Phytochemistry Letters 14 (2015) 159–164

Contents lists available at ScienceDirect

Phytochemistry Letters

journal homepage: www.elsevier.com/locate/phytol

Mini review

New oleanane-type saponins: Leptocarposide B-D, from *Ludwigia leptocarpa* (Onagraceae)

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ARTICLE INFO

Article history:
Received 5 August 2015
Received in revised form 1 October 2015
Accepted 8 October 2015
Available online xxx

Keywords:
Ludwigia leptocarpa
Onagraceae
Triterpenoid glycoside
Bidesmoside
Leptocarposide
Structure elucidation

ABSTRACT

Three new oleanane-type saponins, leptocarposide B-D (**1**–**3**), were isolated from the whole plant of *Ludwigia leptocarpa* (Nutt.) Hara, together with ten known compounds 4–13.

The structures of these compounds were determined by interpretation of their spectral data, mainly HR-TOFESIMS, 1D-NMR (^{1}H, ^{13}C) and 2D-NMR (^{1}H–^{1}H COSY, HSQC, HMBC, and NOESY), and by comparison with the literature data. The structures of the new compounds were established as 28-*O*-β-D-xylopyranosyl-(1 → 4)-α-L-rhamnopyranosyl-(1 → 2)-[α-L-arabinopyranosyl-(1 → 3)]-4-*O*-(3′-hydroxybutanoyloxy-3-hydroxybutanoyloxy)-β-D-fucopyranosyl zanhic acid (1); 3-*O*-β-D-glucopyranosyl-28-*O*-β-D-xylopyranosyl-(1 → 4)-α-L-rhamnopyranosyl-(1 → 2)-4-*O*-(3′-hydroxybutanoyloxy-3-hydroxybutanoyloxy)-β-D-fucopyranosyl medicagenic acid (2); 3-*O*-β-D-glucopyranosyl-(1 → 4)-β-D-glucopyranosyl-28-*O*-β-D-xylopyranosyl-(1 → 4)-α-L-rhamnopyranosyl-(1 → 2)-[α-L- arabinopyranosyl-(1 → 3)]-4-*O*-(3′-hydroxybutanoyloxy-3-hydroxybutanoyloxy)-β-D-fucopyranosyl zanhic acid (3).

Contents

1. Introduction

Ludwigia leptocarpa (Nutt.) Hara (Onagraceae or Oenotheraceae) is a pantropical genus that is also well represented in North America and in tropical Africa (Oziegbe and Faluyi, 2012). It is used in Nigerian folk medicine for the treatment of the rheumatism and the dysentery (Burkill, 1997). Previous work on this genus has revealed the presence of flavonoids (Averett et al., 1990; Mabou et al., 2014), cerebrosides and triterpenoids (Mabou et al., 2014). These results prompted us to continue the investigations on this plant. As such, in our continuous effort to discovery new secondary metabolites of biological importance from Cameroonian medicinal plant, the investigation of the whole plant of *L. leptocarpa* now led to the isolation and characterization of three new oleanane-type

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http://dx.doi.org/10.1016/j.phytol.2015.10.008
1874-3900/

saponins (**1**–**3**), together with ten known compounds (**4**–**13**). This paper deals with the isolation and structure elucidation of three new triterpenoid glycosides.

2. Results and discussion

Purification of the *n*-BuOH soluble fraction of the crude MeOH extract of whole plant of *L. leptocarpa* afforded three new compounds, leptocarposide B-D (**1**–**3**), and ten known compounds (**4**–**13**). The known compounds were identified by comparison of their spectroscopic data with literature values as 3-*O*-β-D-glucopyranosyl-28-*O*-β-D-xylopyranosyl-(1 → 4)-α-L-rhamnopyranosyl(1 → 2)-[α-L-arabinopyranosyl-(1 → 3)]-4-*O*-(3′-hydroxybutanoyloxy-3-hydroxybutanoyloxy)-β-D-fucopyranosyl zanhic acid or leptocarposide (**4**) (Mabou et al., 2014), β-D-altro-2-heptulofuranose (**5**) (Begbie and Richtmyer, 1966; Okuda et al., 1969), 3-*O*-α-D-galactopyranosyl-(1 → 6)-*O*-β-D-galactopyranosyl-glycerol (**6**) (Son, 1990), (*Z*)-3-hexenyl *O*-α-L-arabinopyranosyl-(1 → 6)-

Table 1
^{1}H NMR spectral data of compounds **1**–**3** (MeOD, 600 MHz).

