Quality Studies of Wheat Romanian Varieties from N-V of Transilvania

Simona MAN¹, Sevastiţa MUSTE¹, Constanţa MODORAN¹, Anamaria BIROU (POP)¹, Anamaria POP¹, Rodica KADAR²

¹University of Agricultural Sciences and Veterinary Medicine, Faculty of Agriculture, 3-5 Mănăştur street, 400372, Cluj-Napoca, Romania
²Institut of Research and agriculture Development, 27 Agriculturii street, Turda, e-mail: man_simo07@yahoo.com

Abstract. The purpose of this project is to show Ariesan, Apullum and Dumbrava wheat qualities, by exposing them to some agents to S.C.D.A. Turda. The quality value parameters of this wheat varieties, in S.C.D.A.Turda climate, obtained in 2008 are between normal limits established by standards, is strongly influenced by biological factors, ecological and technological.

Key words: varieties, autumn wheat, treatments applied, characteristics, quality, results.

INTRODUCTION

Wheat was, is and will remain that basic cereal for human food since ancient times. No food does meet the requirements of economic principles in human nutrition and active as bread wheat and hence the importance of quality raw material from which to obtain, especially in terms of its protein content.

On these considerations have added that the wheat is grown in over 100 countries and is the most important raw material for making bread. The especial importance of wheat is the motive for wheat area are very extensive so, different qualities to the same variety are the result of environmental factors that affect crop quality.

Improving the panification characteristics of wheat has been and is currently a target of great significance, creating varieties of wheat with good qualites is currently a priority task of scientific research.

Such concern has been to S.C.D.A. Turda too, were as a result of the improvement works have been created and approved in recent years a number of new wheat varieties: Transilvania, Turda 81, Ariesan, Apullum, Turda 95, Turda 2000, and recently Dumbrava, varieties that have been processed in big culture with great results.

In this paper we proposed to present some of the results regarding the panification characteristics of wheat varieties: Ariesan, Apullum and Dumbrava.

The „Ariesan” autumn wheat variety was created by sexual hybridization followed by repeated individual selection, from hybrid combination Rubin/Turda 141 – 65, approved in 1985. It is part of Triticum aestivum species, ssp vulgare, var. ferrugineum having spicul aristos, red, flat gluma, big grain, red.

Variety of wheat grain Arieşan meet characters of forest grains. It is an early and productive variety, which better exploit the fertile soils and poorer too.

Regarding the physiological characteristics, Arieşan wheat variety presents a fairly good stability in production, due to ecological plasticity and its adaptability to different environmental conditions and culture. Thus, frost resistance of Arieşan variety is assessed as
suitable for the culture in center and north of the country, also wintering resistance is generally good, far superior to other early and intensive varieties.

Arieșan wheat variety is remarkable by increased resistance to the unfavorable action of environmental factors and to attack of diseases and pests. Arieșan variety was cultivated on fertile land of Transylvania Plateau and Plain (Campia și Podisul Transilvaniei), and in cold and wet areas with podzolice soils, this variety having good tolerance to excess water and soil toxicity caused by accumulation of aluminum ions.

*The „Apullum” autumn wheat variety* was created by repeted individual selection with pedigree method, by hybrid combination of Odessaia 75/Bezoastaia 1, approved in 1992. It is part of the species *Triticum aestivum, ssp vulgare, var. erythrospermum* having spicul aristos white, glabrous gluma, middle oval grain, red.

From a production-capacity point of view, the Apullum variety is distinguished by a high production potential, associated with a multitude of agronomical characteristics that give it a good adaptive capacity to diverse climatic/soil and technological conditions. Is a productive variety, highly resistant to frost having the capacity to form big fields, improving both fertile lands and cold wet soils with reduced fertility.

Apullum variety is a very suitable variety for cultivation in areas with large variations in environmental conditions, achieving high and stable production.

Regarding the quality characteristics, Apullum variety has remarkable milling and bakery features, appropriate manufacturing and consumer demands, falling into a group of good grain quality.

*The „Dumbrava” autumn wheat variety* was created to S.C.D.A. Turda, being approved in 2003. Spicul has medium density, aristos, white at maturity, red grain.

Regarding the physiological characteristics of variety, is resistant to hibernation, middle resistant to drought.

In terms of quality, Dumbrava variety is included in higher grain group, with a greater production capacity than other varieties. It recomandes cultivation in favorable area for wheat autumn of Northern Transylvania and Northern Moldavia.

