

## FRUIT ANTHOCYANS OF SPECIES OF THE GENUS *Rosa*

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The fruits of various species of rose *Rosa* L. are natural concentrates of vitamins and are widely used in medicine and the food industry [1, 2]. Among the most important biologically active compounds of the fruits are the anthocyanins, which have hitherto been studied inadequately.

We have investigated the quantitative and qualitative compositions of the anthocyanins of the fruits of five species of rose (dog rose, corymb rose, Chatyrdag rose, Scotch rose, and Ili rose) gathered in the botanical garden of the Institute of Botany of the Azerbaidzhan Academy of Sciences and in the Sheki-Zakataly zone of Azerbaidzhan in the phase of full maturity. The anthocyanins were isolated and their total amounts were determined by the method of Swain and Hillis [3], modified by ourselves. The total amounts of anthocyanins in the fruits of the dog, corymb, Chatyrdag, Ili, and Scotch roses were 82.3, 108.0, 285.0, 443.0, and 1035.0% [sic], respectively.

By ascending chromatography on paper (FN-16) in the n-butanol-acetic acid-water (4:1:1) (1) and water-acetic acid-conc. hydrochloric acid (82:15:3) systems we established that the fruits of the dog rose and corymb rose each contained one, and those of the Chatyrdag, Ili and Scotch roses. each three anthocyanins.

In view of the high concentration of anthocyanins in the fruit of the Scotch rose, we investigated its anthocyanin composition in detail. The freshly gathered fruit (1 kg) was separated from seeds, comminuted, and exhaustively extracted with 80% methanol containing 1% of hydrochloric acid ( $5 \times 6$  liters) at room temperature. The extracts obtained were combined, filtered, and evaporated under vacuum to a dry residue. The residue was dissolved in 0.5% methanolic hydrochloric acid, and the solution was left in the refrigerator for 24 h. Then the precipitate was separated off by centrifugation, and the anthocyanins were precipitated with ether from the supernatant extract. Thus gave 8 g of total anthocyanins.

The anthocyanins were separated by chromatography on a column of acidic cellulose powder in system 2 [4]. The three clearly separated bands were cut out and eluted with methanol containing 1% of hydrochloric acid. The anthocyanins were precipitated from the eluates with petroleum ether. The precipitates of the individual anthocyanins were chromatographed on FN-3 paper in system 1. Three individual anthocyanins were obtained: (I) — 0.6 g; (II) — 2.5 g; and (III) — 1.2 g.

Anthocyan (I) —  $R_f$  0.27 and 0.19 (systems 1 and 2, respectively),  $\lambda_{max}$  365, 535 nm (in 0.1% methanolic hydrogen chloride); no bathochromic shift was observed on the addition of aluminum chloride. Acid hydrolysis formed an aglycon with  $R_f$  0.40 in the Formik system, and 0.60 in the Forestal system. From the chromatographic results and the UV spectrum the aglycon was identified as delphinidin. Glucose was detected in the sugar part of the hydrolysate.

Anthocyan (II) —  $R_f$  0.29 and 0.40 (systems 1 and 2),  $\lambda_{max}$  360, 525 nm; the addition of aluminum chloride produced a bathochromic shift by  $\Delta\lambda +20$  nm. On stepwise hydrolysis [5, 6], cyanidin and glucose were obtained.

Anthocyan (III) —  $R_f$  0.39 and 0.27 (systems 1 and 2),  $\lambda_{max}$  524 nm; on acid hydrolysis it gave cyanidin and glucose.

On the basis of the results of chromatographic analysis, UV spectra (in the 300-600 nm region), the products of acid hydrolysis, and the results of their comparison with authentic samples and literature information [4, 6, 7], anthocyan (I) was identified as delphinidin 3-glucoside, (II) as cyanidin 3,5-diglucoside, and (III) as cyanidin 4-glucoside.

Only cyanidin 3,5-diglucoside was identified in the dog and corymb roses, while delphinidin 3-glucoside, cyanidin 3,5-diglucoside, and cyanidin 3-glucoside were found in each of the Chatyrdag and Ili species of rose.

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