

The absence of any sesquiterpene lactone in *S. acmella* is quite significant.

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2-HYDROXYPHENYL ACETIC ACID AND 2,4-DIHYDROXYPHENYL ACETONITRILE FROM *ERICA SCOPARIA*

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Key Word Index—*Erica scoparia*; Ericaceae; (2-hydroxyphenyl) acetic acid; (2,4-dihydroxyphenyl) acetonitrile.

Several phenolic compounds have been identified in the Ericaceae [1] but *E. scoparia* has not so far been investigated. On paper chromatograms of leaf extracts of this plant, we observed a large, red-purple, uncommon spot after spraying with diazotized *p*-nitroaniline. The compound causing this reaction was present in the NaHCO₃ soluble part of the extractives. After isolation it was identified as 2-hydroxyphenyl acetic acid. Previously, this compound has been found only twice in higher plants, namely in *Astilbe* (Saxifragaceae) [2] and in *Miscanthus floridulus* (Labill.) Warb [3]. The compound has also been found in *Penicillium* cultures [4,5]. Both the biosynthesis and metabolism of hydroxyphenyl acetic acids in higher plants have been studied [6].

From the fraction of the extract not soluble in NaHCO₃ we isolated a substance with chromatographic behaviour similar to orcinol. NMR and mass spectral analysis, however, showed this compound to be a dihydroxyphenyl acetonitrile. The chemical shifts and the coupling constants

of the aromatic protons pointed to the hitherto unknown 2,4-dihydroxyphenyl acetonitrile. This was confirmed by synthesis. Firstly the known 3,4-dihydroxyphenyl acetonitrile [7] was prepared for comparison. An attempt to synthesize 2,4-dihydroxyphenyl acetonitrile similarly by demethylation of 2,4-dimethoxyphenyl acetonitrile [8] failed. The compound was finally prepared, albeit in very low yield, in an analogous way to the known synthesis of 2-hydroxyphenyl acetonitrile [9].

Whether or not 2,4-dihydroxyphenyl acetonitrile in *E. scoparia* is formed enzymatically during the extraction procedure from the corresponding glucosinolate, which seems to be the case with other nitriles found in plants [10], is still an open question. Nevertheless, both 2-hydroxyphenyl acetic acid and the novel 2,4-dihydroxyphenyl acetonitrile may be interesting compounds in the taxonomic classification of the Ericaceae.

EXPERIMENTAL

Material. Leaves of *Erica scoparia* (L.) were collected in July 1973 in Leboreiro, La Coruña (Spain). A sample of the whole

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plant is deposited in the Department of Biology, Faculty of Sciences (Santiago de Compostela, Spain).

Spectra. 100 MHz NMR spectra were run in CD_3COCD_3 with tetramethylsilane as internal standard.

Extraction. Leaves of *E. scoparia* were plunged into boiling MeOH. After filtration, the solvent was evaporated *in vacuo* and the residue was subjected to alkaline hydrolysis with 2 N NaOH under N_2 . After acidification and extraction with Et_2O , the acidic compounds were separated from phenolics using NaHCO_3 soln.

Acids. Repeated CC on Si gel and finally preparative TLC were necessary to purify the main phenolic acid. Preferently, $\text{MeOH}-\text{CHCl}_3$ 1:9 was used as eluent. In this procedure partial conversion of the acid into the methyl ester took place. Both the ester and the acid were finally obtained pure. Methyl 2-hydroxyphenyl acetate crystallized from hexane- C_6H_6 7:3, mp 73° . 2-Hydroxyphenyl acetic acid was recrystallized from $\text{C}_6\text{H}_6-\text{CHCl}_3$, mp $143-144^\circ$. NMR (δ): 5 aromatic H, *m* at 6.68-7.22 ppm; CH_2 , *s* at 3.62 ppm; COOH, broad band around 8.5 ppm. The compound was identical with a commercial sample (Fluka A. G., Buchs, Switzerland).