**MATERIAL AND METHOD**

Were analyzed samples of Arieșan, Apullum and Dumbrava wheat varieties of harvest in 2008 from S.C.D.A. Turda. These wheat varieties were subjected to an polifactoriale experience that the following factors and dosing.

A Factor - base fertilization with macroelements following dosing:

- **A1** N50P50K50 kg/ha at sowing
- **A2** N50P30K50 kg/ha at sowing + N50P30 kg/ha at the resumption of vegetation in spring

**Factorul B** – variety of wheat which was treated with insecto-fungicide (Yunta) following dosing:

- B1 – Arieșan
- B4 – Apullum
- B5 – Dumbrava

**Factorul C** – the vegetation complex control and protection of the culture from disease and pests with 8 levels comprising combinations of treatments with foliar fertilizers, fungicides and insecticides to 4 points in the phenomenology important in wheat growing season.
Of the 8 experimental levels research we chose the following dosing:

- fenofaza end twin step bellows flowering
- vegetation  
- herbicide step

<table>
<thead>
<tr>
<th></th>
<th>IF + IS</th>
<th>IF</th>
<th>IF+FG+IS</th>
<th>IF+FG+IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>IF + IS</td>
<td>IF</td>
<td>IF+FG+IS</td>
<td>IF+FG+IS</td>
</tr>
<tr>
<td>C3</td>
<td>-</td>
<td>IF+IS</td>
<td>IF+FG+IS</td>
<td>IF+FG+IS</td>
</tr>
<tr>
<td>C4</td>
<td>-</td>
<td>IF+IS</td>
<td>-</td>
<td>IF+FG+IS</td>
</tr>
<tr>
<td>C6</td>
<td>IF+IS</td>
<td>IF+IS</td>
<td>-</td>
<td>IF+FG+IS</td>
</tr>
</tbody>
</table>

Legend:  
IF – foliar fertilizers;  
FG – fungicides;  
IS – insecticides.

Polyfeed 19:9:19 + microe.5kg/ha foliar fertilizer was used in all 4 phenology times during the growing season of wheat. Insecticide Calypso was used 100 ml / ha to the vegetation resumption and to the end of twin step, and the bellows fenofaza and flowering was used roteus 0.4 l / ha.

Fungicides used were: Sportak 1kg/ha to end of twin step, Falcon 480 EC 0.6 l / ha in bellows fenofaza and Prosaro 1l/ha in fenofaza flowering.

At the end of înfratitului has been erbicidare with Sekator OD Progress 0135 kg / ha + Esteron 0.5 l / ha and bellows fenofaza and flowering was used as adjuvant Trend 0.3 l / ha.

Preceding wheat crop is soy.

Samples made according to Stas and physico-chemical quality analysis were conducted in the Food Quality Control laboratory, from USAMV Cluj-Napoca, V TPPA.

Were determined following quality indices: impurity, relative humidity (UR%), test weight (MH kg / hl), wet gluten (% GU), the index of deformation (mm ID), expansion index (IE cm), index gluten (GI) index falls (FN sec), the protein content and ash content.

RESULTS AND DISCUSSION

In Tab. 1, Tab. 2 and Tab. 3 are presented values of quality indices followed to all of experimental variants of wheat varieties Arieșan, Apullum and Dumbrava.

