NUTRITIONAL QUALITY OF TRITICALE (× *TRITICOSECALE*) GROWN UNDER DIFFERENT CROPPING SYSTEMS

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INTRODUCTION

Alternative cropping systems are gaining attention throughout the world in order to increase the sustainability of agro-ecosystems. As information on the negative consequences of conventional practices have become available, farmers around the world have adopted no-tillage (no-till) systems, often in combination with greater crop diversity in crop rotations to achieve greater sustainability in crop production. Furthermore, organic farming is also gaining popularity as an alternative to conventional cropping systems (Benaragama, 2016).

During the last few decades triticale has become a commercial crop grown in a variety of environmental conditions worldwide.Triticale is mainly used for animal feed, but the results of recent studies show its possible beneficial effect for human health. Triticale grain is a comparable to wheat protein (11.4-14.0%) source, with a slightly higher amount of lysine (0.33-0.71%), which is the first limiting amino acid in cereals. Its dietary fibre content is similar to wheat, but with a higher amount of soluble fraction, especially water-extractable arabinoxylans (WE-AX), which display viscous properties in an aqueous solution (Rakha et al., 2011). Triticale also has many phenolics with antioxidant activity, alkylresorcinols, phytoestrogens, vitamins and microelements (Jonnala et al., 2010; Fras et al., 2016).

The objective of this study was to investigate nutritional quality of triticale grown under different cropping systems in Latvia.

MATERIALS AND METHODS

Plant materials

Triticale varieties 'Inarta' and 'Ruja'

From Institute of Agricultural Resorces and Economics in Priekuli cultivated in 2014 and 2015 under conventional and organic cropping systems.

Protein (LVS EN ISO 5983-1:2005), starch (*Infratec 1241*) and total dietary fibre (AACC 32-05.01) content were determined using the standard methods.

The total phenol content (TPC) of the triticale extract was determined by Folin-Ciocalteu method with some modifications. The TPC was calculated from the calibration curve of Gallic acid, and the results were expressed as Gallic acid equivalents (GAE) per 100 g dry weight (DW) of the samples.

Antioxidant activity of the extract was measured with the 2,2-diphenyl-1- picrylhydraziyl DPPH method . The radical scavenging activity was expressed as Trolox mM equivalents (TE) 100 g-1 DW of the samples.

Statistical analysis

The results (mean, standard deviation, *P* value) were processed by mathematical and statistical methods. Significance was defined at $P < 0.05$.

RESULTS

Two Latvian winter triticale (× *Triticosecale*) varieties 'Inarta' and 'Ruja,' used in the current study, were grown under conventional and organic management systems. Field trials were established at the experimental fields of Institute of Agricultural Resources and Economics (57°18'57''N, 25°20'19''E, 123 m altitude) in 2013/2014 and 2014/2015. The trial field was certified for organic management.

Table 1

PROXIMATE CHEMICAL COMPOSITION OF THE TRITICALE VARIETY 'INATRA', G 100 G^{-1}

Parameter	Conventional		Organic	
	2014	2015	2014	2015
Moisture	9.19±0.01	12.44±0.10	8.94±0.02	11.82±0.05
Proteins	11.39±0.01	8.31±0.02	11.93±0.09	7.27±0.02
Starch	64.5	70.2	65.5	70.6
Fibre	17.19±0.49	15.90±0.18	15.32±0.10	15.56±0.12

Table 2

PROXIMATE CHEMICAL COMPOSITION OF THE TRITICALE VARIETY 'RUJA', G 100 G^{-1}

Parameter	Conventional		Organic	
	2014	2015	2014	2015
Moisture	9.29±0.01	12.08±0.47	9.18±0.02	11.97±0.67
Proteins	9.70±0.49	8.28±0.17	11.14±0.03	9.10±0.31
Starch	64.2	69.3	63.2	68.3
Fibre	17.23±0.44	16.62±0.25	16.72±0.11	19.18±0.37

Table 3

YIELD OF WINTER TRITICALE IN 2014 AND 2015, T HA^{-1}

Growing conditions	Year	Variety	
		'Inarta'	'Ruja'
Conventional	2014	3.63	5.16
	2015	4.48	5.44
Organic	2014	3.17	3.81
	2015	2.22	2.32

