

Benefits of variety Kornelija for consumers

Grain of the hulless barley variety *Kornelija* has a unique chemical composition and an excellent dietary value, thus the use of this grain variety in food production ensures a significantly higher content of protein, β -glucan, phenolic compounds and their activity compared to other cereal species (ref. to Table 1). Fibre contained in hulless barley, especially soluble fiber β -glucans and phenolic compounds have been recognized as **effective means for the prevention and treatment of heart disease, diabetes, inflammatory bowel and other diseases**. Increased dietary content of total fibre and soluble fibre β -glucans **lowers cholesterol in human blood** (Havlentova *et al.*, 2011), which contributes to the prevention of cardiovascular disease. Research studies (Mitsou *et al.*, 2010) show that barley β -glucans have a strong bifidogenic effect, contribute to the prevention of intestinal diseases and **helps fight specific cancers**. The β -glucan content has been shown to regulate blood sugar levels. Phenolic compounds and their activity have antioxidant properties and therefore play an important role in enhancing the functionality of cereal foods.

Feature	Hulless barley <i>Kornelija</i>	Barley	Oat	Wheat	Rye
Protein, %	15.3±2.9	11.4±1.7	10.58±0.67	12.7±0.65	9.8±0.07
Dietary fibre, %	19.47±2.99	20.82±1.02	17.63±1.52	13.06±0.35	15.7±0.42
β -glucans, %	5.30±0.6	4.24±0.4	3.15±0.19	0.18-0.89	1.3-2.2
Total phenolic compounds, mg GAE 100 g DW	196.8±19.1	175.0±12.1	123.64±15.6	95.88±8.28	88.0±13.39
DPPH antiradical activity, %	74.7±0.42	68.0±3.7	18.56±2.6	2.21±1.01	14.6±2.65

Table 1 Comparison of grain biochemical composition of hulless barley *Kornelija* and other cereals

Currently, oats are positioned in the food market as a ingredient that provides high β -glucan content in the product. However, the most widely grown oat varieties in Latvia provide an average β -glucan level of 3.15%, whereas *Kornelija* grain has an average β -glucan content of 5.30%. In addition, studies show that the food consumption of hulless barley has a **beneficial effect on blood glucose and insulin levels**. Innovative approach within the project realized in Latvia towards the hulless spring cereals and usage of triticale from the health perspective, and the performed clinical research conclude the high effect of hulless barley on lowering glycemic index in blood (testing also included the effect of sprouted grain on blood glucose and insulin levels). Comparing the effects of rye, triticale and hulless barley sprouted flakes and standard (glucose solution) impact on blood glucose and insulin levels, we discovered, as seen in Table 1 reveals, competitiveness of *Kornelija* compared to other cereal varieties, as well as in comparison on average in barley: higher protein, dietary fiber and β -glucan content in grains, high levels of vitamin E, total phenolic compounds, and high DPPH (2,2-diphenyl-1-picrylhydrazyl) antiradical activity, variety of advantages in the grain processing industry **especially for the manufacture of dietetic products**.

In today's society, adults and children alike have a growing number of diseases associated with various allergic reactions and food intolerances. Due to the fact that protein-sourced gluten present in wheat and other cereals, rye, barley and oats, can in some people cause celiac disease, which interferes with the body's uptake of nutrients and vitamins, we compared different cereals from this aspect as well.

Analysis of the results on gluten intolerance (% of 74 samples) shows that the percentage of positive intolerances to barley and oat grains was the lowest (1.4%), which is two times less than that of rye and five times less than that of wheat (ref. to Table 2).

Test evaluation	Gluten (standard)	Wheat	Rye	Barley	Oat
Negative	79.7	79.7	82.4	89.2	90.5
Poorly positive	12.2	12.2	12.2	9.5	8.1
Positive	6.8	8.1	2.7	1.4	1.4
Expressly positive	1.4	0.0	2.7	0.0	0.0

Table 2 Comparison of gluten intolerance test results

Evaluating the potential use of the barley variety *Kornelija* in the production of dietary and functional products, it can be concluded that in terms of the cereal food intolerance, the variety could be equivalent to oats.

Not only the protein content of a product is important in the diet, but also its quality, which is characterized by its amino acid composition. In order to characterize the quality of protein in wheat, barley, rye, oat and triticale, Table 3 summarizes the total amount of amino acids, including the amount of essential amino acids (which can not be synthesized in the body but have to be taken up with the food). Lysine promotes calcium absorption in the body and regulates the action of various hormones. Lysine is an essential amino acid that the body cannot produce on its own, so it should be taken up with a healthy diet of at least 30 mg/kg of bodyweight per day for adults.

	Amino acid volume, g kg ⁻¹	Essential amino acids, g kg ⁻¹	Lysine, g kg ⁻¹	Proportion of essential amino acids, %
Hulless barley variety <i>Kornelija</i>	122.5	38.9	3.6	31.8
Barley	106.8	32.2	3.2	30.1
Oat	104.5	40.5	4.5	38.7
Wheat	112.5	34.4	2.7	30.6
Rye	97.5	29.8	3.4	30.5
Triticale	99.3	29.9	2.8	30.1

Table 3 Comparison of amino acid content and structure of different cereal species

Upon evaluation of content of amino acids, it should be concluded that the highest amount of total amino acids has been determined in barley grain *Kornelija* variety, as well as in wheat, whereas the content of essential amino acids in oat and barley grain variety *Kornelija*, are significantly higher than that of wheat grain. The most valuable cereals in terms of amino acids are oats and barley variety *Kornelija*, because they have the highest proportion of essential amino acids in their grains, as well as a sufficiently high and stable lysine content.

More information can be found in the *Research* section.

Kornelija team