# TOTAL PHENOLS AND ANTIOXIDANT CAPACITY OF HULL-LESS BARLEY AND HULL-LESS OATS

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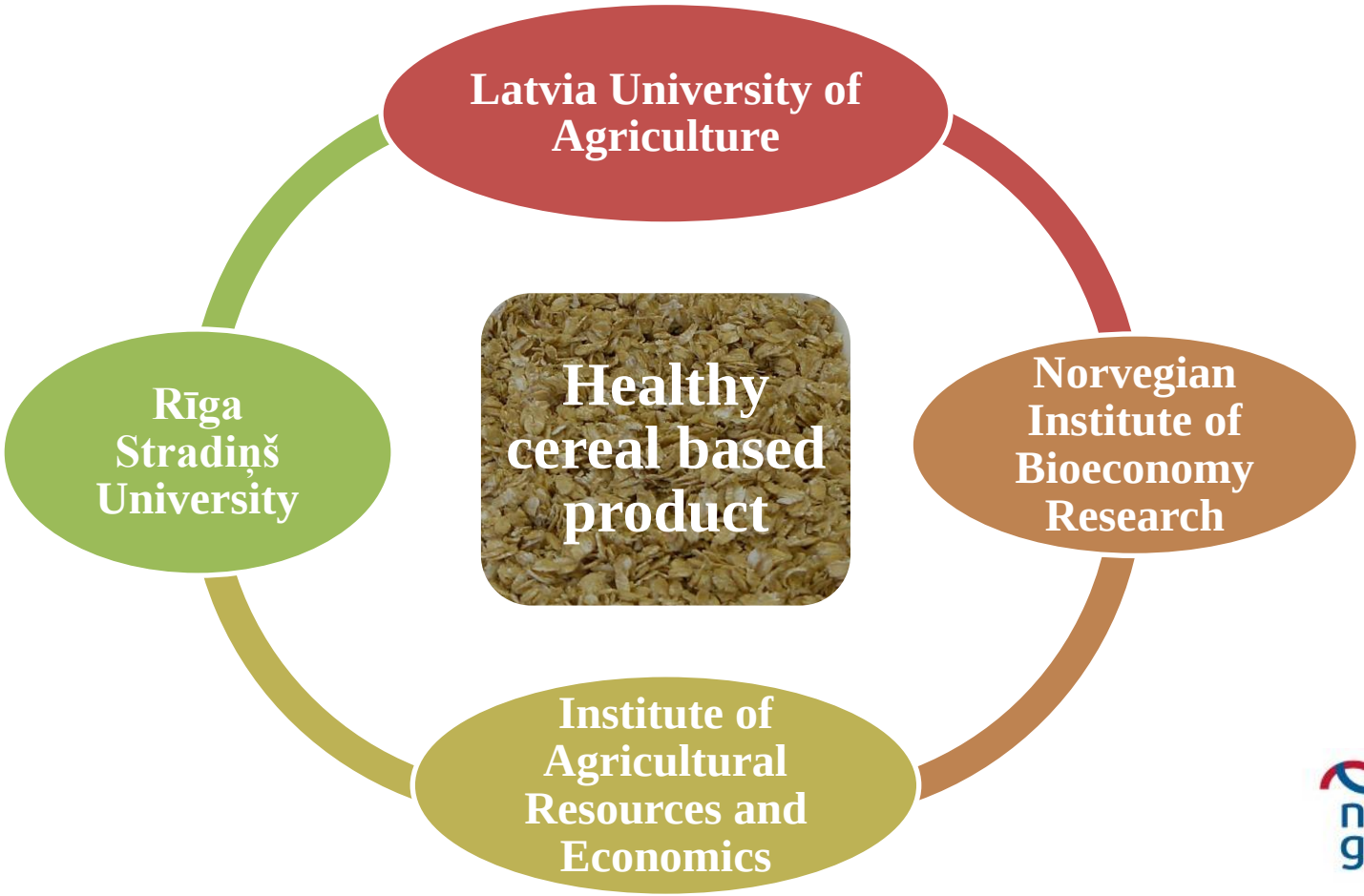
NORWEGIAN INSTITUTE OF BIOECONOMY RESEARCH

