

A NEW PYRANOXANTHONE AND FLAVONOIDS FROM *HYPERICUM CANARIENSIS*

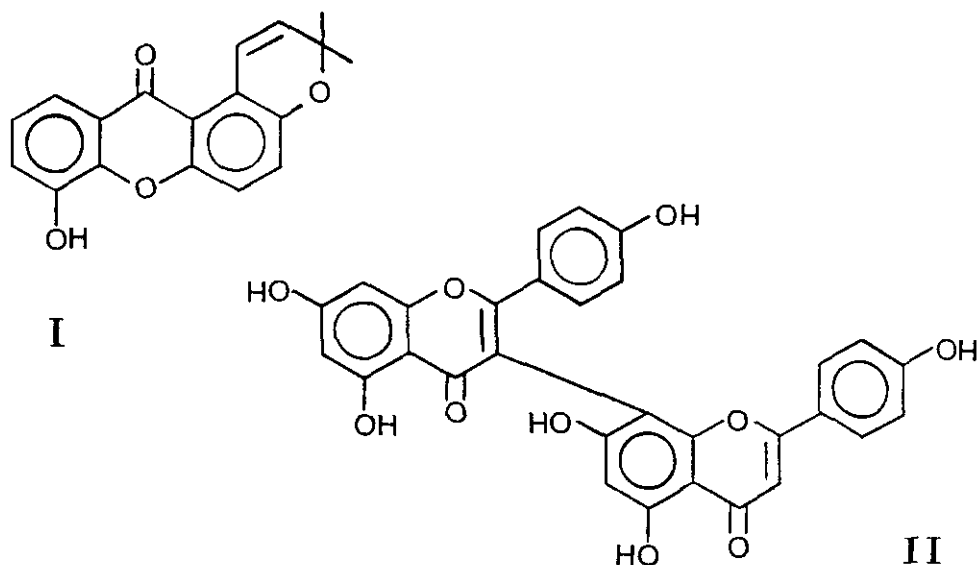
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Abstract - *Hypericum canariensis* contains quercetin, hyperin, I3,II8-biapigenin and a new compound, hypericanarin B, which is identified as 8-hydroxy-3,3-dimethylpyrano(3,2-a)xanthen-12(3H)-one on the basis of spectroscopic evidence.

As a part of our chemical investigations of Spanish *Hypericum*¹⁻⁴ we previously reported several xanthenes and xanthonolignoids from *H. canariensis* L.³⁻⁴ Continuing our studies, we report here the isolation and characterization of a xanthone and three flavonoids of this plant. Among these compounds isolated, 8-hydroxy-3,3-dimethylpyrano 3,2-a xanthen-12(3H)-one (I), named hypericanarin B, has not previously been reported from natural sources.

The ethanol extract of the plant material was re-extracted with ethyl ether. Quercetin was removed by crystallization from this re-extract and the remaining residue was chromatographed on a silica gel column. This chromatographic separation afforded, in addition to small amount of several xanthenes isolated from the chloroform extract,³⁻⁴ quercetin and hyperin (quercetin-3-O-galactoside) a dimer flavonoid (II) and a new pyranoxanthone (I).

The least polar compound among eluted compounds was a new pyranoxanthone (I), which was identified on the basis of its spectroscopic properties. A xanthone nucleus was evident from the uv spectrum (264, 402 nm).⁵ As the molecular formula determined by hrms was C₁₈H₁₄O₃, the molecular carbon content is compatible with a xanthone nucleus substituted with one C₃-unit. This group could be a 2,2-dimethyl-2H-pyran ring because the ¹H-nmr showed a pair of doublets at δ 8.10 and δ 5.91 (J = 10.0 Hz) as well as a six-proton singlet at δ 1.44. The angular and adjacent position of this ring was clearly shown by the low-field nmr signal at δ 8.10 for one of the olefinic proton doublets, due to