N°	Saponins			N°	Saponins		
	1	2	3		1	2	3
1	1.27 (m) 2.14 (dt, 14.4, 2.5)	1.28 (m) 2.13 (t, 6.1)	1.30 (m) 2.15 (dm, 13.2)	Fuc 1‴	5.41 (d, 7.8)	5.41 (d, 7.9)	5.41 (d, 7.9)
2	4.11 (q, 3.3)	4.32 (m)	4.31 (q, 3.4)	2‴	3.94 (dd, 9.4, 7.8)	3.79 (m)	3.94 (dd, 9.2, 7.9)
3	4.00 (d, 3.3)	4.12 (m)	4.15 (d, 3.4)	3‴	4.03 (dd, 9.4, 3.5)	3.92 (m)	4.03 (dd, 9.2, 3.6)
4	–	–	–	4‴	5.30 (d, 3.5)	5.12 (d, 3.7)	5.30 (d, 3.6)
5	1.62 (m)	1.64 (m)	1.64 (m)	5‴	3.87 (m)	3.87 (m)	3.88 (m)
6	1.25 (m) 1.62 (m)	1.22 (m) 1.63 (m)	1.28 (m) 1.60 (m)	6‴	1.08 (d, 6.5)	1.09 (d, 6.3)	1.08 (d, 6.4)
7	1.40 (m) 1.59 (dd, 11.6, 4.2)	1.39 (m) 1.55 (m)	1.39 (m) 1.61 (m)	Rha 1⁗	5.38 (d, 1.5)	5.40 (brs)	5.38 (d, 1.6)
8	–	–	–	2⁗	3.97 (dd, 8.1, 1.5)	3.96 (m)	3.98 (dd, 8.9, 1.6)
9	1.67 (m)	1.61 (m)	1.69 (m)	3⁗	3.83 (dd, 9.1, 8.1)	3.84 (m)	3.83(m)
10	–	–	–	4⁗	3.57 (t, 9.1)	3.50 (t, 9.3)	3.55 (t, 9.4)
11	1.97 (m) 2.04 (m)	1.63 (m) 2.07 (m)	1.95 (m) 2.03 (m)	5⁗	3.82 (m)	3.83 (m)	3.81 (m)
12	5.36 (t, 3.1)	5.30 (t, 3.5)	5.36 (t, 4.9)	6⁗	1.35 (d, 6.4)	1.35 (d, 6.4)	1.35 (d, 6.3)
13	–	–	–	Xyl 1⁗′	4.51 (d, 7.6)	4.43 (d, 7.5)	4.49 (d, 7.4)
14	–	–	–	2⁗′	3.21 (dd, 8.9, 7.6)	3.22 (m)	3.26 (dd, 9.5, 6.3)
15	1.48 (dd, 11.8, 2.8) 1.67 (dm, 11.8)	1.37 (m) 1.63 (m)	1.47 (dd, 11.3, 4.1) 1.68 (dm, 11.3)	3⁗′	3.25 (m)	3.30 (m)	3.30 (t, 9.5)
16	4.48 (t, 2.9)	1.65 (m) 2.07 (m)	4.49 (t, 2.5)	4⁗′	3.52 (m)	3.50 (m)	3.52 (m)
17	–	–	–	5⁗′	3.20 (t, 10.6) 3.88 (dd, 11.4, 5.2)	3.19 (t, 10.8) 3.85 (m)	3.21 (t, 11.5) 3.86 (m)
18	2.95 (dd, 14.2, 3.9)	2.84 (m)	2.95 (dd, 13.8, 3.9)	Ara 1⁗″	4.41 (d, 6.8)	–	4.42 (d, 6.6)
19	1.23 (m) 2.32 (t, 13.8)	1.16 (m) 1.76 (m)	1.09 (dd, 13.8, 3.9) 2.31 (t, 13.8)	2⁗″	3.56 (dd, 8.7, 6.8)	–	3.55 (m)
20	–	–	–	3⁗″	3.53 (m)	–	3.52 (t, 2.1)
21	1.21 (m) 1.97 (m)	1.27 (m) 1.42 (m)	1.20 (m) 1.96 (m)	4⁗″	3.80 (m)	–	3.80 (m)
22	1.82 (dd, 14.4, 4.5) 1.97 (m)	1.63 (m) 1.74 (m)	1.80 (m) 1.96 (m)	5⁗″	3.53 (dd, 11.6, 1.4) 3.84 (dd, 11.6, 3.5)	–	3.53 (m) 3.85 (m)
23	–	–	–	Glc 1′	–	4.41 (d, 7.9)	4.47 (d, 7.8)
24	1.34 (s)	1.39 (s)	1.37 (s)	2′	–	3.23 (dd, 8.7, 7.9)	3.30 (t, 8.0)
25	1.30 (s)	1.30 (s)	1.30 (s)	3′	–	3.27 (m)	3.53 (m)
26	0.81 (s)	0.81 (s)	0.80 (s)	4′	–	3.36 (m)	3.63 (m)
27	1.41 (s)	1.40 (s)	1.40 (s)	5′	–	3.36 (m)	3.42 (t, 9.5)
28	–	–	–	6′	–	3.70 (m) 3.81 (m)	3.83 (dd, 11.6, 1.8) 3.90 (dm, 11.6)
29	0.90 (s)	0.90 (s)	0.90 (s)	Glc 1″	–	–	4.43 (d, 7.8)
30	0.98 (s)	0.96 (s)	0.98 (s)	2″	–	–	3.24 (dd, 9.0, 7.8)
				3″	–	–	3.39 (t, 9.0)
				4″	–	–	3.34 (m)
				5″	–	–	3.34 (m)
				6″	–	–	3.69 (dd, 11.8, 5.0) 3.88 (dm, 11.8)
				HBA 1‴‴‴	–	–	–
				2‴‴‴	2.73 (dd, 16.1, 5.7) 2.81 (dd, 16.1, 7.3)	2.74 (dd, 16.1, 5.6) 2.84 (dd, 16.1, 7.3)	2.73 (dd, 16.0, 5.8) 2.82 (dd, 16.0, 7.4)
				3‴‴‴	5.31 (m)	5.30 (m)	5.31 (m)
				4⁗″	1.35 (d, 6.2)	1.30 (m)	1.35 (t, 6.2)
				HBA' 1‴‴‴‴	–	–	–
				2‴‴‴‴	2.44 (dd, 15.0, 5.1) 2.49 (dd, 15.0, 7.3)	2.38 (dd, 15.0, 5.3) 2.44 (dd, 15.0, 7.5)	2.5 (dd, 14.8, 5.7) 2.61 (dd, 14.8, 7.8)
				3‴‴‴‴	4.18 (m)	4.16 (m)	4.18 (m)
				4‴‴‴‴	1.23 (d, 6.1)	1.22 (d, 6.1)	1.23 (d, 6.2)