# INNOVATIVE APPROACH TO HULL-LESS SPRING CEREALS AND TRITICALE USE FROM HUMAN HEALTH PERSPECTIVE

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

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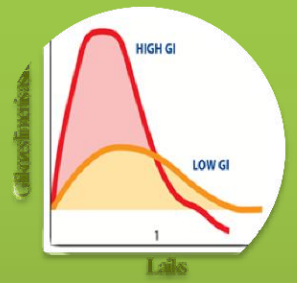
# TOPICS OF THE RESEARCH

**Site-specific evaluation of triticale and hull-less spring cereals**

**Development of germinated cereal flakes production technology**

**Quality and safety evaluation of breakfast cereals made from triticale and/or hull-less spring cereals**




**Assessment of glycemic index of grain products**

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# Site-specific evaluation of triticale and hull-less spring cereals

**The aim:**
**to evaluate the performance of local varieties of triticale, hull-less spring cereals under site-specific conditions for potential benefits for human diets**

Wheat Rye Triticale

Oats Hull–less oats

Barley Hull-less barley

## GROWING PLACES


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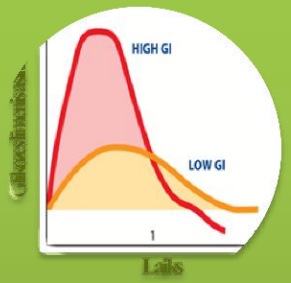


**Assessment of glycemic index of grain products**

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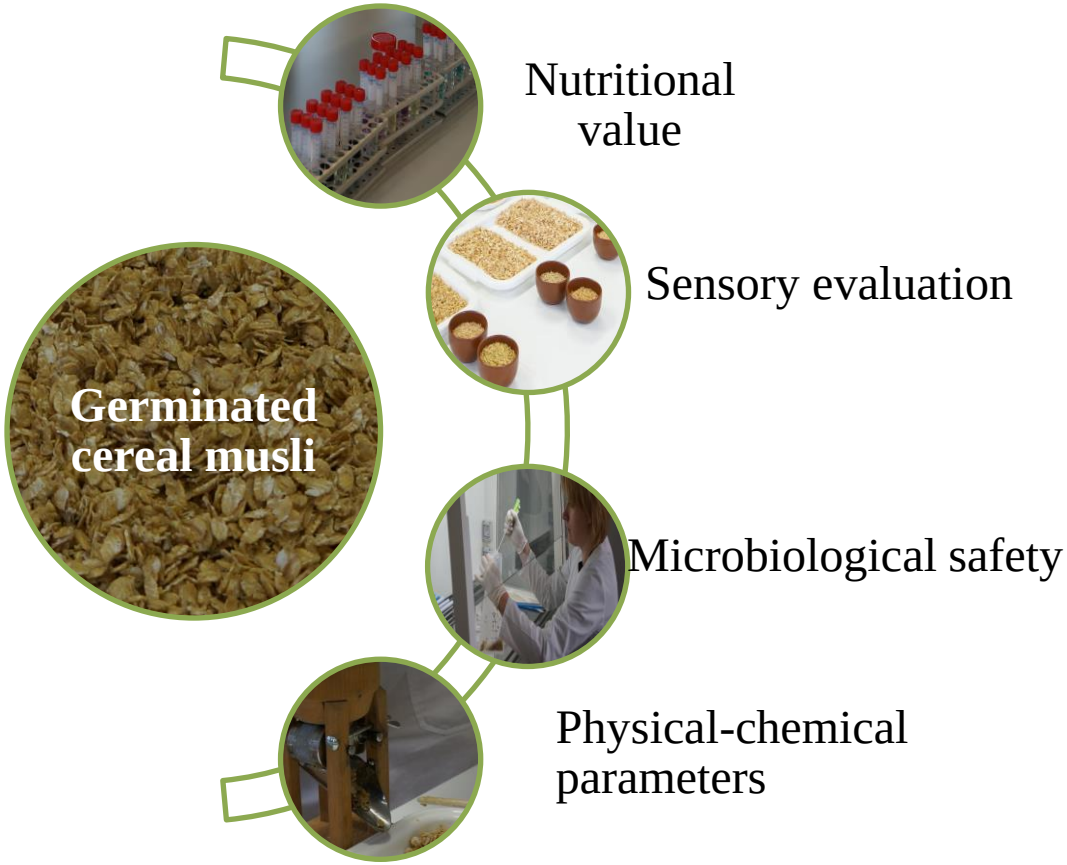
# Quality and safety evaluation of breakfast cereals made from triticale and/or hull-less spring cereals

