Aliso: A Journal of Systematic and Evolutionary Botany

Volume 9 | Issue 3 Article 5

1979

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ALISO
9(3), 1979, pp. 475–477

LEAF FLAVONOIDS OF *SIMMONDSIA CHINENSIS* (SIMMONDSIACEAE)

Ron Scogin and Shannon Brown

Introduction

The Simmondsiaceae is a monotypic family consisting of the single species *Simmondsia chinensis* (Link) C. K. Schnied. Economic interest in *Simmondsia* has recently increased greatly because of the unique liquid wax which is found in its seed and is similar to sperm whale oil. An investigation of the leaf flavonoids of *Simmondsia* revealed one well-characterized and three previously unreported isorhamnetin glycosides.

Materials and Methods

Fresh leaf materials were collected from *Simmondsia chinensis* in cultivation at the Rancho Santa Ana Botanic Garden (RSA Propagation # 6572; voucher accession # RSA 30115).

Standard methods described by Mabry, Markham, and Thomas (1970) were followed in isolation and purification by paper chromatography, in acid and enzymatic hydrolyses, and in chromatographic and UV-spectroscopic characterization of compounds.

Results and Discussion

Two-dimensional paper chromatography of methanolic extracts of *Simmondsia chinensis* leaf tissue revealed two major (compounds 1 and 2) and two minor (compounds 3 and 4) flavonoid constituents. Acid hydrolysis of all four compounds yielded isorhamnetin, identified by co-chromatography in four solvents (TBA, 15% HOAc, BAW, and H_2O) and UV spectroscopy. The color of all four glycosides in UV light was dark, changing to bright yellow in the presence of ammonia.

UV-spectroscopic and paper-chromatographic data for the four glycosides and selected hydrolysis products are presented in Tables 1 and 2.

Compound 1 was unchanged by β-glucosidase treatment and yielded rhamnose and glucose as sugar constituents upon acid hydrolysis. Agreement of UV and chromatographic properties with published values (Mabry, Markham, and Thomas 1970) identify this compound as isorhamnetin 3-rutinoside (narcissin).

Compound 2 was unchanged by β-glucosidase treatment and yielded only rhamnose as a sugar moiety upon acid hydrolysis. Based upon UV prop-

Table 1. Spectral maxima (shoulders omitted) and diagnostic shifts of *Simmondsia* flavonoids.

	Compound			
	1	2	3	4
	λ_{max}(nm)			
In: MeOH	254; 358	254; 355	255; 358	255; 355
	$\Delta\lambda_{max}$(nm)			
+NaOMe (Band I)	+55	+51	+64	+55
+$AlCl_3$ (Band I)	+44	+50	+48	+51
+$AlCl_3$/HCl (Band I)	+40	+45	+46	+51
+NaOAc (Band II)	+15	−2	0	−1

erties and chromatographic properties in comparison with the quercetin analog (Rzadkowska-Bodalska 1970), compound 2 was identified as isorhamnetin 3,7-dirhamnoside.

Compound 3 yielded rhamnose and glucose as sugar constituents upon acid hydrolysis. Beta-glucosidase treatment of compound 3 yielded compound 1, based on co-chromatography in four solvents (TBA, 15% HOAc, BAW, and H_2O). Based upon these data, UV properties, and chromatographic characteristics compared with the quercetin analog (Mabry, Markham, and Thomas 1970), compound 3 was identified as isorhamnetin 3-rutinoside-7-glucoside.

Table 2. Chromatographic properties of *Simmondsia* flavonoids.[1]

	R_f (×100)				
Compound	TBA	HOAc	BAW	H_2O	BEW
1	45	59	44	23	—
2	35	84	36	68	—
3	12	73	18	72	41
3EH	47	56	41	24	—
4	12	88	12	73	43
4EH	49	79	31	60	51

[1] EH, β-glucosidase hydrolysis product; solvents: TBA, t-BuOH-HOAc-H_2O (3:1:1); 15% HOAc: BAW, BuOH-HOAc-H_2O (4:1:5); BEW, BuOH-EtOH-H_2O (4:1:5).

Compound 4 yielded rhamnose and glucose as sugar moieties upon acid hydrolysis. Beta-glucosidase treatment yielded a product with altered chromatographic properties (see Table 2). UV properties and chromatographic characteristics of compound 4 (compared with its quercetin analog; Mabry, Markham, and Thomas 1970) identify this constituent as isorhamnetin 3-glucoside-7-rutinoside.

The enzymatic hydrolysis product of compound 4 is yellow in UV light and is postulated to be isorhamnetin 7-rutinoside. Both compound 4 and its enzymatic hydrolysis product are chromatographically distinct from isorhamnetin 3-glucoside-7-rhamnoside and isorhamnetin 7-rhamnoside, respectively, (Krug and Borkowski 1965) with which they might be confused on the basis of hydrolysis and spectral data.

Literature Cited

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