

The hulless barley variety 'Kornelija' – high-quality wholegrain raw material for developing niche and functional products

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- ❖ In the rapidly growing dietary product market the biochemical properties of raw materials are key, especially those that preventively address or help mitigate the health problems of consumers
- ❖ Hulless barley variety 'Kornelija' have unique biochemical composition which is suitable for production of high-quality traditional products (flour, bread, confectionery) as well as specific dietary and functional product production.
- ❖ Research of hulless barley variety 'Kornelija' (before variety registration line 'IC-360') potential has been initiated at the Institute of Agricultural Resources and Economics during ERDF co-financed project "Assessment of local origin grain variety potential and breeding of variety for the use of specific dietary product development" (01.04.2011-31.03.2013). (Published research results see in the References)

Advantages of the hulless barley 'Kornelija'

Agronomic

- ❖ Early ripening and coarse grains
- ❖ Environment preservation: produce high quality grains also in low-input sustainable farming system

Processing

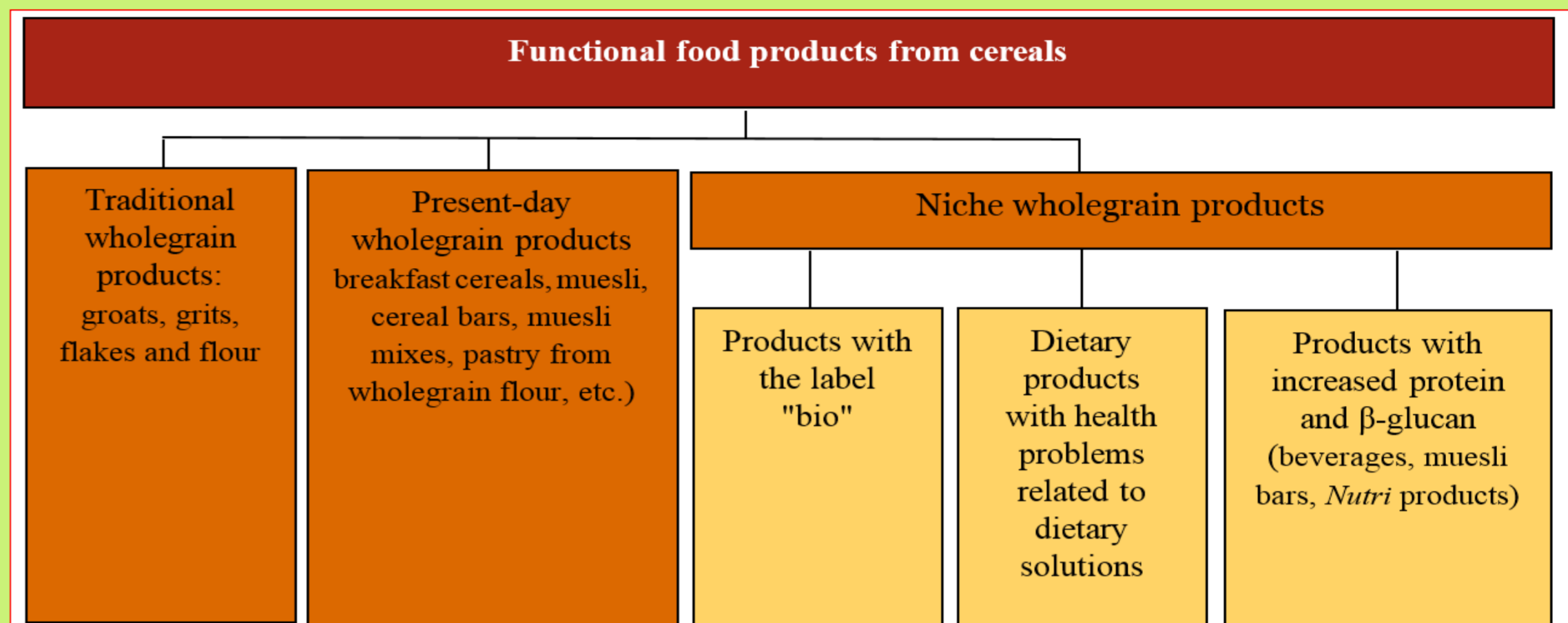
- ❖ Excellent hullessness: ensures 10-12% higher grain product outcome from one ton of grains
- ❖ Saving resources on grain processing, keeping, transportation: less waste, needs less energy consumption

Health

- ❖ High protein and fibre content at the same time
- ❖ Ensures the β -glucan content that other cereal crops are unable to ensure



Positioning of the hulless barley variety 'Kornelija' in the food industry



Advantages of the variety 'Kornelija' for the grain processing industry (the production of grain milling products)