deshielding by the xanthone carbonyl group.⁶⁻⁷ The angular position of the pyran ring was also shown by the absence of any uv absorption band in the region 280-290 nm, in contrast to those xanthenes with a linearly cyclized pyran ring.⁸⁻⁹ To complete the molecular formula of compound (I), one hydroxyl group was needed. The absence of an AlCl_3 -induced shift in the uv spectrum of (I) and the absence of a strongly deshielded hydroxyl group in the $^1\text{H-nmr}$ spectrum of (I) indicated the absence of a chelated hydroxyl group in the 8-position.¹⁰ Consequently, the hydroxyl group must be situated on C-5, because the aromatic region of the $^1\text{H-nmr}$ spectrum contains typical signals of three vicinal protons (H-6, H-7 and H-8) and an AB system (H-3 and H-4). Thus, the structure of hypericanarin B was established as 8-hydroxy-3,3-dimethylpyrano 3,2-a xanthen-12(3H)-one. It is interesting to note that hypericanarin B (I) is reported here for the first time and besides it has an oxygenation pattern that is infrequent in nature.¹¹⁻¹² From *H. canariensis*³ we previously isolated 2-hydroxy-5-methoxyxanthone and 2,5-dihydroxyxanthone, which have the same oxygenation pattern that hypericanarin B (I).

The second eluted product was identified as 13,118-biapigenin (II) previously isolated from *Hypericum perforatum*¹³ and *Hypericum aucheri*¹⁴ by comparison of the spectroscopic properties. The last eluted compounds were quercetin and hyperin.

EXPERIMENTAL

Spectra were recorded with the following instruments: ms, Varian 160; nmr, Bruker AC-200 (200.1 MHz for ^1H and 50.3 for ^{13}C) and uv, Perkin-Elmer Lambda 2.

Isolation.

H. canariensis was collected and classified as described previously.³ The plant material (3.5 Kg) was extracted in a Soxhlet apparatus, successively with hexane, CHCl_3 and EtOH (20 l for 40 hours, each solvent). The EtOH extract was concentrated *in vacuo* to ca. 1 l, diluted with H_2O (2 l) and re-extracted with Et_2O (1 l). This re-extract was concentrated to ca. 100 ml and on standing gave quercetin (0.9 g). The remaining residue (72.5 g) was chromatographed on a silica gel column (60 cm x 6 cm I.D.) using mixtures of CHCl_3 -MeOH as eluent. From fractions eluted with CHCl_3 and CHCl_3 -MeOH (93:7) the compounds (I) (3 mg) and (II) (17 mg) were obtained by repeated column chromatography. Likewise quercetin (50 mg) and posteriorly hyperin (65 mg) were obtained from fractions eluted with CHCl_3 -MeOH (9:1).

Hypericanarin B (I).

Non-crystalline. Ms m/z (rel.int.) 294 (M^+ , 9.1), 275 ($\text{M}-\text{CH}_3$, 42.1), 253 ($\text{M}-\text{C}_3\text{H}_5$, 2.4); uv λ_{max} nm: (MeOH) 263, 297, 322, 403; (MeOH+ NaOMe) 276, 366, 412; (MeOH+ NaOAc) 275, 366, 412; (MeOH+ AlCl_3): no change; (MeOH+ AlCl_3 + HCl): no change. $^1\text{H-Nmr}$ (acetone- d_6): δ 9.07 (s, HO), 8.10 (d, $J=10.0$ Hz, Ar-CH=C), 7.67 (dd, $J=7.8$ and 2.0 Hz, H-8), 7.42 (d, $J=9.4$ Hz, H-4), 7.30 (dd, $J=8.0$ and 2.0 Hz, H-6), 7.25 (d, $J=9.4$ Hz, H-3), 7.22 (t, $J=8.0$ Hz, H-7), 5.91 (d, $J=10.0$ Hz, Ar-C=CH) and 1.44 (s, $2\times\text{CH}_3$).

I3,II8-Biapigenin (II).

mp (methanol-chloroform) 259-261°C; ms (FI-CAI) m/z (rel. int.): 538 (100); uv λ_{max} nm: 271, 330; (MeOH+ NaOMe) 283, 330, 390; (MeOH+ NaOAc) 280, 380; (MeOH+ NaOAc+ H_3BO_3) 271, 330; (MeOH+ AlCl_3) 279, 352, 389; (MeOH+ AlCl_3 + HCl) 280, 345, 388. $^1\text{H-Nmr}$ (acetone- d_6): δ 7.65 (d, $J=8.6$ Hz, II-H-2',6'), 7.46 (d, $J=8.6$ Hz, I-H-2',6'), 6.85 (d, $J=8.6$ Hz, II-H-3',5'), 6.73 (d, $J=8.6$ Hz, I-H-3',5'), 6.57 (s, I-H-3), 6.54 (d, $J=1.5$ Hz, I-H-8), 6.30 (s, I-H-6 and II-H-6).

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