**to evaluate quality and safety of breakfast cereals made from triticale and/or hull-less spring cereals selected in WP1 and quality changes occurring during product storage time.**

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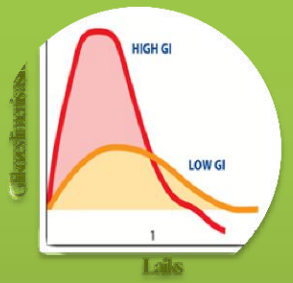


**Assessment of glycemic index of grain products**

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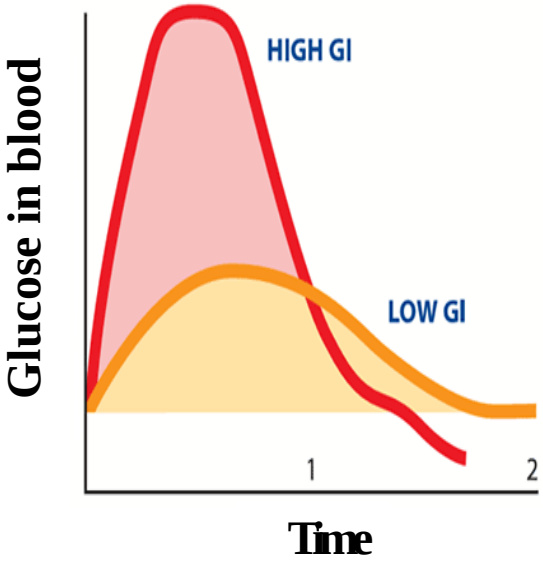
# Assessment of glycemic index of grain products

**assessment of GI of different triticale and hull-less spring cereals grown in Latvia and Norway comparing to traditional cereal products**

## GLYCEMIC INDEX




shows how a carbohydrate-containing food raises blood glucose

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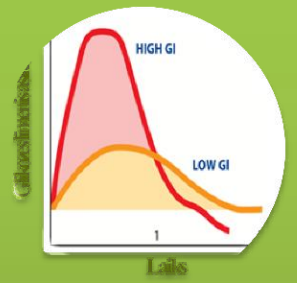


