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ANTHOCYANS OF *Carthamus* SPECIES

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The flora of Azerbaidhzan includes five species of *Carthamus*: *Carthamus lanatus* L., *C. glaucus* M.B., *C. oxycantha* M.B., *C. gypsicola* Sljin, and *C. tinctorius* L. (safflower) [1]. Of these, *C. tinctorius* is used for dyeing and for food [2, 3]. The chemical composition of the pigments of *Carthamus* species has been little studied.

In the present communication we give qualitative and quantitative information on the flavonoids, especially the anthocyans, of *Carthamus* species growing in Azerbaidzhan.

The fresh plant material (flowers) was extracted three times with 80% alcohol on the water bath at the boil in a flask with a reflux condenser. The extracts were combined, filtered, and evaporated to an aqueous residue. Acid hydrolysis of the alcoholic extract showed that flavonoid glycosides were represented by the aglycons quercetin, kaempferol, and luteolin, the chalcone carthamidin, and the anthocyan cyanidin, which were identified chromatographically with authentic specimens and by spectral analysis.

The aqueous residue of extractive substances was mixed with a small amount of polyamide and deposited on a column filled with polyamide, which was then eluted with distilled water and 10, 50, and 80% alcohol. Fractions containing individual substances were combined and were purified by rechromatography on a column and on paper. The individuality of the substances was checked by one- and two-dimensional paper chromatography. The substances were detected by observation in UV light before and after treatment with an alcoholic solution of $AlCl_3$ and with ammonia vapors. Five individual substances were obtained.

Substance (**1**) — UV spectrum* (methanol, nm): 372, 257, R_f 0.14 (butan-1-ol–acetic acid–water (4:1:1) system), R_f 0.06 (15% acetic acid system); quercetin and glucose were found in the hydrolysis products.

Substance (**2**) — UV spectrum (methanol, nm): 370, 250; R_f 0.32, 0.21, respectively. Partial hydrolysis led first to arabinose and substance (**1**) and then to quercetin and glucose.

Substance (**3**) — UV spectrum (methanol, nm); 355, 268; R_f 0.72, 0.26; kaempferol and glucose were found in the hydrolysis products.

Substance (**4**) — UV spectrum (methanol, nm): 352, 257; luteolin and glucose were detected in a hydrolysate.

Substance (**5**) — UV spectrum (methanol, nm): 405; R_f 0.43, 0.67; carthamidin and glucose were detected in a hydrolysate.

Thus, on the basis of chromatographic, spectrometric, and chemical (complete and partial hydrolysis) analyses and by comparison with authentic specimens, substance (**1**) was characterized as quercetin 3-O-β-glucoside; (**2**) as quercetin 3-O-α-arabinoside 7-O-β-glucoside; (**3**) as kaempferol 3-O-β-glucoside; (**4**) as luteolin 7-O-β-glucoside; and (**5**) as carthamidin 5-O-β-glucoside. The luteolin and kaempferol glycosides were detected in all the species investigated, while only *C. glaucus* contained an anthocyan.

The isolation and purification of the individual anthocyans were carried out by a method that we have described previously [4]. The spectrometric, chromatographic, and chemical (acid hydrolysis) analyses of the anthocyan glucoside obtained showed that the anthocyan of the flowers was glucose-bound cyanidin. The anthocyan of *Carthamus* was characterized as chrysanthemin (cyanidin 3-O-β-glucoside).

This is the first time that the presence in *Carthamus* of the substances characterized has been demonstrated.

Quantitative analysis of the flavonoids and anthocyans in *Carthamus* flowers was performed by a spectrophotometric method on an SF-16 instrument. The amounts of the flavonoids were (%): *C. lanatus* — 0.32; *C. glaucus* — 0.23; *C. oxyacantha* — 0.65; *C. gypsicola* — 0.39; *C. tinctorius* — 1.85; anthocyans of *C. glaucus* — 0.38.

*The absorption maxima in the UV spectra of substances (**1**)-(**5**) are given.

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