



Winter rye (*Secale cereale* L.) antioxidant capacity, total phenols content and quality indices

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OBJECTIVE OF THE RESEARCH

Rye grain, like other cereals grains, is important part of human diet. Rye is second to wheat, the most commonly used grain in the production of bread (Michalska, 2006). Whole meal rye flour is the most popular for bread baking. Whole grain rye, primarily their aleurone layer, germ and bran, are rich sources of phytochemicals including phenolic compounds (Zieliński & Kozłowska, 2000; Žilić, 2016). Among health-promoting phytochemicals found in cereal grain, phenolic compounds have gained much attention in many scientific research areas due to their strong antioxidant properties. Their concentrations in rye grains are at least partly influenced by cultivar (Michalska, et al., 2006).

The aim of the study was to assess radical scavenging capacity, total phenols content, protein and starch content and also falling number in rye varieties wholemeal.

MATERIALS AND METHODS

The trial included population winter rye varieties 'Kaupo', 'Amilo', 'Dankowskie Amber', 'Dankowskie Rubin', 'Inspector' and hybrid rye varieties 'SU Drive', 'SU Mephisto', 'SU Bendix', 'Brasetto' and 'Palazzo' grown in Latvia. The antioxidant capacity was determined using the DPPH(2,2-diphenyl-1-picrylhydrazyl radical) assay and total phenols content was determined spectrophotometrically according to the Folin-Ciocalteu method. The rye grain antioxidant capacity was estimated as Trolox equivalent, while the total phenols content was expressed as gallic equivalents (GAE).

The rye grains analysed at the Latvia University of Life Sciences and Technologies in Grain and Seeds Research laboratory and in laboratory at the Department of Chemistry. All winter rye grain samples were ground in a Perten Laboratory Mill 3100 for obtained the wholemeal.



CONCLUSIONS

In our investigation are determined total phenols content, antioxidant capacity, protein, starch content and falling number in winter rye population and hybrid varieties wholemeal.

Protein content and starch content, falling number, total phenols content and antioxidant capacity in winter rye significantly varied depending on the cultivars. The greatest variations of the antioxidant capacity and falling number were observed in population varieties wholemeal, compared to the hybrid varieties. Statistically higher total phenols content and falling number had grain of hybrid rye varieties, compared to the population varieties. Differences between hybrids and population varieties for grain protein and starch content was not observed.

This study indicated that rye wholemeal used widely for human consumption, contained large amount of total phenols and demonstrated relative medium level of antioxidant capacity. It can be suggest that in future more and more rye products will be available on market, especially those originated from wholemeal.

RESULTS

Table 1. Winter rye grain average antioxidant capacity, total phenols, protein content, starch content and falling number

	AC, mmol Trolox eq. 100g ⁻¹	TPC, mg 100 g ⁻¹ GAE	PC, %	SC, %	FN, s
Population varieties					
Mean±standard error	42.0 ± 1.3	183.5 ± 2.0	10.4 ± 0.1	61.0 ± 0.1	260.8 ± 7.1
min	38.5	175.9	10.1	60.9	249.0
max	46.2	187.8	10.7	61.2	288.0
V%	6.7	2.5	2.5	0.2	6.1
Hybrid varieties					
Mean±standard error	42.1 ± 0.8	195.9 ± 4.1	10.0 ± 0.3	61.1 ± 0.1	276.8 ± 2.9
min	39.3	184.9	9.3	60.9	269.0
max	43.8	208.3	10.6	61.3	285.0
V%	4.3	4.7	5.7	5.7	2.3

AC–antioxidant capacity; TPC–total phenols content; PC–protein content; SC–starch content; FN–falling number; V%–coefficient of variation

Table 2. Winter rye wholemeal protein content, starch content and falling number

	PC, %	SC, %	FN, s
Hybrid varieties			
'Brasetto'	9.8	60.9	280
'Palazzo'	9.3	61.0	278
'SU Drive'	9.7	61.3	272
'SU Mephisto'	10.6	61.2	269
'SU Bendix'	10.6	61.1	285
LSD _{0,05}	0.04	0.12	ns*
Population varieties			
'Dankowskie Amber'	10.1	61.0	253
'Dankowskie Rubin'	10.7	61.2	249
'Kaupo'	10.2	61.0	252
'Amilo'	10.6	60.9	288
'Inspector'	10.6	60.9	262
LSD _{0,05}	0.12	0.13	7.14