**Assessment of glycemic index of grain products**

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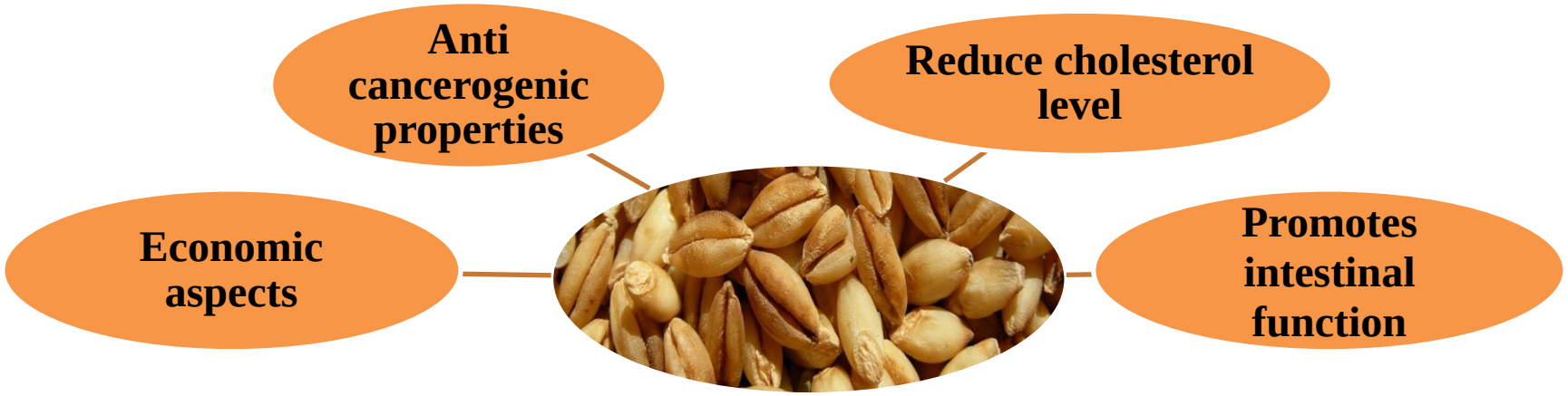
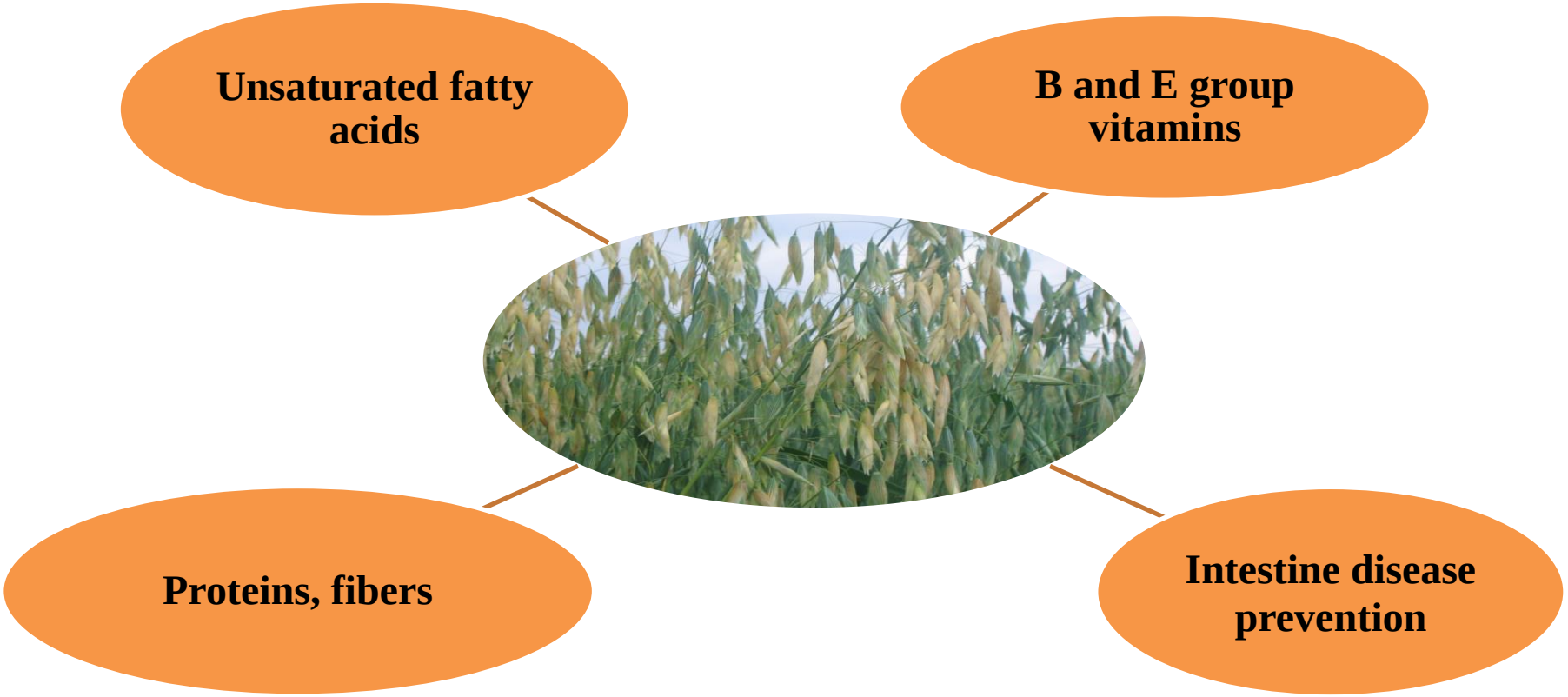
# Hull-less barley




Benefits:

- protein ,
- soluble fibers - β - glucan
- total phenolic compounds
- high antioxidant activity of phenolic compounds

# Hull-less oats




**The aim** of the current study was to assess total phenolic content and radical scavenging activity in different hull-less oats and barley varieties comparing to hulled ones

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# Materials and methods

**Oats**

- Odal
- Laima
- Bikini
- Nudist
- Stendes Emilija

**Barley**

- GN 03386
- Irbe
- Kornelija
- Rubiola
- Tyra


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# Materials and methods

## Extraction of phenolic compounds from grains

- Solvent - ethanol/acetone/water (7/7/6 v/v/v) solution
- Extraction - ultrasonic bath at 35 kHz for 10 minutes at 20±1ºC temperature, centrifuge at 3500 $min^{-1}$ for 5 min . Residues were re-extracted using the same procedure.
- Ratio of sample versus solvent was 1:10.
- Triplicate extraction process was done.

