The Behavior of Some Autumn Wheat Varieties in the Conditions of the Transilvania Central Area

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Abstract. The goal of this paper is to monitor and reveal the behavior of 10 varieties of autumn wheat in two different climatic zones from Transylvania central areas (Turda and Targu Mures), under the action of agrofond. In order to achieve this study we used samples of wheat from 2009 – 2010 harvest year. To determine the quality of wheat were analyzed three wheat quality parameters (protein, wet gluten, sedimentation index). In the conditions of Turda and Targu Mures areas, in the 2009/2010 year crop, Josef has registered the highest values, followed by wheat variety Turda 2000 and Dropia variety and the lowest values were obtained from Serina wheat variety. In the Targu Mures area were registered higher values for protein content, wet gluten and sedimentation index compared with the Turda culture area and in terms of application of fertilizers containing nitrogen and phosphorus, these have influenced the quality parameters in positively way, resulting in very significant positive values compared to the unfertilized control variant.

Keywords: autumn wheat, quality, environmental conditions, fertilization

INTRODUCTION

Wheat is one of the most important food plants, representing fed for 35-40% of the population. On the cultivated areas and productions obtained is considered the second plant wheat crop after rice, maize and rice together providing more than half the global requirement of calories and protein (Bioversity International, 2007).

The knowledge of wheat biological peculiarities is the key step in both genetic and improvement studies and in the research on cultivation technology and then processing technology which aims to printed of some quality characteristics to ensure high quality products.

For the increase of stability yields from year to year, new varieties of autumn wheat to combine high production potential and a good resistance to biotic and abiotic stress conditions (Săulescu şi colab., 2006).

Strong interactions between genotype and environment are complex, both because of very different environmental factors and varietal character and characteristics. Climate change lately have emphasized the extreme variations, with serious consequences for agricultural production (Săulescu şi colab., 2006).

The goal of this paper is is to monitor and reveal the behavior of 10 varieties of autumn wheat in two different climatic zones from Transylvania central areas (Turda area and Targu Mures area), under the action of Agrofond. In order to achieve this study we used samples of wheat from 2009 – 2010year harvest. To determine the quality of wheat were analyzed three wheat quality parameters (protein, wet gluten, sedimentation index).
MATERIALS AND METHODS

Were analyzed ten autumn wheat varieties from the 2009 – 2010 year harvest grown in SCDA Turda and SCDCB Targu Mures. These wheat varieties were subjected to an polifactoriale experience that the following factors and dosing.

**Factorul A** – the area of culture with the following ranges:
A1 – Turda (Mt.)
A2 – Targu Mures

**Factorul B** – base fertilization, with the following ranges:
B1 – unfertilized (Mt.)
B2 – fertilized with N\textsubscript{40}P\textsubscript{40}

**Factorul C** – variety, with the following ranges:
C1 – Arieșan (Mt.)
C2 – Apullum
C3 – Dumbrava
C4 – Turda 2000
C5 – Exotic
C6 – Faur
C7 – Serina
C8 – Glosa
C9 – Josef
C10 – Dropia

The experiments were located in three repetitions rigorously respecting wheat cultivation technology to highlight the experimental factors follow.

Soil tillage consisted of stubble-turning with a disc harrow, followed by plowing at 20 cm and two works with disc harrow for seedbed formation, the previous plant used being a spring mash plant.

Climatic conditions in 2009-2010 showed large differences from one area to another in terms of the hydric regime. These differences determined a specific reactions of wheat (Fig. 1 and 2).

![Fig. 1 Monthly temperatures registered at Turda and Targu Mures during 2009-2010](image-url)
In order to determine the influence of climatic conditions, a variety of organic fertilizers and treatments applied to the quality parameters of wheat, but also to establish relationships between stakeholders, experimental data were processed statistically using the variance analysis method for this purpose. Determination of the degree of association between different quality parameters were made by analyzing correlations and their relationship was described by calculating linear regression.

RESULTS AND DISCUSSIONS

The representative ecological factors, regarding the different pedo-climatic conditions of the culture areas can influence the accumulation of protein and gluten in wheat grain, and also their quality, by changes of temperature and precipitation, especially during grain filling and soil characteristics of specific growing areas.

The experience made at SCDA Turda and SCDCB Targu Mures, in the 2009/2010 year harvest, considered as normal by thermal conditions, but excessive in rains conditions in both culture areas, all the quality parameters analyzed showed significant and significant positive values by report to the culture area from Turda, considered as blank (table 1). This proves that with the favorable influence of climatic conditions of the area can also interact other ecological factors which have’t been studied. Such the protein content increased with 0.36% (11.94% of the SCDA Turda, from 12.30% to SCDCB Targu Mures), wet gluten content increased with 1.26% (26.51% of the SCDA Turda, from 27.77% to SCDCB Targu Mures) and Zeleny sedimentation index increased from 35.75 ml in SCDA Turda, to 37.78 ml (+2.03) in Targu Mures SCDCB.
An important factor on the quality of wheat is the agrofondul, which by its different amounts of nitrogen and phosphorus given to the plants can influence the accumulation of gluten proteins from the wheat grains with repercussions on their qualitative characteristics.

In the experiments realized at SCDA Turda and SCDCB Targu Mures in the 2009 – 2010 year harvest, ten varieties of wheat have been cultivated on the fertilized and non-fertilized agrofond, with a dose of nitrogen and phosphorus N40P40 kg / ha.

