



GRAIN GERMINATION AS MICROBIOLOGICAL RISK FACTOR IN BREAKFAST FLAKES TECHNOLOGY

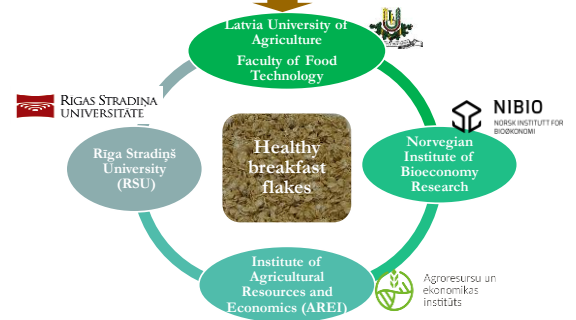
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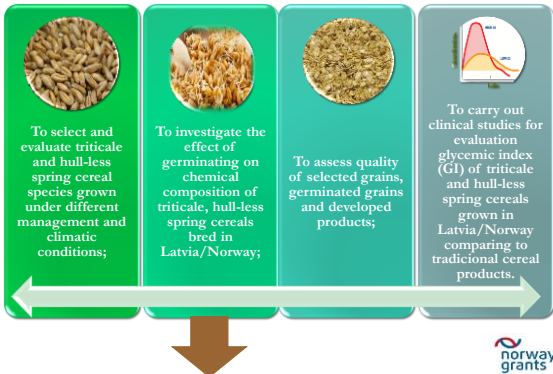
Innovative approach to hull-less spring cereals and triticale use from human health perspective
NFI/R/2014/11



Research overall aim is to increase a knowledge on impact of triticale and hull-less spring cereal species on human health potential.



RESEARCH OBJECTIVES



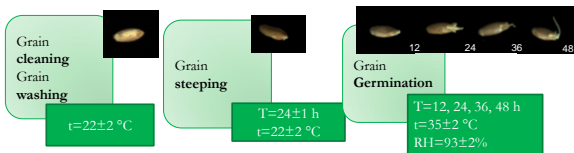
CEREALS FOR GERMINATION



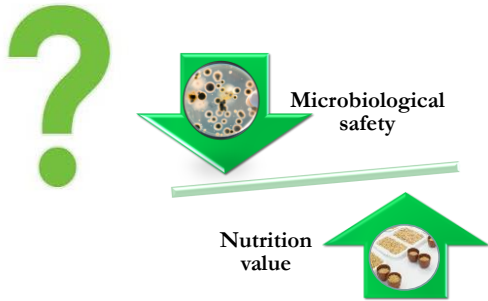
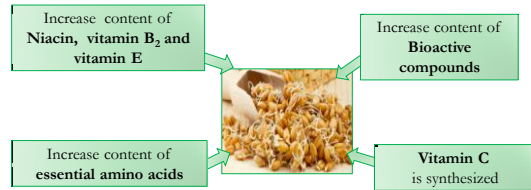
GRAIN GERMINATION



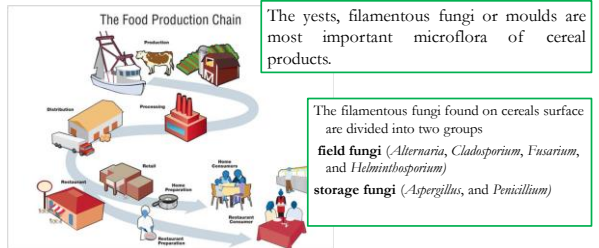
The germination process is characterized by the growth of the embryo of the grain, manifested by the rootlets growth and increase in length of the shoot (acrosipre), with the concomitant modification of the contents of the endosperm (Gorcica, 2013).



BENEFITS OF GRAIN GERMINATION



MICROBIOLOGICAL SAFETY

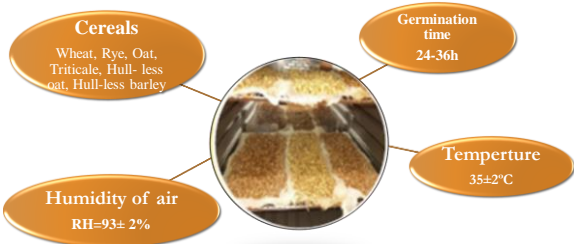


The yeasts, filamentous fungi or moulds are most important microflora of cereal products.

