Quality and quantity of winter wheat varieties in 22 years' time range

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Abstract: The Nagygombos experiments of the Szent István University, Gödöllő, Hungary have always been a testing area for various agronomic technologies as well as a research site for evaluating the performance of crop varieties. The present paper is intended to give an overview of 18 winter wheat *Triticum aestivum* L. varieties tested during the time range between 1996 and 2018. All of the varieties were studied under similar agronomic conditions, each of them for min 3 years in a series of a polyfactorial replicated field trial. The 120 kg/ha N plant nutrition applications of the respective crop years were processed in the evaluation. Amount of grain yield, protein %, wet gluten content and farinographic values of the varieties examined were compared. The results obtained suggest, that most of the varieties had a rather high variation concerning yield figures, however protein and farinographic indicators proved to be more stable characteristics. Wet gluten content was influenced mainly by the crop year. The study may support a conclusion that certain varieties have shown a higher stability in technological quality manifestation regardless to the amount of their grain yield. Alföld 90, Yubileynaya 50, Mv Magdaléna and Mv Toldi varieties proved to be the best quality varieties in this research series.

Keywords: wheat, quality, quantity, long term trial

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Introduction

Environmental conditions are highly influential regarding crop quality and quantity performance. Grain yield and yield quality of winter wheat *Triticum aestivum* L. is highly influenced by the meteorological conditions of the given crop year, especially the amount and distribution of precipitation and the actual temperature (GRIMWADE ET AL 1996, GYŐRI 2008, PEPÓ 2010). Crop yield and grain quality can also be influenced by agronomic applications. Plant nutrition in general and N topdressing in particular should be considered as the most effective treatments within the technologies of winter wheat production. The amount of nitrogen and the timing and distribution of the application have an impact on wheat quality, especially on the protein production of the crop (GYŐRI 2006, PEPÓ 2010). Wheat varieties may have different responses to agro-ecological impacts (VIDA ET AL 1996; MESTERHÁZY 2019). Varietal differences are to be evaluated in long term trials to reduce the impact of variable crop year effects (KISMÁNYOKY AND RAGASITS 2003).

Materials and Methods

A wide range of high milling and baking quality winter wheat *Triticum aestivum* L. varieties were examined under identical agronomic conditions in a long term field trial. The small plot trials were run at the Nagygombos experimental field of the Szent István University, Crop Production Institute, Hungary. Soil type of the experimental field is chernozem (calciustoll). Annual precipitation of the experimental site belongs to the 550-600 mm belt of the Northern edges of the Hungarian Great Plain. Experiments were conducted in a split-plot design with four replications. The size of each plot was 10 m^2. Plots were sown and harvested by plot machines (standard Wintersteiger cereal specific experimental plot machinery series). Various identical agronomic treatments were applied to plots. Plant nutrition applica-

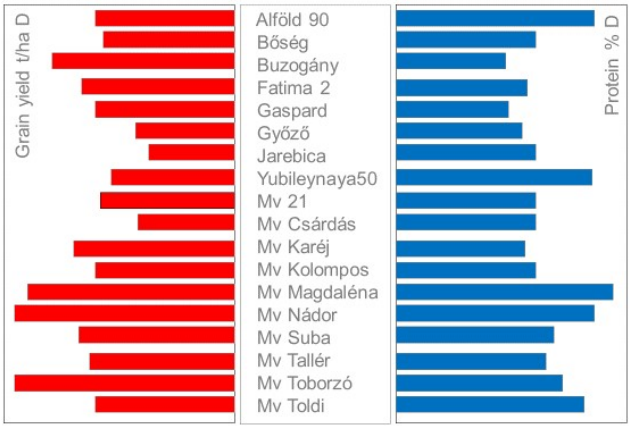

Figure 1. Grain yield and protein content of wheat varieties Nagygombos, 1996-2018.

	Wet gluten content	Quality class
Alföld 90	28-38 %	A1 – B1
Bőség	21-27 %	B2 – C1
Buzogány	22-27 %	B1 – C1
Fatima 2	25-29 %	A2 – B2
Gaspard	21-26 %	B1 – C1
Győző	22-25 %	B2 – C2
Jarebica	23-28 %	B1 – C1
Yubileynaya 50	26-35 %	A1 – B2
Mv 21	26-32 %	A2 – B2
Mv Csárdás	25-32 %	A2 – B2
Mv Karéj	23-33 %	A2 – C1
Mv Kolompos	25-31 %	B1 – C1
Mv Magdaléna	26-38 %	A1 – B2
Mv Nádor	26-35 %	A2 – B1
Mv Suba	23-30 %	B1 – B2
Mv Tallér	24-30 %	B1 – B2
Mv Toborzó	25-37 %	A2 – C1
Mv Toldi	25-38 %	A1 – B2

Figure 2. Wet gluten content and quality classes of wheat varieties Nagygombos, 1996-2018.

