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Emmer wheat – Production parameters

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The objective of the present work was to evaluate the influence of growing season and variety on quantitative parameters (the total number of stems per m² (pcs), the number of productive tillers per square m (pcs), the average length of the stem and spike (cm), the number of fertile spikelets (pcs), the number of grains per spike (pcs), weight of grains per spike (g), the weight of thousand grains (g), the share of glumes (%), harvest index, the theoretical yield (t ha⁻¹) of four emmer wheat varieties (Agnone, Farvento, Guardiaregia, Molise sel Colli) grown under the conditions of organic farming in the south of Slovakia. The experiment was established on Scientific Research Base Dolna Malanta near Nitra during 2010–2011 and 2011–2012 growing seasons. Seven quantitative parameters were significantly influenced by the weather conditions. Tasted varieties showed lower influence on quantitative parameters. Only four out of twelve parameters were influenced by the variety. The best adaptable emmer wheat varieties to growing conditions of the south region of the Slovak Republic were Agnone and Guardiaregia which were characterized by the highest theoretical yield and other parameters. Emmer wheat is suitable, advantageous and profitable crop when cultivated under conditions of organic agriculture from the point of its agronomic characters.

Keywords: emmer wheat, *Triticum dicoccon* Schrank, organic production, quantitative parameters

1 Introduction

The cultivated hulled wheats (einkorn, emmer, and spelt) known in Italy under the common name of “farro”, are among the most ancient *Triticeae* cultivated in the world and have long represented a staple food. As early as Roman times, hulled wheats began to be replaced by higher-yielding, free-threshing wheats. However, the move in recent years towards more natural foods and sustainable agriculture and the rediscovery of ancient foods and flavours have brought renewed interest in these neglected species (Marconi, Cubadda, 2005). Emmer wheat (*Triticum dicoccon* Schrank) is one of the earliest domesticated plants and has been a staple crop over millennia (Nesbitt, Samuel, 1996). Now, it is a minor crop, cultivated mainly in isolated, marginal areas. Its main value lies in its ability to give good yields on poor soils and resistance to fungal diseases (Arzani, 2011). Emmer is characterized by persistent enclosing hulls, tough glumes and a rachis that disarticulates at maturity. Spikes are dense, laterally compressed, narrow and generally awned. The pedicel is short, narrow and pointed. Spikelets are flattened on the inner side, and usually contain two flowers. Kernels are red or white, long and slender, and acute at both ends. Glumes are often pubescent. Emmer (like other hulled wheats) has a thinner pericarp than non-hulled wheats (Zaharieva et al., 2010).

2 Material and Methods

Field stationary experiments were carried out at the Research Experimental Station (Dolna Malanta) of the Faculty of Agrobiolgy and Food Resources of the Slovak University of Agriculture in Nitra. Field experiments were established during 2010-2011 and 2011-2012 growing seasons on a Haplic Luvisol developed at proluvial sediments mixed with loess. The

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location has continental climate, belongs to warm agro-climatic region with predominantly mild winter. The average temperature for 2010-2011 vegetation period was 8.61 °C; precipitations were 339.10 mm. The average temperature for 2011–2012 vegetation period was 9.59 °C; precipitations were 305.30 mm. Four emmer wheat varieties were cultivated in randomized blocks under the conditions of organic farming system.

Quantitative parameters: the total number of stems per m² (pcs), the number of productive tillers per m² (pcs), the average length of the stem and spike (cm), the number of fertile spikelets (pcs), the number of grains per spike (pcs), weight of grains per spike (g), the weight of thousand grains (g), the share of glumes (%), harvest index, the theoretical yield (t ha⁻¹) were analyzed after harvesting. The weight of grains per spike, the weight of thousand grains and theoretical yield were recalculated to a humidity of 14 %. Achieved data were statistically analyzed 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 objective of the present work was to evaluate the influence of growing season and variety on selected production parameters of four emmer wheat varieties (Agnone, Farvento, Guardiaregia, Molise sel Colli) grown under the conditions of organic farming in the south Slovakia.

The average theoretical yield of emmer wheat varieties was 7.09 t ha⁻¹, no significant differences between varieties were determined. Spike length was in average 9.60 cm which contained 19.3 pcs of fertile spikelets, 34.2 grains with the weight of 1.63 g. Significantly the highest weight of grains had Guardiaregia (1.88 g) and the remaining three varieties reached lower, statistically equal values. TGW was 47.6 g, significantly highest was achieved in Guardiaregia (54.5 g) and the lowest in Molise sel Colli (44.8 g).

The share of glumes was 28.16 %. Seven, out of twelve production parameters (the total number of stems per m², the number of productive tillers per m², the average length of the stem, the number of fertile spikelets, the number of grains per spike, the share of glumes, the theoretical yield) were significantly influenced by the weather conditions. Four parameters (the length of spike, the weight of grains per spike, TGW, harvest index) were influenced by the variety and were not influenced by weather conditions.

The best adaptable emmer wheat varieties to growing conditions of the south region of the Slovak Republic were Agnone and Guardiaregia which were characterized by the highest theoretical yield (Agnone – 7.40 t ha⁻¹, Guardiaregia – 7.66 t ha⁻¹) and other production parameters. Better weather conditions for emmer wheat cultivation was in 2010–2011 growing season when the air temperature was more stable although growing season was characterized as dry.

4 Conclusions

Production characters of four emmer wheat varieties cultivated in organic farming system in the south region of the Slovak Republic were analysed in our study. Weather conditions during experimental years showed higher influence on selected production parameters than tested varieties. From the two year analysis it is clear that Agnone and Guardiaregia varieties had the best developed spike as the weight and number of grains per spike was the highest. TGW of Guardiaregia overlapped 54 g; TGW of Agnone reached value 45.62 g. Better growing season for emmer wheat cultivation was in 2010–2011 in which higher number and weight of grains per spike, higher theoretical yield compared to 2011–2012 growing season was achieved. According to our findings emmer wheat is suitable, advantageous and profitable crop when cultivated under conditions of organic agriculture. We could recommend its cultivation for the south part of the Slovak Republic.

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