

NUTRITIONAL AND BIOLOGICAL VALUE OF SPELT WHEAT

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Abstract

The nutritional value of two varieties of spelt wheat (*Triticum spelta* L.) was compared with the conventional variety of winter wheat (*Triticum aestivum* L.) grown in Slovakia and Sweeden. The biochemical analysis shows that the spelt wheat grains have significantly ($P < 0.001$) higher content of nitrogen compounds, crude protein, proteins, essential amino acids, lysine, more nonessential amino acids, fat, ash and BPV than winter wheat.

It was not find any significant differences between the varieties on the basis of biological test of growth in rats.

Key words: spelt wheat, laboratory rat, digestibility of crude protein, BVP and PER, NPU

Introduction

Wheat is the principal source of energy, protein and dietary fiber for a major portion of the world's population (1,2,3,4). While most of the world wheat crop arises from production of common (*Triticum aestivum* L.) and durum (*Triticum durum* DESF.) cultivars, there is increasing interest in ancient wheat species, especially spelt (*Triticum spelta* L.).

The aim of this work was to compare the nutritional value of the grain of the spelt wheat varieties (*Triticum spelta* L.) with common winter wheat cultivar Samanta (*Triticum aestivum* L.) and to test it on the basis of biological test of growth in rats.

Material and methods

Two spelt samples (*Triticum spelta* L.) and one common winter wheat – Samanta (*Triticum aestivum* L.) ecologically grown in Slovakia and in Sweden were observed. In all varieties the content of nutrients, protein fractions and amino acids were determined. The digestibility of crude protein, the nitrogen balance, protein biological value (BPV), protein efficiency ratio (PER), net protein utilization (NPU) and feed consumption per 1 gram of wheat increase were tested in six repeated experiments with rats of the Wister strain from the SPF breeding (Velaz Praha, Czech Republic). The tested wheat varieties represented the only source of nitrogen in the experimental diets, and crude protein (Nx6.25) created 10% dry matter of feed ration. The PER value was determined during the period of 21 days (feeding experiment) and the BHB value during the period of 7 days (balance experiment).

Results and discussion

Chemical analysis have shown (Table1) that the spelt wheat grains have significantly ($P < 0.001$) higher content of nitrogen compounds, crude protein, essential amino acids, lysine, more nonessential amino acids, fat, ash and BPV than winter wheat.

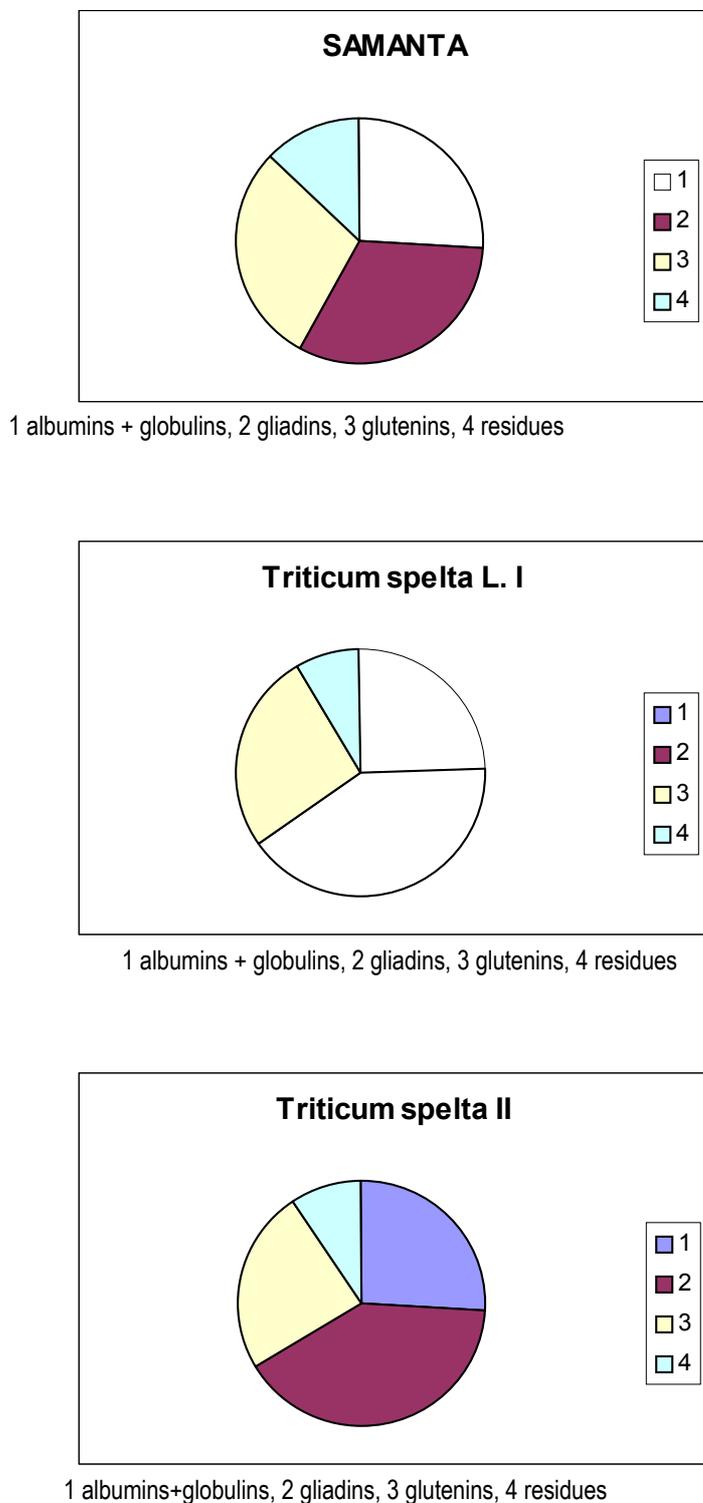
The crude protein digestibility and the nitrogen balance in experimental animals are very closed to protein quality. Low proportion of albumins and globulins (Fig.1) in spelt wheat conditions also the low concentration of lysine, threonine and agrinine as well as high concentration of glutamic acid and proline which are the most frequent amino acid rasts in gliadin proteins.

