DIRECT BAKING QUALITY OF SPELT WHEAT (*TRITICUM SPELTA* L.)

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Abstract: *Spelt has shown good potential in variety of end-uses depending on genotype, variety and processing conditions. Consumer´s quality perception of bread is mainly determined by sensory and health attributes. Bread quality is affected by both flour properties and baking process used. The use of spelt in bread production is possible: bread with addition of spelt flour is characteristic by strong bread smell, excellent taste and it stays longer fresh and soft. Because the consumers interest in health and their knowledge of relationship between diet and well-being has raised, wheat spelt is gaining interest and popularity. In the framework of our research during the years 2008 – 2009 we analyzed selected indicators for baking quality of four cultivars of Triticum spelta L. – Altgold, Ostro, Rubiota and Franckenkorn grown in an ecological system at the locality of Dolna Malanta near Nitra. The bread loaves were prepared from fractions I and II achieved by the Brabender Quadrumat senior laboratory mill. The baked loaves were evaluated by means of following criteria: bread weight (g), bread volume (cm^3), specific volume ($cm^3.100g^{-1}$ of flour), cambering (height/width ratio), bulk productivity ($cm^3.100g^{-1}$of loaf), baking extraction (%) and baking loss (%). Our research proved that all selected indicators were significantly influenced by the year of growing. The normal air temperatures and sufficient precipitation of 2008 reflected into the best dough properties of spelt wheat and baking quality when compared with 2009. Based on the direct indicators we consider the variety Rubiota as the most suitable and the best quality from the baking point of view. The baking products from Rubiota was evaluated as having an excellent volume, specific volume, bread weight with a very good cambering and bulk productivity as well. Unexpectedly bad results have been found in Altgold, which showed the lowest bread volume, specific volume and height/width ratio. The spelt grain can be a good source for making bread flour, but it closely depends on choice of spelt variety.*

Key words**:** *spelt, direct baking quality indicators, bread*

INTRODUCTION

Spelt has shown good potential in variety of end-uses depending on genotype, variety and processing conditions (ABDEL-AAL, 2008; MACAK, 2006). Today, more spelt-based products are available including flour, bread, pasta (MARQUES et al., 2007) and number of regional specialties. Consumer´s quality perception of bread is mainly determined by sensory and health attributes. Bread quality is affected by both flour properties and baking process used. The use of spelt in bread production is possible: bread with addition of spelt flour is characteristic by strong bread smell, excellent taste and it stay longer fresh and soft (OSELLA et al., 2008). Old landraces of spelt may represent primitive quality, they may also have already been selected for improved quality, while modern spelt varieties are often crosses between spelt and modern wheat which have been systematically bred to resemble modern wheat quality (SHOBER et al., 2006). SLUIMER (2005) resulted that spelt wheat varieties differed widely in technological properties and that some of the spelt wheat exhibited baking qualities similar to winter wheat. Just as good technological properties are not found in every available wheat variety, likewise, classifying spelt as a cereal with bad dough properties and unsatisfactory baking quality is not applicable to every spelt wheat variety and should rather depend on its intended use. These food applications show diverse use of spelt; and reasonable quality of spelt products can be achieved by choosing the right variety and/or by manipulating processing

condition. The expansion of the cultivation of spelt largely depends on the possibility of using it in the production of various products. Because the consumers are increasingly interest in health and their knowledge of relationship between diet and well-being has raised, wheat spelt is likely, to gain interest and popularity (ZIELINSKI et al., 2008).

MATERIAL AND METHODS

In the framework of the our research during the years 2008 – 2009 we analyzed selected indicators for baking quality of four cultivars of *Triticum spelta* L. – Altgold, Ostro, Rubiota and Franckenkorn grown in an ecological system at the locality of Dolna Malanta near Nitra. We present direct indicators of the baking quality of the cultivars evaluated in two - years study. The bread loaves were prepared from fractions I and II achieved by the Brabender Quadrumat senior laboratory mill. The baked loaves were evaluated by means of following criteria: bread weight (g); bread volume (cm^3) – principle of measurement consists in determination of the changes in volume refill with milled seeds; specific volume ($cm^3.100g^{-1}$ of flour) – the ratio of bread volume and weight of flour used for its preparation; height/width ratio; bulk productivity ($cm^3.100g^{-1}$ of loaf) – an expression of the ration between bread volume and weigh; bread yield (%) – express the relation between weight of bread loaf and used amount of flour for its production; baking loss (%). Baking loss is characterized as the bread weigh reduction after baking. It is determined according to dough weight before baking and bread weight, which was detected one hour after baking. Indicators were conducted using ICC standard method No 131. They were evaluated in three replicates and the results presented are means of the three realized measurement. All data were statistically analysed by analysis of variance (ANOVA) and Fischer test. The least significant difference at the 5% probability level (P value<0.05) was calculated for each parameter.

