

## BRIEF COMMUNICATIONS

### BENZOIC AND CINNAMIC ACIDS

#### FROM *Campanula cephalotes*

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Continuing an investigation of the epigeal part of *Campanula cephalotes* Nakai, we have found in it by paper chromatography, in addition to flavonoids, [1], about 18 other substances of phenolic nature.

From chloroform and ethanolic extracts of this species by column chromatography on polyamide and cellulose we isolated 11 substances that are derivatives of benzoic and cinnamic acids.

Substances (I-VII) were identified by their melting points,  $R_f$  values, color reactions, and UV and IR spectra with authentic samples of p-hydroxybenzoic, protocatechuic, vanillic, syringic, p-coumaric, caffeic, and ferulic acids.

Substance (VIII), with the composition  $C_{10}H_{10}O_3$ , mp 170-171°C (from 50% methanol),  $\lambda_{max}$  (in ethanol) 289 nm,  $\lambda_{max}$  (with sodium ethoxide) 280 nm,  $\lambda_{max}$  (with aluminum chloride) 310, 240 nm, possessed a bright blue fluorescence in UV light and gave an orange coloration with ferric chloride.

When the substance was heated with hydriodic acid in acetic anhydride, p-hydroxybenzoic acid was obtained, and oxidation with potassium permanganate in an alkaline medium led to the formation of anisic acid with mp 179-182°C.

On the basis of the results obtained, substance (VIII) was identified as p-methoxycinnamic acid. The IR spectra of (VIII) and of the p-methoxycinnamic acid synthesized by the method of Gill et al. [2] were identical.

Substance (IX),  $C_{10}H_{10}O_4$ , mp 142-144°C (from water),  $\lambda_{max}$  (in ethanol) 329, 303, 245 nm,  $\lambda_{max}$  (with sodium ethoxide) 380, 311, 265 nm,  $R_f$  0.35 (2%  $CH_3COOH$ ). In UV light it has a blue fluorescence changing to greenish blue in ammonia vapor. With ferric chloride it gives a gray-green color.

The alkaline hydrolysis (0.1 N NaOH, 1 h, 100°C) of substance (IX) gave caffeic acid and methanol. The latter was detected by reaction with chromotropic acid after its oxidation to formaldehyde.

The bathochromic shift of band 1 of the UV spectrum by 51 nm in the presence of sodium ethoxide shows the ester nature of this substance.

The results obtained, and also those of a comparison of  $R_f$  values in several solvent systems with those of an authentic sample, permitted this substance to be characterized as methyl caffeate.

Substances (X) and (XI), on the basis of their physicochemical properties, the results of UV spectroscopy, and a comparison with authentic samples, were identified as chlorogenic and neochlorogenic acids.

The herb *Campanula cephalotes* Nakai contains chlorogenic acid in largest amount, and we have also found this substance in eight other species of the genus *Campanula* L. [4].

#### LITERATURE CITED

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