

SHORT COMMUNICATION

BETACYANINS OF SOME CHENOPODIACEAE*†

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Abstract—Four species of the Chenopodiaceae have been investigated for their betacyanin content. From the leaves of *Suaeda fruticosa* a new acylated pigment has been isolated and identified as citryl-celosianin.

IN CONNECTION with our systematic investigation of the betacyanin constituents of plants of the order Centrospermae, we have examined some species of Chenopodiaceae. From fresh leaves, pigments were extracted with water and isolated by chromatography and/or by electrophoresis. The isolated pigments were identified by means of co-chromatography and co-electrophoresis with reference samples. Tentative identifications were always substantiated by enzymatic or chemical degradations.

In addition to known compounds, one of the species examined (*Suaeda fruticosa*) contains a new pigment, *suaedin*, which on deacylation with 0.2 N NaOH for 3 hr (under nitrogen) gave rise to caffeic acid, *p*-coumaric acid, citric acid and amaranthin. Partial acid hydrolysis with 0.03 N HCl for 12 hr at room temp. resulted in the production of citric acid and celosianin. The new acylated pigment is therefore citryl-celosianin.

TABLE 1. THE QUANTITATIVE DISTRIBUTION OF BETACYANINS IN SOME CHENOPODIACEAE*

Plant	Betanin	Percentage of each betacyanin†	Celosianin	Suaedin
		Amaranthin		
<i>Altriplex portulacoides</i> L.		45	55	
<i>Salicornia fruticosa</i> L.		8	92	
<i>Suaeda fruticosa</i> Forsk.		12	68	20
<i>Chenopodium urbicum</i> L.	91	9		

* The values given are a percentage of total betacyanins.

† Each betacyanin is in fact a mixture of two C-15 diastereoisomeric pigments.

The results of the quantitative determination of the individual betacyanins in the four members of the Chenopodiaceae investigated are reported in Table 1.

EXPERIMENTAL

Plant material. The plant material was collected near Catania in late autumn 1970.

Isolation and identification of pigments. The total betacyanin fraction was obtained from aqueous extracts of fresh leaves by chromatography on strongly acid ion-exchange resin. From this fraction individual pigments were separated by chromatography on polyamide powder or, in the case of *Suaeda fruticosa*, by preparative electrophoresis. Known pigments were identified by comparison of retention data on polyamide

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column with those of authentic compounds and by co-electrophoresis. The identifications were confirmed by chemical and enzymatic degradations according to previously described procedures.¹

Characterization of Suaedin. Suaedin had λ_{\max} 546, 330 and 294 nm in H_2O ; migration in paper electrophoresis relative to betanin: pH 2.4 = 1.12; pH 4.5 = 1.66; and pH 8.7 = 1.50. Its hydrolysis products were identified by standard methods.¹ Citric acid was identified by paper chromatography (two solvents) and TLC on silica-gel (two solvents) using *p*-dimethylaminobenzaldehyde as spray reagent.²

Quantitative determination of betacyanins. Individual betacyanins were determined by measuring E_{\max} and comparing with known $E_{1\text{cm}}^{1\%}$ values at λ_{\max} for pure pigments (betanin: 1120; amaranthin: 780, celosianin: 465. Since no crystalline specimen of suaedin was available, for this pigment the $E_{1\text{cm}}^{1\%}$ value was assumed equal to that of celosianin).

¹ L. MINALE, M. PIATTELLI, S. DE STEFANO and R. A. NICOLAUS, *Phytochem.* **5**, 1037 (1966).

² K. SCHREIBER and W. HACK, *Naturwissenschaften* **43**, 178 (1956).