (Api1) and one terminal *α*-apiopyranosyl (Api2) units (Figure 1). The sequence within the sugar chain at C-3 was determined by HMBC experiments. The key HMBC correlation between proton H-1 (δ_H 4.48) of GlcNAc and carbon C-3 (δ_C 91.1) of aglycon determined that the GlcNAc was linked to C-3 of aglycon (Figure 2). The important HMBC correlations between proton H-1 (δ_H 4.65) of Glc1 and carbon C-4 (δ_C 80.6) of GlcNAc, proton H-1 (δ_H 4.57) of Ara and carbon C-6 (δ_C 68.3) of GlcNAc, and between proton H-1 (δ_H 4.49) of Xyl and carbon C-3 (δ_C 83.1) of Ara showed the location of Glc1 at C-4 of GlcNAc, of Ara at C-6 of GlcNAc, and of Xyl at C-3 of Ara (Figure 2). In the same way, the other sugar chain at C-28 was determined by the key HMBC correlations of proton H-1 (δ_H 5.43) of Glc2 with carbon C-28 (δ_C 176.8) of aglycon, proton H-1 (δ_H 5.37) of Api1 with carbon C-2 (δ_C 79.9) of Glc2, and proton H-1 (δ_H 4.97) of Api2 with carbon C-5 (δ_C 71.4) of Api1 (Figure 2). Detailed analysis of HR-ESI-MS, 1D, 2D-NMR, and comparison with published data allowed us to determine compound **1** as phaseoloideside C [19].

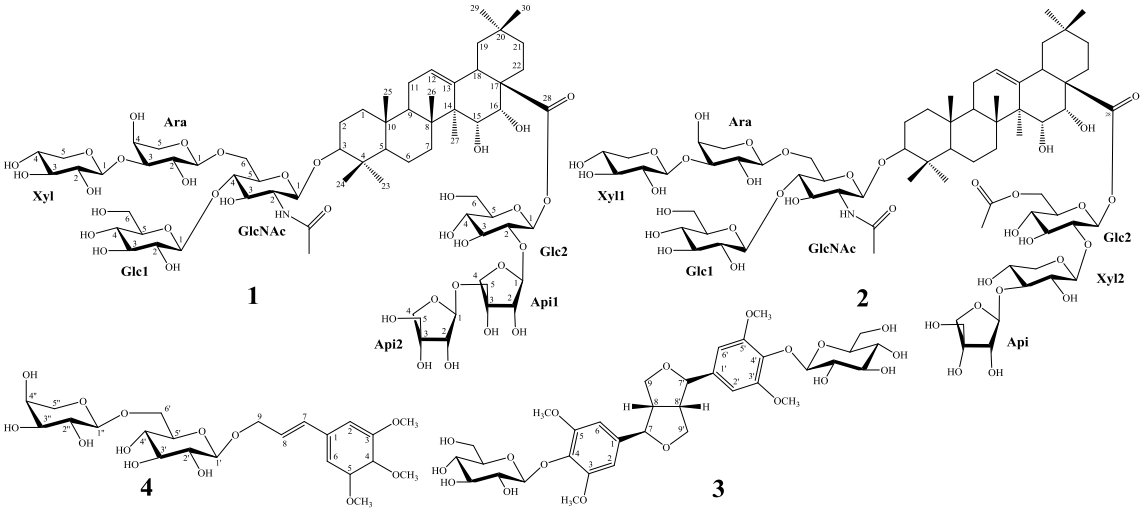

Figure 1. Chemical structures of compounds **1**-**4**.

