Anthocyanin content in grains of barley and oat accessions from the VIR collection

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(What appears below is a summary and translation of the original work)

Background: Barley (*Hordeum vulgare* L.) and oat (*Avena sativa* L.) are grain crops used as two of the main sources of food and forage in the Russian Federation. They contain proteins and various groups of vitamins, fats, carbohydrates, β-glucans, and minerals, as well as different bioactive compounds, including anthocyanins. Recently, much attention has been given to anthocyanins because of their various and valuable properties. Therefore, barley and oat grains are potentially promising economic products and components of functional nutrition. The aim of this work was to estimate the content of anthocyanins in barley and oat accessions with varying pigmentation in kernels and lemmas.

Materials and methods: Thirty-two barley and eleven oat accessions were studied by spectrophotometry. Anthocyanins were extracted from barley and oat kernels with a 1% HCl solution in methanol.

Results and discussion: Accessions and varieties with the highest content of anthocyanins were identified. For barley, these were k-15904 (China), k-19906 (Mongolia), k-18709 (Japan), k-18723, k-18729 (Canada), k-17725 (Turkey; belonging to var. *violaceum*); k-29568 (Japan; var. *densoviolaceum*); k-8690 (Ethiopia; var. *griseinigrum*); and k-28205 (Germany; var. *nudidubium*). For oat (see Table 1 for all accessions tested), these were k-15527 (Ethiopia; *A. abyssinica* Hochst. var. *braunii* Koern.) and k-15245 (Poland; *A. strigosa* Schreb. subsp. *brevis* var. *tephera* Mordv. ex Sold. et Rod.).

Conclusion: The obtained results demonstrated that the VIR collection includes accessions with potential value for the development of oat and barley varieties with increased anthocyanin content, which can be used as functional food products.

Table 1. Total content of anthocyanins in oat kernels, mg/kg (in terms of cyanidin-3-glucoside).

VIR catalogue number	Botanical variety	Designation	Origin	Average concentration of free anthocyanins, mg/kg
12133	*A. sativa* L. var. *affinis* Koern.	Rhea	France	7,26±0,96
4585	A. *abyssinica* Hochst. var. *braunii* Koern.	Local	Ethiopia	7,29±0,85
15130	A. *strigosa* Schreb. ssp. *nudibrevis* (Vav.) Kobyl. et Rod. Comb. Nov.	23 Avena Strigosa nuda	Great Britain	8,56±0,83
9093	A. *byzantina* K. Koch. var. *nigra* Mordv. ex Rod. et Sold.	Avoine Noire 912	Algeria	9,48±1,21
1790	A. *byzantina* K. Koch. var. *ursina* Mordv. ex Rod. et Sold.	Local	USA	9,71±0,74
15174	A. *byzantina* K. Koch. var. *culta**	Furlong	Canada	10,12±2,18
14787	*A. sativa* L. var. *aurea* Koern.	Privet	RF, Moscow reg.	11,30±0,56
11515	*A. sativa* L. var. *grisea* Koern.	Pin-Lan-Che-U-Sao	China	11,76±3,01
15698	*A. sativa* L. var. *montana* Alef.	Harve Fran Mero	Sweden	11,93±2,08
15527	*A. abyssinica* Hochst. var. *braunii* Koern.	Local	Ethiopia	14,64±1,52
15245	*A. strigosa* Schreb. ssp. *brevis* var. *tepherea* Mordv. ex Rod. et Sold.	Local	Poland	20,49±3,04
$LSD_{0,5}$				1,42

* *A. byzantina* K. Koch. var. *culta* has reddish-brown coloured glumes, which came from the *Pg16* gene being backcrossed in from *A. fatua*.