Table 1 Content of crude protein, proteins and amino acids in tested varieties of wheat (g.10⁻² g dry matter)

Chemical compounds n = 4	Samanta		<i>Triticum spelta</i> L. I		<i>Triticum spelta</i> L. II		Significance of differences
	x	s	x	s	x	s	
Crude protein (N x 6,25)	9.99	0.38	16.36	0.37	12.71	0.33	1:2:3+++
Proteins	8.98	0.31	14.16	0.13	11.26	0.43	1:2:3+++
Total amino acids	8.74	0.40	14.84	0.73	11.30	0.43	1:2:3+++
Essential amino acids	3.40	0.19	5.46	0.20	4.12	0.28	1,3:2+++ 1:3++
Lysine	0.26	0.01	0.37	0.02	0.31	0.02	1,3:2+++ 1:3+
Threonine	0.28	0.01	0.45	0.02	0.35	0.03	1:2:3+++
Essential/nonessential AA	0.636		0.593		0.574		

Triticum spelta L I. – grown in Slovakia, *Triticum spelta* L. II. – grown in Sweden

Fig.1 Protein fractions of tested samples of wheat (% share in total N content)



The higher crude protein content and gliadin fraction in spelt wheat increased the proportion of proline to arginine and lysine compared with values in winter wheat. It decreased the total utilisation of proteins.

The highest biological protein value (BVP) was assessed for Slovak spelt variety of the tested wheats, however, the differences between the varieties were not significant. We found significant differences in faeces excreted N from intake N,

and it manifested itself in significant differences in crude protein digestibility which was higher in the samples of spelt wheat. The balance experiment has shown that the crude protein digestibility was in the case of the spelt wheat higher (85%) than in the Samanta cultivar (78%). It confirms positive relationship between the nitrogen content in wheat and his digestibility. Similarly, the proportion of retention nitrogen from the digested N in the spelt wheat was higher (51.5%) than in the Samanta variety (47.4%). The nondigestible part of the N-compounds from the feed diet was reflected in the nitrogen amount in excrement, which was considerably lower in the case of the spelt wheat. There were no significant differences in the amount of nitrogen excreted in urine among experimental groups.

Table 2 Results of testing the wheat varieties in metabolic trials on rats

Index	Samanta		<i>Triticum spelta</i> L I		<i>Triticum spelta</i> L II		Significance of differences
	x	s	x	s	x	s	
n = 6							
Crude protein digestibility %	78.12	2.56	85.08	1.59	80.47	0.65	1,3:2+++
Excrement N output from N uptake %	21.88	2.56	14.92	1.59	19.54	0.65	1:3+ 1,3:2+++
Urinary N output from N uptake %	41.12	5.40	41.20	5.56	41.71	2.99	NS
Protein biological value	73.37	6.88	75.63	5.53	72.13	2.57	NS
Net protein utilization	56.50	5.27	63.92	5.89	58.04	2.19	2:1,3+
Utilizable proteins %	5.64	0.53	10.46	0.96	7.38	0.28	2:1,3+++ 1:3+++

Triticum spelta L I. – grown in Slovakia, *Triticum spelta* L. II. – grown in Sweden

Acknowledgements

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