Journal of Pharmacognosy
ISSN: 0976-884X & E-ISSN: 0976-8858, Volume 3, Issue 2, 2012, pp.-121-122.
Available online at http://www.bioinfo.in/contents.php?id=70

SHIKIMIC ACID AS A MAJOR COMPOUND FROM *Ludwigia alternifolia* Linn.

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Received: March 21, 2012; Accepted: April 09, 2012

Abstract- Shikimic acid has been isolated from the whole plant of *Ludwigia alternifolia Linn.* as a major compound (1). Along with it, a ellagitannin strictinin (2), and two pairs of C-glycosidic flavanoides vitexin (3), isovitexin (4), Orientin (5) isoorientin (6) and a benzoic acid derivative (7) were isolated for the first time from *Ludwigia alternifolia*. The structures of the isolates were established on the basis of spectroscopic methods and available literature. The compounds were screened for antimicrobial activity but significant activity could not be recorded. Significance of the above investigation is presented in this communication.
Keywords- Shikimic acid, *Ludwigia alternifolia Linn.*

Citation: Ayinampudi Sridhar Rao and Ramchander Merugu (2012) Shikimic acid as a major compound from *Ludwigia alternifolia* Linn. Journal of Pharmacognosy, ISSN: 0976-884X & E-ISSN: 0976-8858, Volume 3, Issue 2, pp.-121-122.

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Introduction

Ludwigia alternifolia Linn. belongs to Onagraceae family. Distributed in Wisconsin in the west to southern New England in the East, southward to Florida and Texas. Shikimic acid (1) was first isolated in 1885 by Eijkman from the fruit of the Japanese plant *Illicium religiosum Sieb* [1]. The elucidation of its structure nearly 50 years later [2] and the discovery that shikimic acid (1) was found to play an important role in the biosynthesis of the three aromatic amino acids phenylalanine, tyrosine, and tryptophan [3] which resulted in intensified research efforts towards the synthesis of the compound [4], its isolation from other organisms [5] , identification of its metabolites [6] and its transformation into potential chemotherapeutics. This latter area of research has lead to the syntheses of various bioactive compounds from 1. All the isolated compounds (1-7) were isolated for the first time from this plant [7].

Experimental

Melting point was recorded on Thomas Hoover Unimelt melting point apparatus. UV spectra were recorded on Varian Cary 50Bio UV-VIS spectrophotometer. NMR spectra were recorded on Varian AS 400 NMR Spectrometer using pyridine-d5. Chemical shifts were reported in d units (ppm) and coupling constants (J) in Hz. Optical rotation were measured on a Rudolph Research Auto Pol IV Polarimeter. The IR spectra were recorded using NaCl pellet on a Bruker, Tensor 27 FT-IR Spectrometer. The HRESIMS data was obtained on a Agilent Series 1100 SL mass spectrometer. Column chromatography was performed by using silica gel (JT Baker, 40 Im for flash chromatography). TLC analyses were carried out on silica gel 60 F254 plates (Merck, Germany).

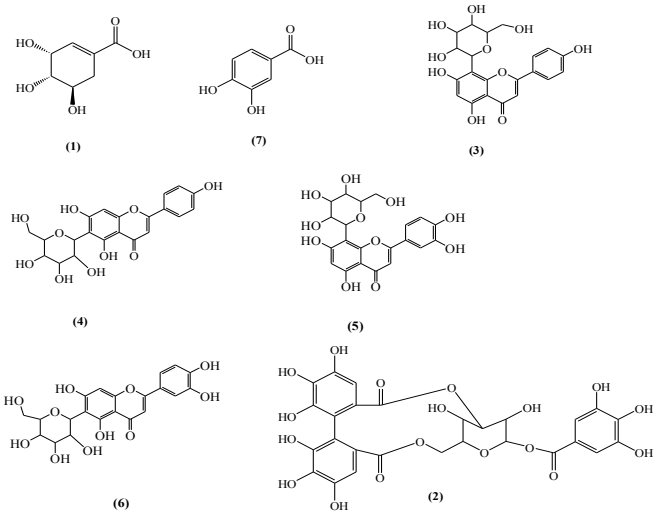
Plant Material

Stems of *L. alternifolia Linn.* were obtained from University of Mississippi at the National Center for Natural Products Research, University of Mississippi, where a voucher specimen (No. 3287) has been deposited.

Extraction and isolation

Stems powder (1 kg) was extracted with EtOH (3X3 L 4X4h) sonication. The combined extracts were evaporated under reduced pressure to afford a brown powder (60 g). Ethanol extract 60 g was subjected to vacuum liquid column chromatography over RP

C-18 silica gel (200 g) and eluted initially with 100% water, 20/80% (W/M), 40/60% (W/M), 60/40% (W/M), 20/80% (W/M), and 100% (M) give six fractions. In total fractions, 100% water fractions have only sugars the remaining all fractions were subjected to column chromatography, in sequence 20/60% (W/M) to gave 1 (1.3g) and 7 (10.2 mg), immediate fraction 40/60% yielded 2 (165.0 mg) and finally 60/40 % fraction yielded 3 (4.5 mg), 4 (11.2 mg), 5 (13.5 mg) and 6 (8.9 mg). Remaining all the fractions contained lipids and triterpinoids.



