

Technological possibilities and evaluation of functional flour extraction

Aim: evaluating the technological possibility of hulless barley "Kornelija" in order to concentrate functional components and obtain a prototype of a functional raw material. (Finland Patent No. EP 0 377 530 B1, 1995)

Tasks:

- 1) Purifying hulless flour from small-molecule, water-soluble particles, mainly starch, by means of settling and filtration methods;
- 2) Obtaining a product prototype (functional flour) with a concentrated amount of functional particles;
- 3) Comparing the technological properties of hulless barley "Kornelija" and hulless oats "Stendes Emilija", and obtaining a functional product prototype.

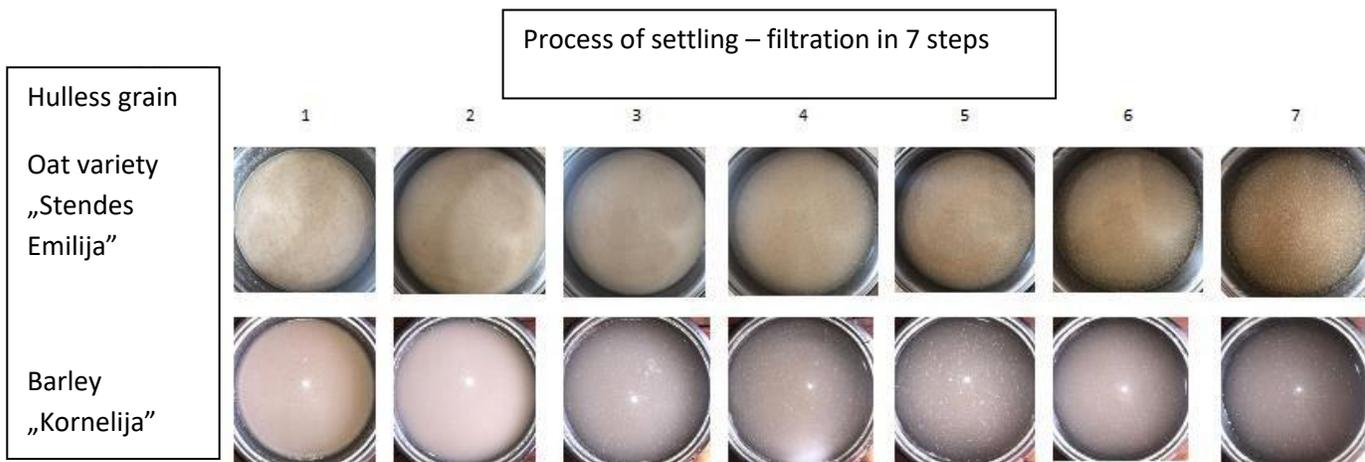


Figure No. 1. Extraction of functional flour concentrate.

Characterization of the obtained functional flour prototype

- Barley flour "Kornelija" was purified from small molecules, water-soluble particles in the amount of ~50%, but oat flour –in the amount of ~70%, which indicates that barley variety "Kornelija" contains more water-insoluble particles, which remain unfiltered and therefore the final output product is larger;
- Dried particles of refined barley and oat flour products have an adherent structure (Fig. 2, A), therefore, it was ground to a floury consistency (Fig. 2, B);
- The obtained barley flour prototype has a grey colour and "grainy" structure, but the oat product has a yellow colour and "cellulose" structure (Fig. 2, B);
- The drying process and time do not differ between the two samples.

**Prototype of
barley variety
"Kornelija"
functional flour
product**



A



B

**Prototype of oat
variety "Stendes
Emilija"
functional flour
product**



A



B

Fig. 2. Functional flour samples A – unground concentrate; B – ground sample.

Conclusion: with such a method of concentration of functional particles it is possible to obtain raw grain raw materials with high added value, namely – functional flour. When evaluating the composition of such flour, the changes and importance of each ingredient in the diet are described.