Trait	Hulless barley 'Kornelija'	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 fats, %	2.35±0.15	2.23±0.16	5.15±0.19	2.1±0.03	1.8±0.04
E vitamin (α -tocopherol), mg kg ⁻¹	8.18±1.84	8.70±1.74	7.80±2.36	10.1	8.5
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 anti-radical activity, %	74.7±0.42	68.0±3.7	18.56±2.6	2.21±1.01	14.6±2.65
Zn, mg kg ⁻¹	30.5±13.5	20.8±3.7	26.1±3.8	34.6	26.5
Cu, mg kg ⁻¹	4.10±1.6	3.50±0.5	3.60±0.4	4.2	3.67
Mg, mg kg ⁻¹	1147.0±88.0	1101.0±40.0	1361.3±152.7	900	1100
Fe, mg kg ⁻¹	40.4±8.5	39.3±5.5	44.5±0.6	53.7	26.3

Due to high-quality biochemical composition and nutritional value the hulless barley variety 'Kornelija' is positioned as a high-quality grain raw material to be used in the production of niche and functional food

The Commercialization Strategy developed for the high-quality hulless barley 'Kornelija'

Activities of the Commercialization Strategy	Contacts for collaboration
Strengthening and maintaining the protection of the plant breeders' rights Transferring the plant breeder's rights	Alberts Aužiņš alberts.auzins@arei.lv
Carrying out field experiments to develop and test the technology	Mara Bleidere mara.bleidere@arei.lv
Carrying out industrial research for transferring the technology to grain farming in practical production condition	
Preparing the commercialization offer and promoting it in priority markets	Andris Lismanis andris.lismanis@arei.lv
Studying the properties of grain raw material/end products and optimizing the technological process of processing	Vita Šterna vita.sterna@arei.lv

- ❖ Collaboration with the grain processing and food manufacturing companies
- ❖ Experimental development of the **prototypes of new products**
- ❖ Verifying the suitability of 'Kornelija' for various technological processes and opportunities in the development of new **niche and functional products.**

The main conclusions from the first experimental development:

Grains / flour of hulless barley 'Kornelija' can be successfully used for bread-making - adding to 30 - 40%, it is possible to obtain bread with good porosity and significantly improving the nutritional value of wheat bread. Bread enriched with barley grains has significantly higher dietetic fibre, including β -glucans content, higher protein and fat content.



1. – control, 100% wheat bread; 2. – 30% naked barley flour; 3. – 40% naked barley flour; 4. – 30% naked barley grains; 5. – 40% naked barley grains; 6. – 30% of naked barley flours in sourdough; 7. - 40% of naked barley flours in sourdough.



Barley is not good for beer producing because high protein content, but could be used for functional drink creation. Sprouted grains of 'Kornelija' could be added to foods to give the product specific taste and color. confectionary, biscuits, breakfast cereals etc.

Parameters	Units	The result
Water content	%	5.2
Extractives content in dry matter	%	77.0
Difference of extractives	%	-
Must color	EBC°	2.0
Boiled must color	EBC°	3.8
Friability	%	-
Protein content in dry matter	%	20.9
Must pH	pH	6.08
Time of superconducting	min	10
Kolbaha index	%	44.3
Viscosity	mPa×s	1.87
β -glucans content	mg/l	575
Diastatic force	WK	476
Hartonga number Vz45°	%	36.2

References

- Bleidere M., Zute S., Brunava L., Bobere N., Jākobsone I. (2013) Yield and grain quality of hulless spring barley in field trials under different nitrogen management conditions. Proceedings of the Latvian Academy of Sciences, Section B: Natural, Exact and Applied Sciences, Vol. 67 (3): 229 - 235.
- Šterna V., Zute S., Jākobsone I. (2015) Grain composition and functional ingredients of barley varieties created in Latvia // Proceedings of the Latvian Academy of Sciences, Section B., Vol.67, 4, 373-377.
- Bleidere M., Jansone Z., Grunte I., Jākobsone I. (2017) Effects of pearling on grain chemical composition for various spring barley genotypes. Proceedings of the Latvian Academy of Science, Section B: Natural, Exact and Applied Sciences. Volume 71 (6), 468-473.
- Šterna V., Zute S., Jansone I., Kantane I. (2017) Chemical Composition of Covered and Naked Spring Barley Varieties and Their Potential for Food Production // Polish Journal of Food and Nutrition Sciences. - Vol. 67, No. 2 (2017), p. 151-158.
- Šterna V., Kunkulberga D., Straumite E., Bernande K. (2019) Naked barley influence on wheat bread quality// prepared for Baltic conference on food science and technology Foodbalt 2019 is not published yet.

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