Phenolic compounds. A good separation of 2,4-dihydroxyphenyl acetonitrile was obtained after repeated CC on Si gel with $\text{C}_6\text{H}_6-\text{EtOAc}$ 5:4 as eluent; m.p. $129-130^\circ$; NMR (δ): 2 OH, broad bands around 8.5 ppm; CH_2 , *s* at 3.63 ppm; H-3, *d* at 6.45 ppm, $J_{3,5} = 2$ Hz; H-5, *dd* at 6.35 ppm, $J_{3,5} = 2$ Hz, $J_{5,6} = 8$ Hz; H-6, *d* at 7.09 ppm, $J_{5,6} = 8$ Hz. MS: parent peak *m/e* 149.0477 (calcd for $\text{C}_8\text{H}_7\text{NO}_2$ 149.04767).

Synthesis of 2,4-dihydroxyphenyl acetonitrile. 3,7-Dihydroxycoumarin. A mixture of 7-acetoxy-3-benzoylamino coumarin [11] (10 g) and 20% NaOH (125 ml) was refluxed for 5 hr under N_2 . The soln was cooled in an ice-salt bath and carefully acidified with conc HCl. The ppt. was collected and appeared to consist of nearly pure benzoic acid. Filtrate was extracted with EtOAc. The extracts were dried over Na_2SO_4 and evaporated *in vacuo* which yielded a brown oil.

TLC (Si gel, EtOAc) showed that, next to a compound strongly fluorescing under UV light, large amounts of other substances with lower R_f values were present. The brown oil was taken up in EtOAc and the soln filtered over Si gel. Oily residue obtained after evaporation of the eluate was dissolved in a small amount of MeOH. After standing for several days at room temp, crystals began to appear. These were collected, washed with Et_2O and recrystallized from MeOH. Yield: 200 mg, mp 285° (after darkening at 250°). TLC: one spot, with blue fluorescence under UV NMR (δ): H-4 at 7.06 ppm; H-5 at 7.34 ppm; H-6 at 6.82 ppm, H-8 at 6.74 ppm; 2 OH

at 8.1 and 8.9 ppm. MS: parent peak *m/e* 178. Analysis: found, C 60.5; H 3.2 $\text{C}_9\text{H}_6\text{O}_4$ requires, C 60.68; H 3.39%.

2,4-Dihydroxyphenyl pyruvic acid oxime. 3,7-Dihydroxycoumarin (170 mg) in 10% NaOH (5 ml) was refluxed for 5 min under N_2 . After cooling to 50° , $\text{NH}_2\text{OH}-\text{HCl}$ (200 mg) was added. After standing overnight the soln was cooled to 0° and acidified with conc HCl. The soln was extracted with EtOAc, and the extract dried (Na_2SO_4) and evaporated. A brownish oil was obtained. TLC (Si gel, EtOAc-MeOH-AcOH 75:24:1) showed one spot at R_f 0.4 and much smaller spots at lower and higher R_f . NMR (δ): CH_2 at 1.99 ppm; H-3 at 6.37 ppm; H-5 at 6.30 ppm; H-6 at 6.98 ppm. This material was used without further purification in the next step.

2,4-dihydroxyphenyl acetonitrile. The above mentioned oxime (120 mg) was warmed for 15 min on a steam bath with Ac_2O (2 ml). After addition of H_2O the soln was extracted with EtOAc. The extract was washed thoroughly with NaHCO_3 soln, dried over Na_2SO_4 and evaporated. Purification was effected by CC on Si gel ($\text{CHCl}_3-\text{EtOAc}$ 1:1). The slightly yellowish crystals were washed with CHCl_3 . Yield: 40 mg, mp $130-131^\circ$, identical (NMR, MS) with the compound obtained from *E. scoparia*. Analysis: found, N 9.38. $\text{C}_8\text{H}_7\text{NO}_2$ requires, N 9.39%.

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