Compound **2** was obtained as a white amorphous powder. Its molecular formula was determined as $C_{72}H_{115}NO_{37}$ from pseudo-molecular ion peak at *m/z* 1586.7206 $[M+H]^+$ (calcd. for $C_{72}H_{116}NO_{37}$, 1586.7226) in the HR-ESI-MS. Its ^{1}H-NMR spectrum indicated the signals of nine methyl groups at δ_H 0.79, 0.83, 0.91, 0.96, 0.98, 1.03, 1.32, 1.96, and 2.07 (each, 3H, s), a trisubstituted olefinic proton at δ_H 5.40 (1H, brs), two oxymethine groups at δ_H 3.86 (1H, brs) and 4.33 (1H, brd, *J* = 3.5 Hz), and seven anomeric protons at δ_H 4.48 (1H, d, *J* = 8.5 Hz), 4.49 (1H, d, *J* = 7.5 Hz), 4.57 (1H, d, *J* = 6.5 Hz), 4.65 (1H, d, *J* = 8.0 Hz), 4.69 (1H, d, *J* = 8.0 Hz), 5.28 (1H, d, *J* = 3.0 Hz) and 5.47 (1H, d, *J* = 7.5 Hz). The ^{13}C-NMR and DEPT of **2** displayed the signals of 72 carbons: 10 non-protonated (including 3 carbonyls), 37 methine, 16 methylene, and 9 methyl carbons (Table 1). The signals of two carbonyl carbons at δ_C 173.2, 172.7 and two methyl groups [(δ_H 1.96 (s) and δ_C 23.2; δ_H 2.07 (s) and δ_C 20.8] in the HSQC spectrum suggested the presence of two acetyl groups. By comparing ^{1}H- and ^{13}C-NMR data, the structure of **2** can be similar with that of phaseoloideside C (**1**). However, the differences between them

are the component of sugar units of oligosaccharide chain at C-28 and an additional acetyl group. It was confirmed by the key HMBC correlations of proton H-1 (δ_H 5.47) of Glc2 with carbon C-28 (δ_C 176.9), proton H-1 (δ_H 4.69) of Xyl2 with carbon C-2 (δ_C 80.3) of Glc2, and proton H-1 (δ_H 5.28) of Api with carbon C-3 (δ_C 85.6) of Xyl2. Moreover, the HMBC correlation between proton H-6 (δ_H 4.20, 4.29) of Glc2 and acetyl group at δ_C 172.7 (C=O) showed the position of acetyl group at C-6 through an ester bond (Figure 2). All NMR assignments of **2** were confirmed by detailed analyses of HSQC and HMBC spectra, which are in good agreement with those reported in literature [11]. Consequently, compound **2** was identified as phaseoloideside E.

Similarly, detailed analysis of ^{1}H-, ^{13}C-NMR data as well as comparison of them with the literature values led to the identification of compounds **3** and **4** as acanthoside D [22] and 1-(3,4,5-trimethoxyphenyl)prop-7-en-9-ol-*O*-(6″*O*-*α*-L-arabinopyranosyl)-*β*-D-glucopyranoside [23].

Table 1. The ^{1}H- and ^{13}C-NMR data of **1-2** and reference compounds.

C	$\delta_C^{\#1}$	**Compound 1**		**C**	$\delta_C^{\#2}$	**Compound 2**	
		$\delta_C^{a,b}$	$\delta_H^{a,c}$ **(mult., *J* in Hz)**			$\delta_C^{a,b}$	$\delta_H^{a,c}$ **(mult., *J* in Hz)**
1	37.1	37.6	1.72 (m)	1	37.1	37.5	1.72 (m)
2	26.5	27.0	1.69 (m) 1.90 (m)	2	26.7	27.0	1.69 (m) 1.90 (m)
3	89.7	91.1	3.14 (dd, 4.0, 11.5)	3	89.7	91.1	3.14 (dd, 4.0, 11.5)
4	39.3	40.0	-	4	39.3	40.0	-
5	55.6	56.8	0.77 (m)	5	55.8	56.8	0.76 (m)
6	19.0	19.6	1.40 (m) 1.52 (m)	6	19.1	19.6	1.37 (m) 1.53 (m)
7	39.0	39.9	1.01 (m) 1.65 (m)	7	39.1	39.9	0.97* 1.63 (m)
8	42.1	42.2	-	8	41.6	42.2	-
9	47.5	48.3	1.54 (m)	9	47.5	48.3	1.54 (m)
10	37.2	38.0	-	10	37.1	38.0	-
11	24.1	24.7	1.92 (m)	11	24.1	24.7	1.88 (m)
12	124.8	125.8	5.44 (brs)	12	125.0	125.8	5.40 (brs)
13	144.7	144.9	-	13	144.6	144.8	-
14	47.9	48.5	-	14	47.7	48.5	-
15	68.9	69.3	3.87 (brs)	15	68.9	69.3	3.86 (brs)
16	79.1	79.5	4.33 (d, 3.0)	16	78.9	79.2	4.33 (brd, 3.5)
17	48.7	48.5	-	17	48.7	48.5	-
18	42.1	42.6	2.97 (dd, 4.0, 14.5)	18	41.9	42.5	3.02 (brd, 10.5)

