

doi:<http://dx.doi.org/10.15414/afz.2015.18.si.01-03>

Indirect indicators of baking quality of organic emmer wheat

Veronika Curna, Magdalena Lacko-Bartosova *

Slovak University of Agriculture in Nitra, Faculty of Agrobiological and Food Resources, Department of Sustainable Agriculture and Herbolology

Emmer wheat (*Triticum dicoccon* Schrank, *Triticum dicoccum* Schubl.) is one of the oldest crops in the world. It belongs to the hulled wheat species which has been grown and used as a part of the human diet for a very long time. Presented results aimed at evaluation of selected indirect indicators of baking quality of four emmer wheat varieties (Agnone, Guardiaregia, Farvento, and Molise sel Colli) cultivated under the conditions of organic farming system in the south region of the Slovak Republic. The obtained results indicated that emmer wheat varieties had low content of gluten and sedimentation. Values of falling number depended on growing season with very high differences. According to achieved results we can conclude that emmer wheat varieties are not very suitable for baking purpose, but emmer can be used as porridge, groats, whole grains in traditional soups, pasta, pancakes and other food products.

Keywords: emmer wheat, *Triticum dicoccon* Schrank, indirect indicators of baking quality

1 Introduction

Organic farming is receiving increasing attention from consumers, citizen groups, the media, market players, and governments (David et al., 2005). In cereal production there is an increasing need for some kind of specialities, from which the ancient cereals, einkorn and emmer were a staple food for human population for more than 10000 years. The effects of organic production methods on food quality, safety and finally on livestock and human health are essential. According to recent knowledge, the use crop varieties are playing a crucial role in the production of "functional organic food" (Kovacs, 2008). Emmer wheat (*Triticum dicoccon* Schrank, *Triticum dicoccum* Schubl.) as functional food is an excellent source of several functional compounds, and is very useful in organic farming practice. It is a suitable alternative crop to the durum wheat, which has similar characteristics (Konvalina et al., 2011).

2 Material and Methods

Emmer wheat varieties - Agnone, Guardiaregia, Farvento, and Molise sel Colli were grown at the Research Experimental Station Dolna Malanta of the Faculty of Agrobiological and Food Resources of the Slovak University of Agriculture in Nitra on a Haplic Luvisol developed at proluvial sediments mixed with loess. The location has continental climate, belongs to warm agroclimatic region with predominantly mild winter with an average temperature during vegetative period 9.2 °C and average annual precipitation 518 mm. Four emmer wheat varieties were cultivated in randomized blocks under the conditions of organic farming system. Emmer wheat flour was prepared by using laboratory mill Brabender Quadrumat Senior.

Parameters of indirect baking quality – falling number (s), wet gluten (%), gluten index (%), and Zeleny test (ml) were investigated in three repetitions. Falling number was determined

* **Correspondence:** Magdalena Lacko-Bartosova, Slovak University of Agriculture in Nitra, Department of Sustainable Agriculture and Herbolology, Tr. A. Hlinku 2, Nitra 949 76, Slovak Republic. E-mail: magdalena.lacko-bartosova@uniag.sk

by Falling number (Perten) according to ICC Standard 107/1 and STN 46 1100-2, wet gluten content was determined according to ICC Standard No. 155 by the Glutomatic 2200, Gluten index by Glutomatic Centrifuge. Zeleny test was determined according to ICC 116/1 and ISO 5529 (Lacko-Bartosova et al., 2012). Achieved data were statistically analysed by analysis of variance (ANOVA) in STATISTICA 7.0. Significant differences were evaluated by Fisher's least significant difference (LSD) test at $P < 0.05$.

3 Results

The falling number detects damage of storage matter of grain wheat endosperm by hydrolytic enzymes, which are synthesised in consequence of germination before harvest in grain (Konvalina et al., 2008).

The falling number which is the indicator of enzymatic activity was influenced by the variety and growing season. Regarding to the weather conditions, there was a significant difference between 2010-2011 (64s) and 2011-2012 (443s) growing season. Very high enzymatic activity was determined in 2010-2011 when wet weather during June could influence this parameter negatively. Average value of the falling number was 254s and ranged between the varieties from 252s (Agnone) to 263s (Molise sel Colli).

