

PHENOLIC ACIDS OF WORMWOODS OF THE ORDER Frigidae

E. N. Sal'nikova, N. F. Komissarenko, A. I. Derkach,
S. E. Dmitruk, and G. I. Kalinkina

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Continuing an investigation of the phenolic compounds of the epigeal part of *Artemisia jacutica* Drob, *A. sieversiana* Wild., and *A. absinthium* L. [1], we have isolated the phenolic carboxylic acids from a 70% ethanolic extract. An ethyl acetate fraction obtained by a method described previously [1] was, after the elimination of the extractant, deposited on a column of polyamide sorbent or of a powder of microcrystalline cellulose. The phenolic acids were eluted from the polyamide with water and with aqueous alcohol having increasing concentrations of ethanol. The total fractions were rechromatographed on FN-11 paper, and the individual substances were eluted with hot 50% ethanol. After recrystallization, substances (I), (II), (III) and (VII) were obtained. The cellulose-containing column was eluted with 2% CH₃COOH. The eluted substances (IV), (V), and (VI) were recrystallized from methanol. Substances (I–VII) were identified on the basis of qualitative reactions, chromatographic behavior, physical constants, the products of alkaline hydrolysis, IR and UV spectra with diagnostic additives, and comparison with authentic specimens. Authenticity was confirmed by HPLC [2, 3].

Substance (I) was vanillic acid C₈H₈O₄, mp 202–204°C, UV spectrum $\lambda_{\max}^{\text{EtOH}}$ 290, 260 nm.

Substance (II) was p-hydroxybenzoic acid, C₇H₆O₃, mp 210–211°C. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 255 nm.

Substance (III) was neochlorogenic acid, C₁₆H₁₈O₉. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 325, 299, 245 nm.

Substance (IV) was chlorogenic acid, C₁₆H₁₈O₉, mp 203–205°C. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 325, 298, 240 nm. Alkaline hydrolysis led to the formation of equimolar amounts of caffeic and quinic acids. On heating with acetic anhydride, the pentaacetate was formed.

Substance (V) was ferulic acid, C₁₀H₁₀O₄, mp 167–169°C. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 330, 320, 236 nm. The product of alkaline degradation was vanillic acid.

Substance (VI) was caffeic acid, C₉H₈O₄, mp 197–200°C. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 325, 299, 235 nm. 3,4-Dihydroxybenzoic acid was detected among the products of alkaline degradation.

Substance (VII) was p-coumaric acid, C₉H₈O₃, mp 212–214°C. UV spectrum: $\lambda_{\max}^{\text{EtOH}}$ 310, 290, 228 nm. IR spectrum: $\lambda_{\max}^{\text{KBr}}$ 1310, 1640, 1705 cm⁻¹. Alkaline degradation led to the formation of p-hydroxybenzoic acid.

Caffeic, chlorogenic, ferulic, p-hydroxybenzoic, and vanillic acids were detected in all the species investigated. p-Coumaric acid was present only in *A. sieversiana*, and neochlorogenic only in *A. jacutica*. The detection of caffeic and chlorogenic acids in *A. sieversiana* and *A. absinthium* agrees with the literature [4, 5]. We are the first to have isolated p-hydroxybenzoic, vanillic, ferulic, p-coumaric, and neochlorogenic acids from the species investigated.

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