19	46.7	47.4	1.02 (m) 2.32 (t, 13.5)	19	46.7	47.1	1.02 (m) 2.33 (t, 13.0)
20	30.9	31.3	-	20	30.9	31.4	-
21	36.0	36.5	1.19 (m) 1.97 (m)	21	36.3	36.5	1.18 (m) 1.98 (m)
22	31.9	32.0	1.92 (m)	22	31.7	32.3	1.84 (m) 1.97 (m)
23	28.2	28.6	0.98 (s)	23	28.1	28.6	0.98 (s)
24	17.1	17.1	0.77 (s)	24	17.1	17.1	0.79 (s)
25	15.8	16.2	0.99 (s)	25	15.8	16.3	0.96 (s)
26	18.1	18.3	0.87 (s)	26	18.1	18.5	0.83 (s)
27	20.8	20.5	1.34 (s)	27	20.8	20.5	1.32 (s)
28	175.7	176.8	-	28	176.1	176.9	-
29	33.4	33.4	0.90 (s)	29	33.4	33.4	0.91 (s)
30	24.6	24.8	1.00 (s)	30	24.5	24.9	1.03 (s)
GlcNAc				**GlcNAc**			
1	104.5	105.0	4.48 (d, 8.0)	1	104.6	105.0	4.48 (d, 8.5)
2	57.6	57.3	3.74 (m)	2	59.0	57.3	3.72 (m)
3	73.9	73.9	3.64 (dd, 8.5, 10.5)	3	73.9	73.9	3.64 (m)
4	81.0	80.6	4.04 (t-like, 8.0)	4	80.9	80.6	4.03 (m)
5	75.1	75.1	3.51 (m)	5	75.1	75.1	3.54 (m)
6	68.2	68.3	3.95 (m) 4.13 (m)	6	68.3	68.3	3.95 (m) 4.12 (dd, 6.0, 12.0)
CH_3 (Ac)	23.7	23.2	1.96 (s)	CH_3 (Ac)	23.8	23.2	1.96 (s)
C=O (Ac)	170.0	173.2	-	C=O	170.1	173.2	-
Glc1				**Glc1**			
1	104.5	104.3	4.65 (d, 8.0)	1	104.5	104.3	4.65 (d, 8.0)
2	74.8	74.9	3.32 (t-like, 8.0)	2	75.0	74.9	3.32 (m)
3	78.8	77.9	3.38 (m)	3	78.6	77.9	3.38 (m)
4	71.3	71.4	3.88 (m)	4	71.6	71.4	3.35 (m)
5	78.7	77.7	3.45 (m)	5	78.4	77.7	3.44 (m)
6	62.3	62.4	3.70 (m) 3.88 (m)	6	62.4	62.4	3.72 (m) 3.88 (m)
Ara				**Ara**			
1	103.5	103.6	4.57 (d, 6.5)	1	103.5	103.6	4.57 (d, 6.5)
2	73.2	73.9	3.74 (m)	2	73.2	73.9	3.74 (m)
3	83.4	83.1	3.76 (m)	3	83.9	83.1	3.75 (m)
4	68.5	71.1	3.38 (m)	4	68.9	71.1	3.39 (m)