Wet gluten and gluten index (GI) are indicators closely related to the baking quality of flour (Lacko-Bartosova et al., 2012). The lowest allowed value for common wheat according to STN is 25 %. The average wet gluten content in four emmer wheat varieties was about 10 % and ranged from 3.2 % (Farvento) to 20.6 % (Molise sel Colli). Differences between varieties were significant. Wet gluten content was significantly influenced by the year of growing. Significantly higher content of wet gluten was during 2011-2012 growing season (15.2 %) than in 2010-2011 (only 4.9 %). GI was 22.5 % in average. Statistical analysis showed high influence of the variety on this parameter. The year of growing did not affect this parameter. Significantly the highest value of GI was achieved by Agnone (33.3 %). The remaining three varieties had significantly lower values of GI 25.3 % (Molise sel Colli), 17.9 % (Farvento) and 13.5 % (Guardiaregia). Low values of GI are characterised by weak gluten which is not suitable for bakery processing.

Sedimentation value determines viscoelastic character of gluten albumines and their quality which provide fermentative processes in dough (Konvalina et al., 2008). Zeleny test is based on the use of bread flour. The composition of flour depends strongly on the moisture content of grain when being ground (Lacko-Bartosova et al., 2011). The average sedimentation value according to Zeleny test was 14.6 ml. Significantly the lowest value was observed in Farvento (12.2 ml). Significantly the highest value was reached in Molise sel Colli (15.8 ml). According to weather conditions significantly higher sedimentation value was found in 2011-2012 growing season (16.8 ml) than in 2010-2011 (12.4 ml). The sedimentation values are low in both years of growing. None variety achieved the value of STN 46 1100-2 which is determined as minimum for category A for common wheat (min. 25 ml).

4 Conclusions

Indirect baking quality parameters of four emmer wheat varieties cultivated in organic farming system in the south region of the Slovak Republic were analysed in our study.

The achieved results indicated that emmer wheat varieties had very low content of gluten. Gluten of emmer was weak with indication for lower suitability in bakery applications. The values of falling number depended on the year of growing. During 2010-2011 was enzymatic activity too high, during 2011-2012 too low. According to our findings we can conclude that emmer flour is not very suitable for baking purposes. That is also confirmed by relatively low values of sedimentation. Nevertheless, emmer can be used as human food, mainly like porridge, groats, whole grains in traditional soups, pasta, pancake or baby food. The market

is driven also by consumer perception that the products can answer the demand for safer and healthier foods.

5 Acknowledgements

The research presented in this work was supported by project VEGA No. 1/0513/12 "Research of agroecosystems to reduce climate change, ecological food production and improve nutrition and health parameters of human", and by the project ITEBIO "Support and innovations of a special and organic products technologies for human healthy nutrition" ITMS: 26220220115, implemented under Operational Programme Research and Development.

References

- DAVID, CH., GELINAS, P., BONDI-ANKOMAH, S., HENNING, J. (2005) Organic Grains and Products. Emmer Wheat. In: ABDEL, E., AAL, E., WOOD, P.J. (eds) *Specialty Grains for Food and Feed*. St. Paul, Minnesota: American Association of Cereal Chemistry, pp. 7-35.
- KONVALINA, P., MOUDRÝ, J. jr., MOUDRÝ J. (2008) Quality parameters of emmer wheat landraces. In *Journal of Central European Agriculture*, vol. 9, no. 3, pp. 539-546.
- KONVALINA, P., CAPOUCHOVA, I., STEHNO, Z., MOUDRY, J. jr., MOUDRY, J. (2011) Spike productivity in relation to yield as a criterion for emmer wheat breeding. In *Romanian Agricultural Research*, vol. 28, pp. 49-56.
- KOVACS, G. (2008) Ancient cereals: einkorn and emmer as a source of healthy organic food. Poster at the 4th European Research & Innovation Exhibition, 5-7 June 2008.
- LACKO-BARTOSOVA, M., KORCZYK-SZABO, J. (2011) Indirect baking quality and rheological properties of spelt wheat (*Triticum spelta* L.). In *Research Journal of Agriculture Science*, vol. 43, no. 1, pp. 73-78.
- LACKO-BARTOSOVA, M., KORCZYK-SZABO, J. (2012) Technological properties of spelt - amaranth composite flours. In *Research Journal of Agriculture Science*, vol. 44, no. 1, pp. 90-93.