PC–protein content; SC–starch content; FN–falling number; *ns–not significant

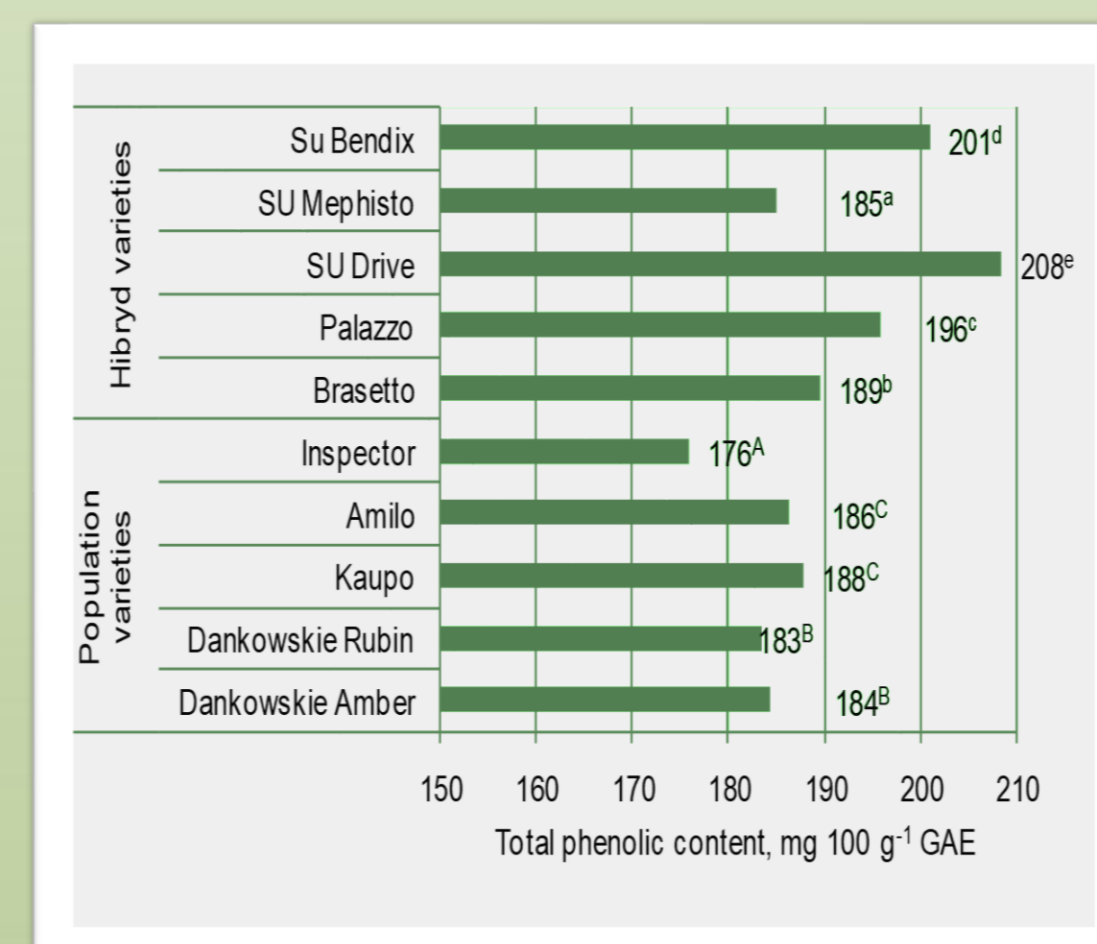


Figure 1. Total phenols content (mg 100 g⁻¹ GAE) in winter rye wholemeal.

Significantly different means are marked with different letters in superscript: a, b, c, d, e, – significant difference for rye grain hybrid varieties; A, B, C – significant difference for rye grain population varieties.

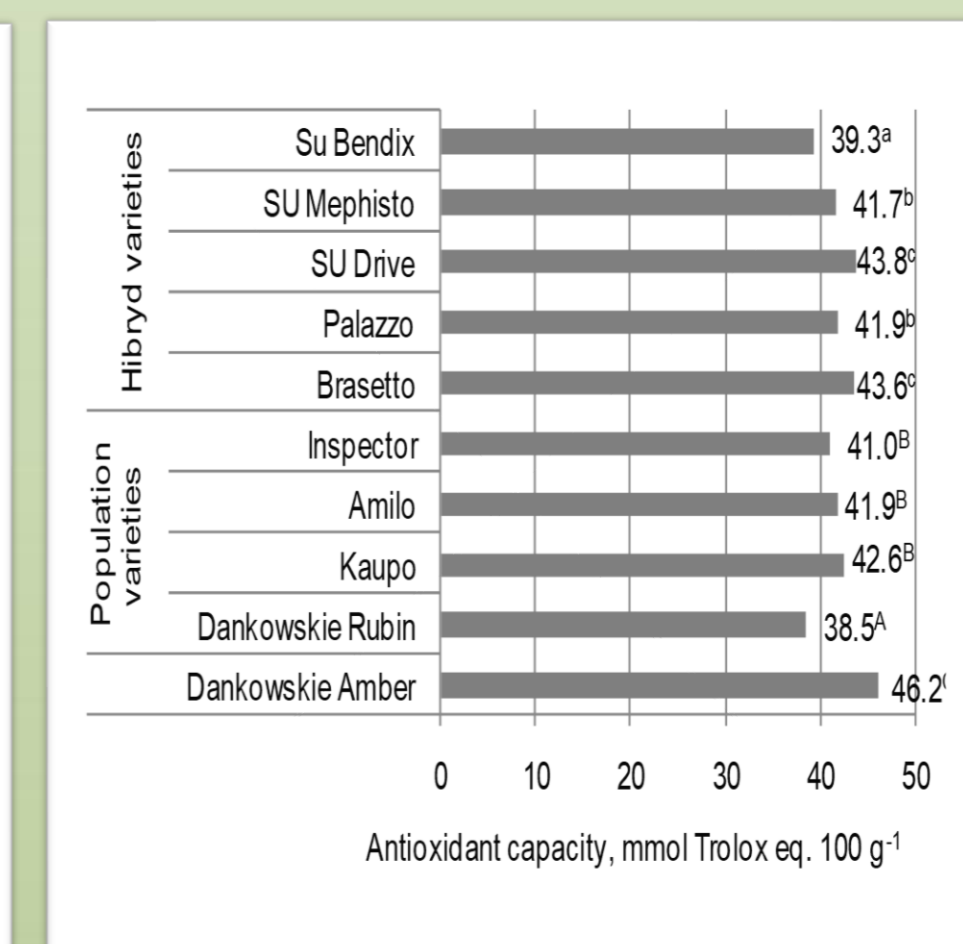


Figure 2. Antioxidant capacity (mmol Trolox eq. 100 g⁻¹) in winter rye wholemeal.

Significantly different means are marked with different letters in superscript: a, b, c, – significant difference for rye grain hybrid varieties; A, B, C – significant difference for rye grain population varieties.

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