5	66.4	66.5	3.54 (m) 3.87 (m)	5	66.4	66.5	3.55 (m) 3.87 (m)
Xyl				**Xyl1**			
1	107.0	107.6	4.49 (d, 7.5)	1	107.9	107.6	4.49 (d, 7.5)
2	76.7	76.4	3.28 (m)	2	74.8	76.4	3.28 (m)
3	78.9	78.0	3.38 (m)	3	78	78.0	3.38 (m)
4	71.0	71.1	3.50 (m)	4	70.8	70.8	3.50 (m)
5	67.5	67.4	3.28 (m) 3.88 (dd, 6.0, 11.5)	5	67.5	67.3	3.27 (m) 4.08 (dd, 6.0, 11.5)
Glc2				**Glc2**			
1	94.5	94.7	5.43 (d, 8.0)	1	93.3	93.6	5.47 (d, 7.5)
2	80.1	79.9	3.53 (m)	2	80.1	80.3	4.30 (brd, 10.5)
3	78.6	78.4	3.55 (m)	3	78.4	78.4	3.67 (m)
4	70.9	71.4	3.39 (t-like, 8.5)	4	70.4	69.8	3.37 (m)
5	78.2	78.4	3.33 (m)	5	78.2	78.4	3.64 (m)
6	62.5	62.4	3.70 (m) 3.80 (m)	6	64.2	64.5	4.20 (dd, 5.0, 12.0) 4.29 (brd, 10.5)
CH_3 (Ac)	-	-	-	CH_3 (Ac)	20.8	20.8	2.07 (s)
C=O (Ac)	-	-	-	C=O (Ac)	170.8	172.7	-
Api1				**Xyl2**			
1	110.9	110.9	5.37 (d, 3.5)	1	105.7	105.3	4.69 (d, 8.0)
2	78.0	78.7	4.00 (m)	2	75.9	75.9	3.43 (m)
3	80.4	80.4	-	3	85.0	85.6	3.41 (m)
4	75.2	75.2	3.78 (m) 4.11 (m)	4	69.5	69.0	3.56 (m)
5	71.6	71.4	3.55 (m) 3.75 (m)	5	67.2	66.9	3.20 (m) 3.96 (m)
Api2				**Api**			
1	110.8	110.8	4.97 (d, 3.0)	1	111.5	111.2	5.28 (d, 3.0)
2	77.6	77.9	3.93 (d, 3.0)	2	77.9	77.9	4.00 (d, 3.0)
3	80.4	80.4	-	3	80.5	80.5	-
4	75.1	75.2	3.78 (m) 4.00 (m)	4	75.2	75.3	3.62 (m)
5	65.5	65.5	3.60 (d, 2.0)	5	65.6	65.3	3.82 (m) 4.14 (m)

[a]measured in MeOD-d_4, [b] 125 MHz, [c] 500 MHz, [#1]δ_C of phaseoloideside C in pyridine-d_5 [19], [#2]δ_C of phaseoloideside E [22]. * Signal overlapped.

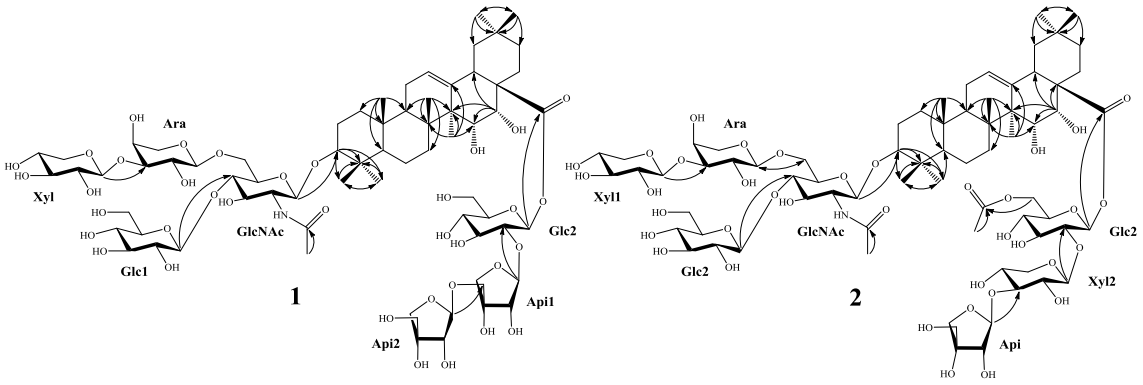

Figure 2. Key HMBC correlations of compounds **1-2**.

4. CONCLUSIONS

The phytochemical study on the water extract of the seeds of *Entada phaseoloides* (L.) Merr. led to the isolation of four compounds including phaseoloideside C (**1**), phaseoloideside E (**2**), acanthoside D (**3**), and 1-(3,4,5-trimethoxyphenyl)prop-7-en-9-ol-*O*-(6″-*O*-*α*-L-arabinopyranosyl)-*β*-D-glucopyranoside (**4**). Their chemical structures were elucidated by HR-ESI-MS data, 1D, 2D-NMR spectra analysis and in comparison with those reported in the literature. To the best of our knowledge, this is the first report of isolation of compounds **3-4** from this plant.

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