The filamentous fungi found on cereals surface are divided into two groups
field fungi (*Alternaria*, *Cladosporium*, *Fusarium*, and *Helminthosporium*)
storage fungi (*Aspergillus*, and *Penicillium*)

Factors affecting the growth and survival of microorganisms in food products:
Temperature **Moisture** **Aw** **pH** **Nutrition**

FACTORS OF GERMINATION

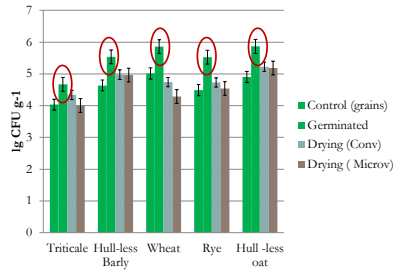


Conditions of germination process have risk factors for microbiological safety of cereals flakes



YEASTS AND MOULDS IN GRAIN SAMPLES

Method ISO 21527-1:2008



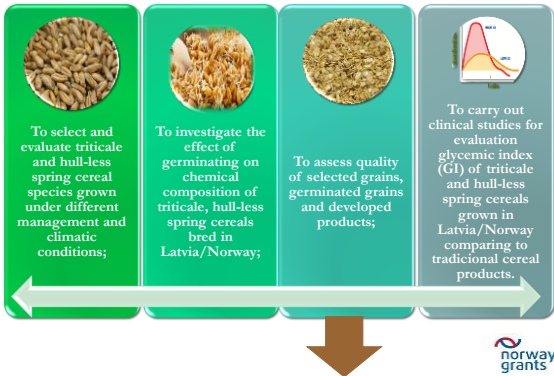
Conventional Drying process
t: 60±5°C
T: 4h

Microwave Vacuum Drying
t: 40±5°C
T: 50min

Filamentous fungi or moulds have been detect in the germinated rye and triticale grain samples



RESEARCH OBJECTIVES



BREAKFAST FLAKE SAMPLES PREPARATION

Ingredients	S-1	S-2	S-3
Wheat	-	-	10
Oats	-	30	-
Rye	10	-	20
Triticale	50	40	20
Naked oats	-	-	-
Germinated wheat	-	10	-
Germinated rye	-	-	20
Germinated triticale	20	10	-
Germinated Hull-less Oats	10	-	10
Germinated Hull-less barley	10	10	20
Total	100	100	100



Diatry Fibre source
GI low (<50), high fiber content (>12 g 100 g⁻¹)

Protein source
GI mid (50-75), high content of protein (>12 g 100 g⁻¹)

B group vitamin
GI low (<50), high content of B group vitamins



BREAKFAST FLAKE SAMPLE PACKAGING AND STORAGE

Breakfast cereal samples were packaged

Standup pouches
750ml Pap50g/Alu7/Pe60



Standup pouches
Fibrecote® HB MG Pap40/Pe60

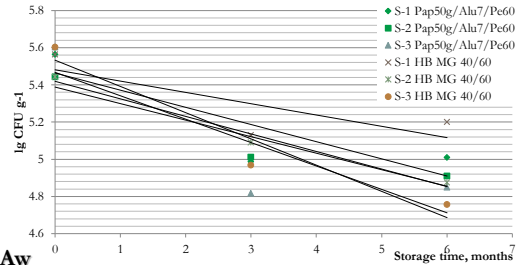


Samples were stored for 6 months at 20±2° C temperature and relative air humidity 55±3%.



CHANGES IN CONTENT OF YEASTS AND MOULDS IN SAMPLES

Method ISO 21527-1:2008



Aw

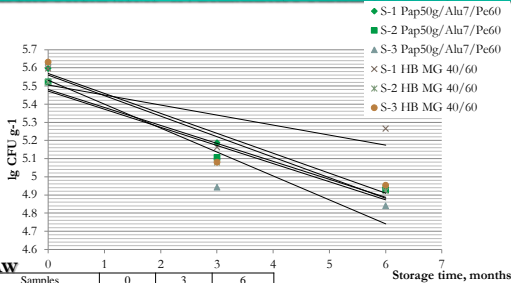
Samples	0	3	6
S-1 Pap50g/Alu7/Pe60	0.61	0.63	0.62
S-1 HB MG 40/60	0.61	0.43	0.49
S-2 Pap50g/Alu7/Pe60	0.63	0.63	0.62
S-2 HB MG 40/60	0.63	0.44	0.43
S-3 Pap50g/Alu7/Pe60	0.60	0.64	0.63
S-3 HB MG 40/60	0.60	0.54	0.51

Moulds has not been detect in the samples



CHANGES IN CONTENT OF TOTAL COUNT OF MICROORGANISMS IN BREAKFAST FLAKE SAMPLES

Method LVS EN 4833:2003



Aw

Samples	0	3	6
S-1 Pap50g/Alu7/Pe60	0.61	0.63	0.62
S-1 HB MG 40/60	0.61	0.43	0.49
S-2 Pap50g/Alu7/Pe60	0.63	0.63	0.62
S-2 HB MG 40/60	0.63	0.44	0.43
S-3 Pap50g/Alu7/Pe60	0.60	0.64	0.63
S-3 HB MG 40/60	0.60	0.54	0.51

Pathogenic microorganisms has not been detect in the samples



CONCLUSION

Grain steeping and germination process have risk factors for development cereal breakfast flake with high nutrition value

FUTURE FOR INVESTIGATION.....

- Flakes treatment with gassy ozone (Grains were treated with gassy ozone (concentration 0.0002%) for 6min (established in previous experiments).
- Increase temperature of flake drying process





Thank you!!!!



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