## Determination of total phenolic content (TPC)

The TPC of the extracts was determined according to the Folin-Ciocalteu spectrophotometric method . Results were expressed as gallic acid equivalents

## Determination of radical scavenging activity

Antioxidant activity of the plant extracts was measured on the basis of scavenging activities of the :

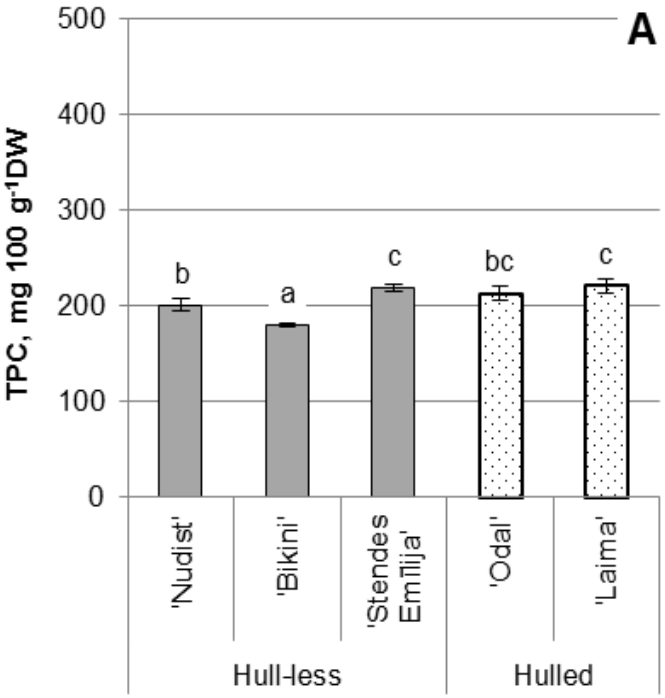
- ❖2,2-diphenyl-1-picrylhydraziyl ($DPPH^{\bullet}$) radical ,
- ❖ $ABTS^{\bullet+}$radical cation assay.

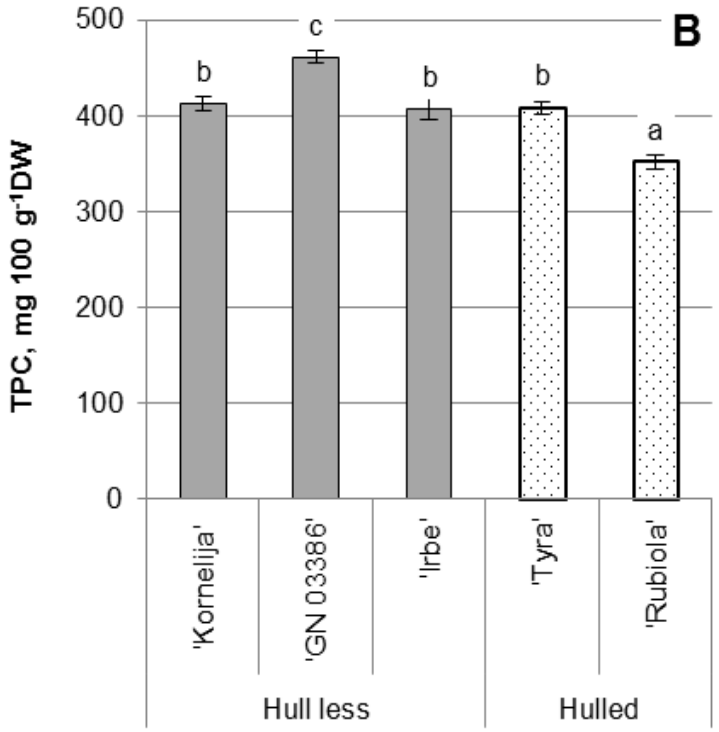
## Statistics

- Analysis of variance (ANOVA) and Tukey test were used to determine differences among samples. A linear correlation analysis was performed in order to determine relationship between TPC, antioxidant activity such as $DPPH^{\bullet}$, and $ABTS^{\bullet+}$radical scavenging activity.