Proteins

Using the concentration method, an increase of 30% in protein was observed in the obtained functional flour product compared to the initial amount in hulless barley variety "Kornelija" and hulless oat variety "Emilia" grains (21.25 g/100 g and 16.4 g/100 g, respectively). The composition of the obtained functional flour is rich in proteins, amino acids, especially essential amino acids.

Many observational and interventional studies have confirmed that the intake of plant proteins has a positive effect on the modification of cardiovascular risk factors (Fjolla *et al.*, 2020), so it is highly recommended in the daily diet.

Starc

The endosperm of hulless barley variety, which accounts for 75–80% of the total weight of barley hulless grain, is rich in starch embedded in the protein matrix (Thava and Ratnajothi, 2009).

Barley starch granules contain proteins that are considered to be an integral part of starch granules, so barley proteins cannot be completely purified from starch even with strict starch purification methods (Thava and Ratnajothi, 2009). This fact is also the reason why starch was cleaned by only 16% in "Kornelija" flour barley variety flour. In addition to protein, barley starch contains small amounts of lipids and phosphorus (Thava and Ratnajothi, 2009). Starch proteins are located in the central and peripheral part of the granule, while starch

Raw materials – examination of the technological properties of hulless barley variety "Kornelija".

lipids are located on the surface and inside the granule. Phosphorus in barley starch is mainly in the form of phospholipids (Thava and Ratnajothi, 2009).

Fibre

The amount of both total and insoluble fibres in functional flour decreased, but no decrease in soluble fibres, namely – β -glucans was observed, on the contrary, an increase in β -glucan concentration was observed by 39% compared to the initial amount in grains

(amounts of 6.81 g/100 and 4.9 g/100 g, respectively). B-glucans are known to lower blood cholesterol and sugar, reduce the risk of cardiovascular disease and diabetes, maintain satiety, help reduce excess weight, strengthen the immune system (Smith and Queenan, 2008) (Shaveta and Simarjit, 2019), therefore it is highly recommended in the daily diet.

Resistant starch

Amylose and amylopectin are the main carbohydrate components of hulless barley starch granules. The starch fraction – linear amylopectin – is resistant to amylase hydrolysis in the human gastrointestinal tract and is therefore called resistant starch (RC). Resistant starch, when entering the colon, promotes beneficial bacterial growth and activity. Recently, there has been a growing interest in indigestible starch fractions and their prebiotic ability similar to dietary fiber (Thava and Ratnajothi, 2009).

Conclusion

Due to the naturally balanced composition of hulled barley "Kornelija", it is recommended to use this variety in the development of functional products, especially products with a low glycemic index and products with a prebiotic effect.

In some cases, in order to increase the concentration of vegetable protein in the product, it is recommended to use functional flour with an increased amount of protein. Interest in plant proteins is growing in various target groups, including vegans, vegetarians, *etc.*, who need to consume products rich in essential amino acids on a daily basis.

The review was developed by the dietary sciences Mg. sc. sal. Vanda Sargautiene.

References

- Fjolla, Z.-B., *et al.*, (2020). The impact of type of dietary protein, animal versus vegetable, in modifying cardiometabolic risk factors: A Position Paper from the International Lipid Expert Panel (ILEP). *Clinical Nutrition*, 39.
- Lehtomaki, L., Karinen, P., Bergelin, R., and Myllymaki, O. (1995). *Finland Patent No. EP 0 377 530 B1*.
- Shaveta, H. K., and Simarjit, K. (2019). Hulless barley: A new era of research for food purposes. *Journal of Cereal Research*, 11(2), 114-124.
- Smith, K., & Queenan, K. T. (2008). Physiological effects of concentrated barley β -glucan in mildly hypercholesterolemic adults. *Journal of the American College of Nutrition*, 27, 434-440.
- Thava, V., and Ratnajothi, H. (2009). Barley Starch: Production, Properties, Modification and Uses. In B. James, & W. Roy, *Starch: Chemistry and Technology* (p. 601). Elsevier.

Raw materials – examination of the technological properties of hulless barley variety "Kornelija".