

## PRINCIPAL ANTHOCYANS FROM CERTAIN PLANTS OF THE GROSSULARIACEAE FAMILY

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Anthocyanins from the Grossulariaceae family are interesting as food dyes. The literature contains much data for the anthocyanins composition of black currant (*Ribes nigrum* L.) [1-6]. However, some of the results are unexpected [6]. Using traditional methods, the detection of relatively large quantities of delphinidin and cyanidin diglucosides were reported.

The composition of pigments in Grossulariaceae plants available to us was determined using a previously described HPLC method [7]. Plants growing in Belgorod region in 2003 were used. Anthocyanins were extracted from fruit skin separated from pulp by soaking in aqueous formic acid (10%) until apparently bleached (about 10 mL of extractant per single fruit). The degree of anthocyanin extraction was >97%. The next day the extract was filtered, diluted with eluent, and chromatographed.

The variety of several specimens of black currant (more than 10 in various stages of ripening) was not exactly established. Specimens of Sokrovishche (Treasure) and Eksotika (Exotic) varieties were supplied by O. P. Zaporozhets. A mixture of several varieties was used in the study of anthocyanins from gooseberry [*Grossularia reclinata* var. *vulgare* (L.) Mill.].

Investigations with the minimum effect (time and harshness of separation conditions) on the starting material indicate that the principal anthocyanins of black currant are delphinidin and cyanidin glucosides and rutinosides, although in different ratios (Table 1). Usually (except for one instance), the content of delphinidin components is noticeably greater than that of cyanidin components.

TABLE 1. Anthocyanin Composition of Fruit Skin

Variety	Anthocyanin fraction, mol %							
	Dp-Glu	Dp-Rut	Cy-Glu	Cy-Rut	ΣGlu	ΣRut	ΣDp	ΣCy
<i>R. nigrum</i> L.								
Minai Shmyrev	11.6	50.7	5.5	32.2	17.1	82.9	62.4	37.6
Sokrovishche (Treasure)	14.2	56.5	4.7	24.5	19.0	81.0	70.8	29.2
Eksotika (Exotic)	12.8	57.7	3.9	25.6	16.8	83.2	70.5	29.5
Various varieties	6.5÷15.4	35.1÷59.3	3.3÷9.3	26.0÷42.3	9.8÷24.8	75.2÷90.2	55.9÷70.2	29.8÷49.9
<i>R. aureum</i> Pursh.								
-	0	0	41.5	58.5	41.5	58.5	0	100
<i>G. reclinata</i> var. <i>vulgare</i> (L.) Mill.								
Mixture of varieties	0	0	66.5	33.5	66.5	33.5	0	100
<i>Ioshta</i>								
-	8.2	19	13.2	59.6	21.4	78.6	27.2	72.8

Dp-Glu is delphinidin-3-glucoside; Dp-Rut, delphinidin-3-rutinoside; Cy-Glu, cyanidin-3-glucoside; Cy-Rut, cyanidin-3-rutinoside; ΣGlu, ΣRut, ΣDp, ΣCy, sum of the glucosides, rutinosides, delphinidin and cyanidin derivatives, respectively.

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Petunidin and peonidin rutinosides, the occurrence of which has been reported [7], were present in very small quantities (<0.5%) (not shown in Table 1). However, their relative quantity increased sharply upon incomplete extraction (i.e., with a large material:extractant ratio). Gooseberry and golden currant (*R. aureum* Pursh.) anthocyanins are formed by cyanidin (glucoside and rutinoside). The fraction of delphinidin components was <0.2%. *Ioshta* anthocyanins [hybrid of *R. nigrum* L. and *G. reclinata* var. *vulgare* (L.) Mill.] had an intermediate composition. Delphinidin components were present but, in contrast with *R. nigrum* L., their fraction was less than that of cyanidin components.

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