RESULTS AND DISCUSSIONS

Baking tests are used to assess the effects of factors such as wheat quality, dough additives and processing parameters on end-product quality. The evaluation of bread quality could be done with concrete and objective data (DOBRASZCZYK, 2008). Our research proved that all selected indicators were significantly influenced by the year of growing and variety of *T. spelta.*

The weight of baked products is influenced mainly by the weight of the dough piece before baking and thus by the water absorption and rheological quality of the flour used for the bread preparation. The average weight of bread loaves was 276.4g (table 1). The weight of bread measured after one hour cooling was statistically significantly affected by the variety and year of growing. Breads from the flour of Ostro and Rubiota had the same weight (277 g).

Many previous studies have used loaf volume and specific volume as a measure of loaf quality (DOBRASZCZYK, 2008; KOPPEL, 2010). The average volume of bread was $869.8cm^3$. The bread volume was statistically significantly influenced by the variety and year of growing. The lowest bread volume was found in Altgold ($804.2cm^3$). The volume higher than $900cm^3$ was observed in Rubiota ($962.5cm^3$).

The specific volume was in average $447.2cm^3.100g^{-1}$ of flour. Specific volume should be as high as possible. The bread with specific volume lower than $350cm^3.100g^{-1}$ of flour is characterized as unsatisfactory. Statistical analysis confirmed significant influence of the factor variety. The lowest specific volume, maximum $414.2cm^3.100g^{-1}$ was measured in Altgold. Specific volume higher than $450cm^3.100g^{-1}$ was found in Rubiota ($494.6cm^3.100g^{-1}$) and Ostro; flour of these spelt wheat varieties was of good quality.

Table 1

The indicators of direct baking quality of spelt wheat (*Triticum spelta* L.), average values for 2008-2009

VARIETY	DOUGH WEIGHT (g)	BREAD WEIGHT (g)	BREAD VOLUME (cm^3)	SPECIFIC VOLUME ($cm^3.100g^{-1}$)
Altgold	311,3 a	276,07 a	804,17 a	414,15 a
Ostro	313,6 a	277,08 b	883,33 c	453,58 c
Rubiota	313,8 a	277,22 b	962,50 d	494,63 d
Franckenkorn	311,1 a	275,19 a	829,17 b	426,30 b
YEAR				
2008	309,58 a	272,29 a	977,08 b	500,64 b
2009	315,30 b	280,48 b	762,50 a	393,70 a
average	**312,44**	**276,39**	**869,79**	**447,17**
standard error	±1,43	±0,95	±70,08	±35,68

Besides the loaf volume, the shape of loaves is characterized by calculating of height/width ratio. This is a relevant parameter because spelt bread tends to become flat (SCHOBER et al., 2006). The average height/width ratio was 0.78 (Table 2). It was significantly influenced by the variety and year of growing. In all spelt wheat breads, it overlapped 0.78 indicating good bread quality. Rubiota had the highest height/width ratio (0.84) when compared with the other spelt wheat varieties.

Table 2

The indicators of direct baking quality of spelt wheat (*Triticum spelta* L.), average values for 2008-2009

VARIETY	HEIGHT/WIDTH RATIO	BULK PRODUCTIVITY ($cm^3.100g^{-1}$)	BREAD YIELD (%)	BAKING LOSS (%)
Altgold	0,73 a	308,34 a	142,20 b	11,32 a
Ostro	0,78 b	319,79 a	142,43 b	11,60 a
Rubiota	0,84 c	348,34 b	142,47 b	11,72 a
Franckenkorn	0,77 b	301,99 a	141,61 a	11,55 a
YEAR				
2008	0,85 b	367,31 b	139,53 a	12,05 b
2009	0,71 a	271,77 a	144,82 b	11,05 a
average	**0,78**	**319,62**	**142,18**	**11,55**
standard error	±0,05	±20,52	±0,40	±0,17

Bulk productivity is another parameter used for prediction of bread-making quality. The average bulk productivity was 319.6$cm^3.100g^{-1}$ of loaf indicating good flour quality. The influence of the variety on the bulk productivity was significant. The highest bulk productivity was found in Rubiota (348.36$cm^3.100g^{-1}$).

The average bread yield was 142.2%. There was found statistically significant influence of the variety factor on this parameter. The lowest bread yield, less than 142% was found in Franckenkorn.

Baking loss – the reduction of bread weight after baking was in average 11.6%. The baking loss wasn't significantly influenced by the variety. Significantly lower values of baking loss were observed in 2009 (11.1%).

CONCLUSIONS

Our research proved that all selected indicators were significantly influenced by the variety and year of growing. The normal air temperatures and sufficient precipitation of 2008 reflected into the best dough properties of spelt wheat and baking quality when compared with

2009 (significantly the highest values of bread volume, specific volume, height/width ratio and bulk productivity).

Based on the direct indicators we consider the variety Rubiota as the most suitable and the best quality from the baking point of view. The bread from Rubiota was evaluated as having an excellent volume, specific volume, bread weight with a very good cambering and bulk productivity as well. Unexpectedly bad results have been found in Altgold, which showed the lowest bread volume, specific volume and height/width ratio.

Flour of Rubiota and Ostro according to specific volume, bulk productivity and height/width ratio was of good quality.

The spelt grain can be a good source for making bread flour, but it closely depends on choice of spelt variety. The recommended spelt variety is Rubiota for conditions of western Slovakia region.

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