tions were done in single and combined treatments. N topdressing variants were applied by single and repeated topdressings representing 6 levels: 0, 80, 80+40, 120, 120+40 and 160 kg/ha N in single and split applications. All plots were sown with identical series of wheat varieties for studying their performance in relation with agronomic impacts. The present paper is intended to give an overview of 18 winter wheat *Triticum aestivum* L. varieties tested during the time range between 1996 and 2018. All of the varieties were studied under similar agronomic conditions, each of them for min 3 years in a series of a polyfactorial replicated field trial. The 120 kg/ha N plant nutrition applications of the respective crop years were processed in the evaluation for both yield and quality parameters. Wheat grain quality parameters: protein and wet gluten contents were determined from grain samples, as well as quality characteristics at the Research Laboratory of the SIU Crop Production Institute, and RET Regional Knowledge Centre

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laboratories according to Hungarian and EU standards (MSZ 1998; EK 2000, HORVÁTH 2014). During the examined period levels of fusarium head blight (*Fusarium graminearum*) infection were detected in the wheat trials.

Results

During the 22 years of the experimental series many varieties had been studied in the trials (JOLÁNKAI ET AL 2018). In this paper only those are introduced which were tested for minimum 3 years at the Nagygombos site. Amount of grain yield, protein %, wet gluten content and farinographic values of the varieties examined were compared. The results obtained suggest, that most of the varieties had a rather high variation concerning yield figures, however protein and farinographic indicators proved to be more stable characteristics. Wet gluten content was influenced mainly by the crop year.

Figure 1 provides information on grain yield and protein content of the varieties. Buzogány, Mv Magdaléna, Mv Nádor, Mv Toborzó were the highest yielding varieties during the examined years. The study may support a conclusion that certain varieties have shown a higher stability in quality manifestation regardless to the amount of their grain yield. *Figure 2* presents information on the quality ranges of the varieties summarising the wet gluten content and the baking quality groups. Alföld 90, Yubileynaya 50, Mv Magdaléna and Mv Toldi varieties proved to be the best quality varieties in this research series.

During the examined period fusarium head blight infection had been monitored in all years. According to the data presented in *Figure 3* it can be stated, that except few extreme years the Nagygombos experimental site was not exposed to severe fusarium head blight infections. There were two peaks with high infection: 1997 to 1999 was a strong infection period followed by an almost 10 years' free period of Fusarium sp. The next peak occurred in 2010. Both high infections were escorted by extreme weather conditions – like water flood during the pre harvest vegetation period.

Discussion

According to the results obtained it should be emphasized that the quantity and quality parameters of any crop varieties are to be examined in polyfactorial long term trials that may provide the researcher identical conditions to exclude unfavourable factors and buffer the crop year effects.

The authors are sorry to inform the LOTEX participants that in 2018 year the Nagygombos experimental site of the SIU Crop Production Institute had to be terminated. *Figure 4* attached presents a satellite photo of the experimental site from 2016. We do hope, that preserving the main blocks of the experimental design, once the trial can be restarted again.

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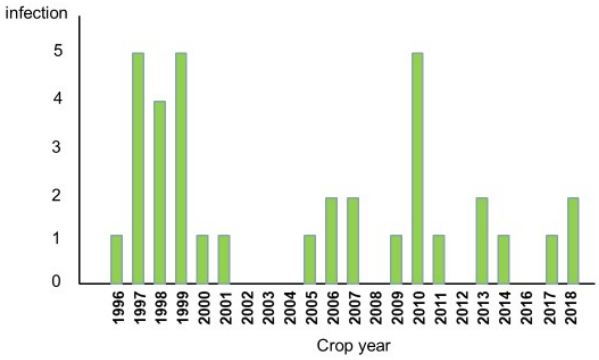

Figure 3. Occurence of fusarium head blight infection in wheat trials Nagygombos, 1996-2018.

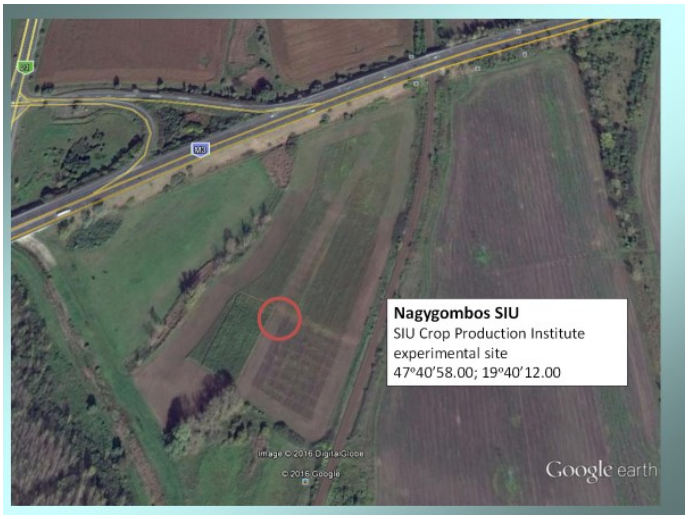

Figure 4. Satellite photo of the Experimental site of the SIU Crop Production Institute Nagygombos, 2016.

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