From the statistical data analyze presented in the table 2 can be noticed very significant positive changes for all the analyzed quality parameters. The presence of nitrogen and phosphorus doses is strongly felt by the protein content which is increased from 11.01% to 13.23% (+2.22) , the wet gluten which increases from 23.29% to 30.98% (+7.69) and the Zeleny sedimentation index which increases from 28.34 ml to 45.19 ml (+16.85).

The variety is one of the most important factors in wheat culture technology, because its quality depends in a relatively high genetic potential of each variety.

The wheat variety Arieșan was used as a blank in the analyzed experiences being the most cultivated variety in the research areas. The values of quality parameters analyzed were
12.25% for protein content, 27.38% for wet gluten content and 36.59 ml for index sedimentation content.

Based on the statistical data analysis was noticed that for the majority of wheat varieties taken into study, significant negative or insignificant differences were noticed reported to Arieșan variety considered blank sample. An exception was made by Josef wheat variety which shown very significant positive differences for all the analyzed qualitative parameters, with an increase of +0.83% for protein content (fig. 3), +3.60% for wet gluten content (fig. 4) and +7.28 ml for Zeleny sedimentation index (fig. 5).

Josef wheat variety was followed by Turda 2000 wheat variety, which showed significant differences in protein content (+0.11 compared to the blank) (fig. 3), very significant positive differences in wet gluten content (+0.52% to of blank) (fig. 4), and Zeleny sedimentation index (+1.85 ml compared to the blank) (fig. 5).

For the association value of quality parameters analysis from three wheat breeds harvested at SCDA Turda in the 2007 – 2010 experimental years and also for ten wheat breeds harvested in the same conditions and in the same experimental year (2009-2010), but in different areas at SCDA Turda and at SCDCB Targu Mures, it was calculated correlation coefficients (r ). Studying the existent relationships between the analysed quality parameters has a great impact in mill and bakery products industry, by allowing the selection of wheat
breeds with several optimal quality parameters for bakery, but it also draws us attention of how difficult it’s to achieving these requirements.

The results regarding the correlation coefficients between studied quality parameters from those ten autumn wheat breeds from SCDA Turda and SCDCB Targu Mures are illustrated in table 3.

The correlation coefficients between quality parameters at 10 wheat varieties grown in Turda and Targu Mures (2009/2010)

<table>
<thead>
<tr>
<th>Quality parameters</th>
<th>TURDA</th>
<th>TARGU MURES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protein content, %</td>
<td>Wet gluten, %</td>
</tr>
<tr>
<td>Protein content %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wet gluten, %</td>
<td>0.9937***</td>
<td>1</td>
</tr>
<tr>
<td>Zeleny index, ml</td>
<td>0.9574***</td>
<td>0.9633***</td>
</tr>
</tbody>
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For a more precise examination of correlations found in autumn wheat, between bread manufacturing quality parameters, regressions were made for the most important attributes.

The association of protein content with the wet gluten from the experiment realized at SCDA Turda and at SCDCB Targu Mures in 2009/2010 year harvest(fig. 6), it can be seen that for autumn wheat breeds the association is described by an regression line with a strong ascending slope (b=3.48) at SCDA Turda and (b=3.45) at SCDCB Targu Mures, which shows that the wet gluten is direct proportional with protein content.

![Fig. 6 The relationship between protein content and wet gluten at ten varieties of winter wheat (Turda and Targu Mures, 2009/2010)](image)

The determination coefficient ($R^2$) calculated show that the total variation of wet gluten content 98% (SCDA Turda) and 96% (SCDCB Targu Mures) is determined by the variation of protein content.
A very tight relationship between the protein content and the sedimentation index is described by the regression line with a slope $b=6.48$ and $b=8.18$ (SCDA Turda and SCDCB Targu Mures, 2010) (fig. 7), a natural relationship stating that sedimentation index characterizing protein quality.

The determination coefficient $R^2$ has high values, 0.9167 and 0.9637 (SCDA Turda and SCDCB Târgu Mureș, 2010), which means that the sedimentation index variation is determined in proportion of 91% and 96% by the protein content variation.

In fig. 8 are graphically represented the relationships between wet gluten content and Zeleny index content for autumn wheat breeds from SCDA Turda and SCDCB Târgu Mureș 2009/2010 year harvest.

The determination coefficient ($R^2$) calculated indicates that from total variation of Zeleny index, 92% and 88% (SCDA Turda and SCDCB Târgu Mureș, 2010) is determined by the variation of wet gluten content.
CONCLUSION

- In the Targu Mures area of culture were recorded higher values for protein content, wet gluten and sedimentation index, resulting in significant and distinct values significantly from Turda culture area, considered a blank;
- To the application of nitrogen and phosphorus fertilizers, they influenced the quality parameters positively, resulting in very significant positive values to the unfertilized control variant;
- In the conditions of the SCDA Turda and SCDCB Targu Mures, in the 2009/2010 agricultural year, Josef wheat variety showed the highest values, followed by wheat variety Turda 2000 and Dropia next to Serine wheat variety with the lowest values recorded.
- From the analysis of correlations between quality parameters obtained by wheat crop in the same conditions, but in the different cultural areas (Turda and Targu Mures), we remark highly significant correlations between all parameters analyzed, with small differences, influenced by climatic conditions of the areas culture;
- With the help of linear regression was established very close relationship between quality parameters analyzed.

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