# Results

## Total phenolic compounds in oats (A) and barley (B)




| Variety | Stende (LV) | | Priekuli (LV) | | Kvithamar (NOR) | | Apelsvoll (NOR) | |
|---|---|---|---|---|---|---|---|---|
| | C | O | C | O | C | O | C | O |
| Hull-less oats | | | | | | | | |
| Bikini | | | | | | | | |
| Nudist | | | | | | | | |
| Stendes Emilija | | | | | | | | |

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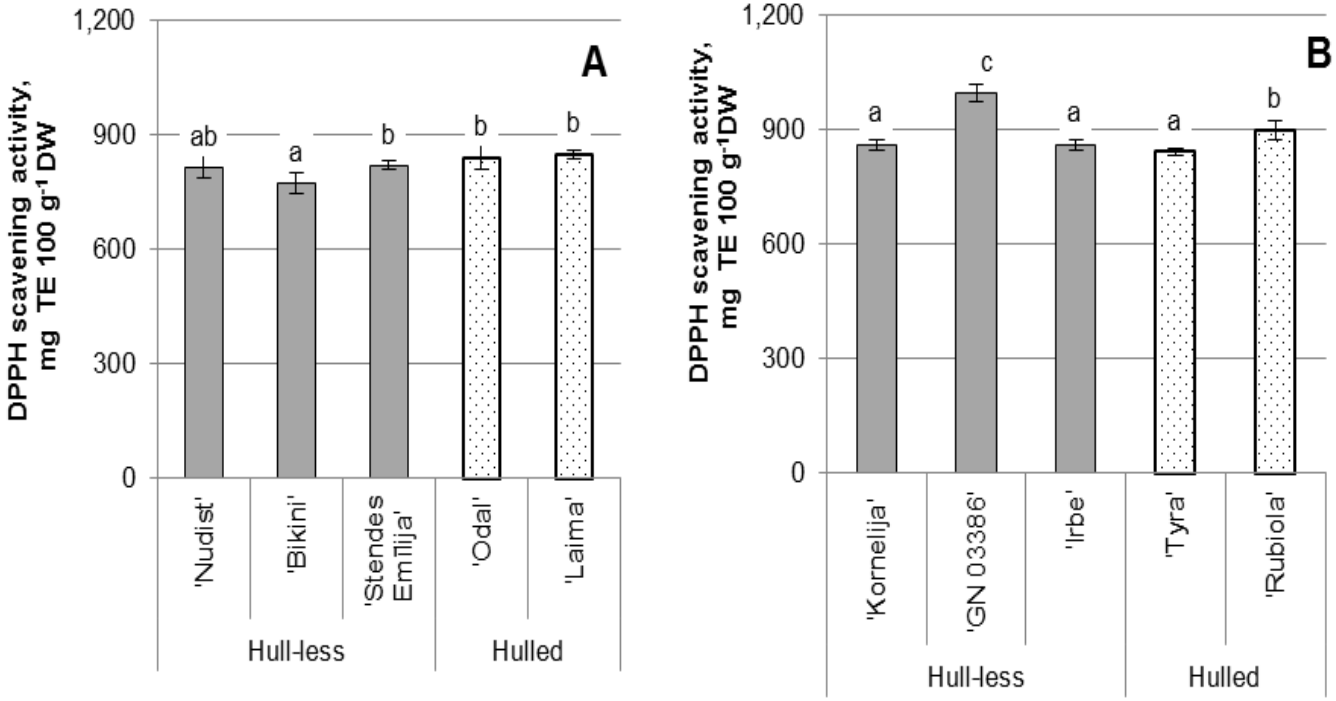
# Results

## DPPH scavenging activity of oats (A) and barley (B)




| Variety | Stende (LV) | | Priekuli (LV) | | Kvithamar (NOR) | | Apelsvoll (NOR) | |
|---|---|---|---|---|---|---|---|---|
| | C | O | C | O | C | O | C | O |
| Hull-less oats | | | | | | | | |
| Bikini | | | | | | | | |
| Nudist | | | | | | | | |
| Emilija | | | | | | | | |