List of isolated compounds from *Ludwigia alternifolia*

Results and Discussion

Investigation of *Ludwigia alternifolia* stems resulted in six known compounds for the first time from this plant. Shikimic acid has been isolated and characterized as a major compound from this plant although their presence has already been reported in this group. The isolated compounds were tested for their biological activities but none of the isolated compounds could show any significant activity. Previous reports have shown that the crude extracts isolated from this plant have shown good antimicrobial activity. In continuation of the earlier work, we have isolated secondary metabolites to check for any possible biological activity. We could isolate seven known compounds with shikimic acid as a major compound (1), a ellagitannin strictinin (2), and two pairs of C -glycosidic flavanoides vitexin (3), isovitexin (4), orientin (5) isoorientin (6) and benzoic acid derivative (7). Table 1 indicates the complete 1H and 13C NMR data of all the isolated compounds. Probably, the compounds individually may not show antimicrobial activity but cumulatively they are capable of showing good biological activity.

Acknowledgements

Authors thank Mahatma Gandhi University, Nalgonda for providing necessary infrastructural facilities.

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Table 1- ^{1}H *NMR and* ^{13}C *NMR data of compounds (2-6)*

S.No	^{1}H NMR & ^{13}C NMR (1)		^{1}H NMR & ^{13}C NMR (2)		^{1}H NMR & ^{13}C NMR (3)		^{1}H NMR & ^{13}C NMR (4)		S.No	^{1}H NMR & ^{13}C NMR (5)	
1	-	-	-	-	-	-	-	-	1	6.916 (m,	109.8
2	-	163.0	-	163.0	-	163.4	-	163.7	2	3H)	109.0
3	6.9 (s,1H)	104.2	6.9 (s,1H)	104.2	6.9 (s,1H)	103.2	6.9 (s,1H)	103.4	3	6.562 (s, 1H)	107.1
4	-	182.9	-	182.9	-	181.4	-	181.5	4	6.529 (s, 1H)	93.8
5	-	159.0	-	159.0	-	159.8	-	159.7	5	6.233 (s, 1H)	70.3
6	6.83 (s, 1H)	95.0	-	106.5	6.83 (s, 1H)	95.0	-	107.3	6	4.98 (d, 1H)	74.9
7	-	162.0	-	162.0	-	162.0	-	162.4	7	4.390 (t, 1H)	61.2
8	-	104.3	6.53 (s, 1H)	92.5	-	104.3	-	93.3	8	4.334 (s, 1H)	63.9
9	-	157.8	-	157.8	-	155.8	-	155.4	9	4.021 (t, 1H)	68.2
10	-	110.5	-	110.5	-	113.1	-	112.5	10	3.867 (s, 1H)	115.5
1'	-	122.5	-	122.5	-	122.5	-	122.5	11	-	116.0
2'	7.88 (d, 1H)	129.2	7.88 (d, 1H)	129.2	7.88 (d, 1H)	121.2	7.88 (d, 1H)	121.4	12	-	119.4
3'	7.23 (d, 1H)	117.2	7.23 (d, 1H)	117.2	7.23 (d, 1H)	118.9	7.23 (d, 1H)	118.4	13	-	124.3
4'	-	157.8	-	157.8	-	148.8	-	148.8	14	-	124.4
5'	7.88 (d, 1H)	117.2	7.88 (d, 1H)	117.2	-	144.8	-	144.8	15	-	136.5
6'	7.23 (d, 1H)	129.2	7.23 (d, 1H)	129.2	7.23 (d, 1H)	115.3	7.23 (d, 1H)	115.2	16	-	137.0
1"	5.84 (d, 1H)	80.2	5.84 (d, 1H)	80.2	5.84 (d, 1H)	80.2	5.84 (d, 1H)	80.2	17	-	139.3
2"	3.76 (m, 1H)	83.4	3.76 (m, 1H)	83.4	3.76 (m, 1H)	83.4	3.76 (m, 1H)	83.4	18	-	144.0
3"	3.40 (m, 1H)	72.3	3.40 (m, 1H)	72.3	3.40 (m, 1H)	72.3	3.40 (m, 1H)	72.3	19	-	144.2
4"	3.49 (m, 1H)	75.9	3.49 (m, 1H)	75.9	3.49 (m, 1H)	75.9	3.49 (m, 1H)	75.9	20	-	144.5
5"	3.79 (m,1H)	70.2	3.79 (m,1H)	70.2	3.79 (m,1H)	70.2	3.79 (m,1H)	70.2	21	-	144.9
6"	3.54 (dd, 2H)	64.8	3.54 (dd, 2H)	64.8	3.54 (dd, 2H)	64.8	3.54 (dd, 2H)	64.8	22	-	145.2
									23	-	165.6
									24	-	167.4
									25	-	169.0
										-	