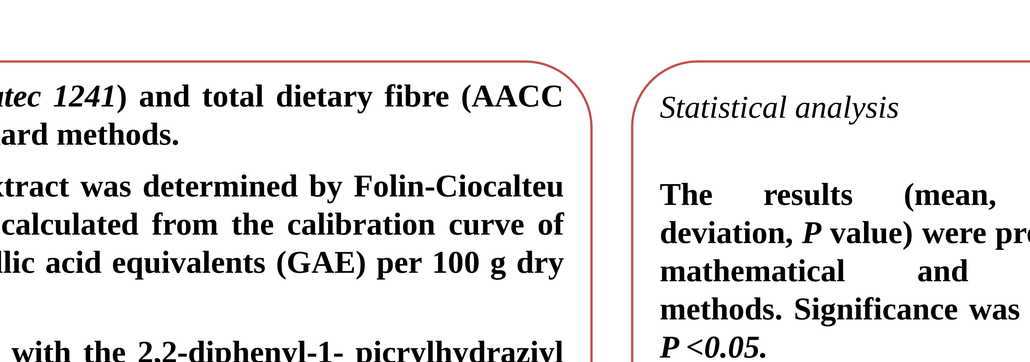

Figure 1. Total phenol content in triticale varieties depending on growing conditions

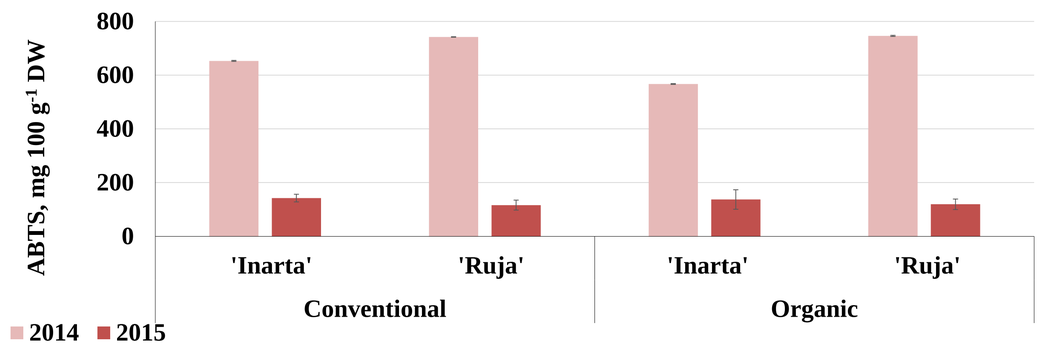

Figure 2. ABTS$^{\cdot+}$ radical scavenging activity of triticale extracts depending on growing conditions

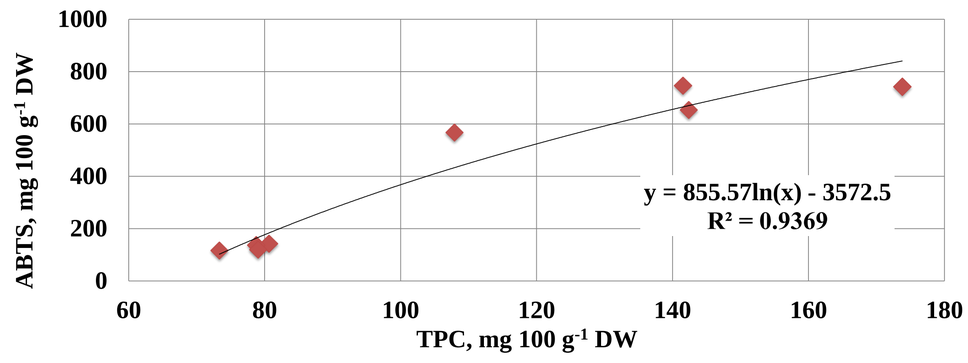

Figure 3. Correlation between ABTS^{+} and total phenolic compounds (TPC)

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CONCLUSIONS

Overall, the highest content of protein, TPC and ABTS cation scavenging activity was in triticale harvested in 2014 due to meteorological conditions.

The type of cropping system had no significant effect ($p > 0.05$) on protein and starch content, but TPC, DPPH and ABTS^{+} scavenging activity was influenced by cropping system.

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).