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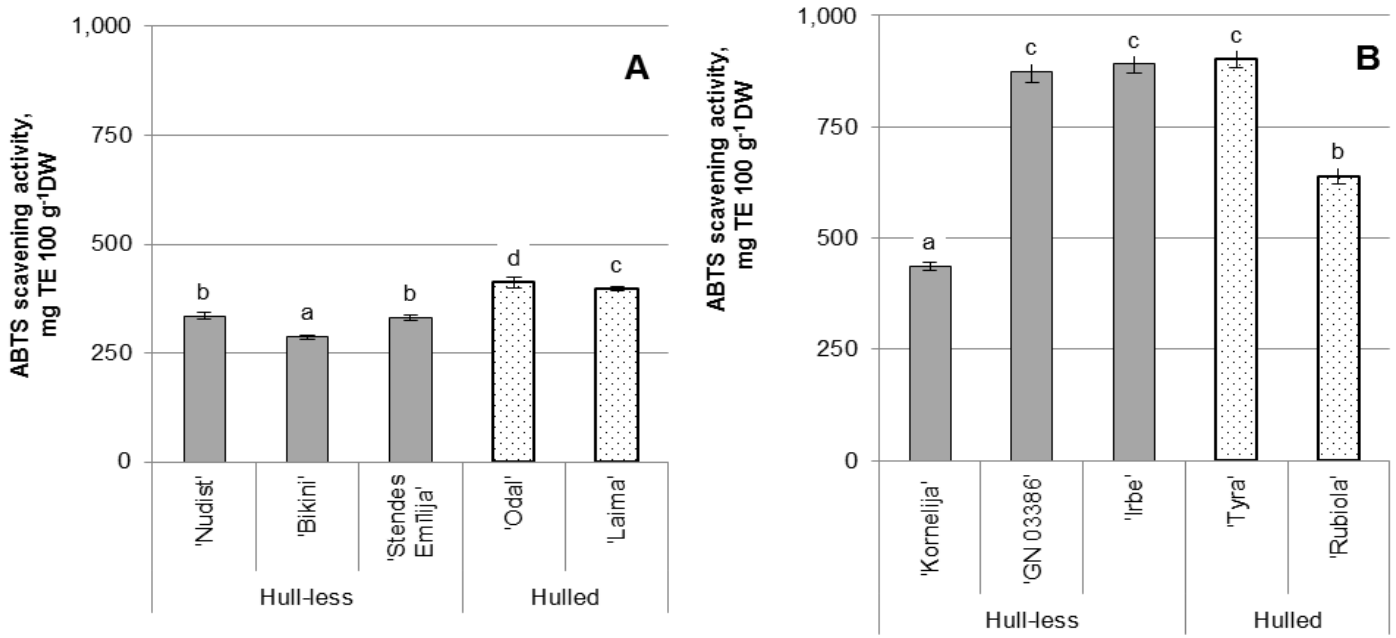
# Results

## ABTS scavenging activity of oats (A) and barley (B)




| Variety | Stende (LV) | | Priekuli (LV) | | Kvithamar (NOR) | | Apelsvoll (NOR) | |
|---|---|---|---|---|---|---|---|---|
| | C | O | C | O | C | O | C | O |
| Hull-less oats | | | | | | | | |
| Bikini | | | | | | | | |
| Nudist | | | | | | | | |
| Emilija | | | | | | | | |

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# Conclusions

- The present study determined TPC and antioxidant activity in grains of five oats and five barley varieties from Latvia and Norway.
- For oats and for barley, TPC and antioxidant activity was significantly influenced by cultivar variety. The type of grain- hull-less or hulled had no effect on analysed compounds.
- All barley varieties had higher TPC and ABTS scavenging activity comparing to the oats varieties.
- The highest activity was detected in hull-less barley line ‘GN 03386’.
- Bioactive compounds should be taken into consideration developing new functional products.

# Acknowledgment

The research leading to these results has received funding from the Norwegian Financial Mechanism 2009-2014 under Project Innovative apporach to hull-less spring cereals and triticale use from human health perspective (NFI/R/2014/011).

# Thanks for your attention!