Tab. 1

<p>| | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nr.</td>
<td>Variant</td>
<td>CS</td>
<td>UR</td>
<td>MH</td>
<td>GU</td>
<td>ID</td>
<td>IE</td>
<td>GI</td>
<td>FN</td>
<td>Protein</td>
<td>Ashes</td>
</tr>
<tr>
<td>crt.</td>
<td></td>
<td>%</td>
<td>%</td>
<td>Kg/hl</td>
<td>%</td>
<td>mm</td>
<td>cm</td>
<td>%</td>
<td>sec</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1.</td>
<td>Martor</td>
<td>1</td>
<td>11,4</td>
<td>73,2</td>
<td>16,9</td>
<td>5</td>
<td>28</td>
<td>31</td>
<td>232</td>
<td>9,7</td>
<td>1,45</td>
</tr>
<tr>
<td>2.</td>
<td>A1B1C1</td>
<td>1</td>
<td>11,3</td>
<td>74,9</td>
<td>18,4</td>
<td>5</td>
<td>27</td>
<td>33</td>
<td>302</td>
<td>9,5</td>
<td>1,45</td>
</tr>
<tr>
<td>3.</td>
<td>A1B1C3</td>
<td>1,2</td>
<td>11,4</td>
<td>73,2</td>
<td>16,9</td>
<td>4</td>
<td>26</td>
<td>31</td>
<td>191</td>
<td>9,9</td>
<td>1,33</td>
</tr>
<tr>
<td>4.</td>
<td>A1B1C4</td>
<td>1,3</td>
<td>11,8</td>
<td>74,4</td>
<td>17</td>
<td>4</td>
<td>26</td>
<td>31</td>
<td>221</td>
<td>9,5</td>
<td>1,31</td>
</tr>
<tr>
<td>5.</td>
<td>A1B1C6</td>
<td>1,5</td>
<td>12</td>
<td>74,1</td>
<td>16,5</td>
<td>3</td>
<td>25</td>
<td>30</td>
<td>159</td>
<td>9,6</td>
<td>1,30</td>
</tr>
<tr>
<td>6.</td>
<td>A2B1C1</td>
<td>1,5</td>
<td>11,3</td>
<td>75,5</td>
<td>18,5</td>
<td>5</td>
<td>27</td>
<td>33</td>
<td>190</td>
<td>10</td>
<td>1,58</td>
</tr>
<tr>
<td>7.</td>
<td>A2B1C3</td>
<td>1,8</td>
<td>11,3</td>
<td>74,8</td>
<td>19</td>
<td>5</td>
<td>28</td>
<td>34</td>
<td>233</td>
<td>10</td>
<td>1,64</td>
</tr>
<tr>
<td>8.</td>
<td>A2B1C4</td>
<td>1,6</td>
<td>11,3</td>
<td>74,7</td>
<td>17,5</td>
<td>4</td>
<td>26</td>
<td>32</td>
<td>224</td>
<td>9,5</td>
<td>1,35</td>
</tr>
<tr>
<td>9.</td>
<td>A2B1C6</td>
<td>1,5</td>
<td>11,3</td>
<td>74,5</td>
<td>18,5</td>
<td>4</td>
<td>25</td>
<td>33</td>
<td>262</td>
<td>9,7</td>
<td>1,45</td>
</tr>
</tbody>
</table>
The quality indices of wheat variety Apullum

<table>
<thead>
<tr>
<th>Nr. crt.</th>
<th>Variant</th>
<th>CS %</th>
<th>UR %</th>
<th>MH Kg/hl</th>
<th>GU %</th>
<th>ID mm</th>
<th>IE cm</th>
<th>GI %</th>
<th>FN sec</th>
<th>Protein %</th>
<th>Ashes %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Martor</td>
<td>1,2</td>
<td>11,8</td>
<td>72</td>
<td>14,3</td>
<td>4</td>
<td>24</td>
<td>29</td>
<td>274</td>
<td>9,2</td>
<td>1,48</td>
</tr>
<tr>
<td>2</td>
<td>A1B5C1</td>
<td>1,3</td>
<td>11,3</td>
<td>74,2</td>
<td>11,4</td>
<td>4</td>
<td>20</td>
<td>21</td>
<td>255</td>
<td>8,2</td>
<td>1,12</td>
</tr>
<tr>
<td>3</td>
<td>A1B5C3</td>
<td>1,3</td>
<td>11,3</td>
<td>74,6</td>
<td>11,4</td>
<td>3</td>
<td>28</td>
<td>21</td>
<td>206</td>
<td>8,5</td>
<td>1,16</td>
</tr>
<tr>
<td>4</td>
<td>A1B5C4</td>
<td>1,5</td>
<td>11,5</td>
<td>75,2</td>
<td>13,2</td>
<td>3</td>
<td>24</td>
<td>24</td>
<td>140</td>
<td>8,5</td>
<td>1,18</td>
</tr>
<tr>
<td>5</td>
<td>A1B5C6</td>
<td>1,2</td>
<td>11,5</td>
<td>75,1</td>
<td>12</td>
<td>3</td>
<td>22</td>
<td>22</td>
<td>169</td>
<td>8,5</td>
<td>1,20</td>
</tr>
<tr>
<td>6</td>
<td>A2B5C1</td>
<td>1,5</td>
<td>11,5</td>
<td>75,5</td>
<td>15,3</td>
<td>3</td>
<td>24</td>
<td>28</td>
<td>193</td>
<td>9</td>
<td>1,53</td>
</tr>
<tr>
<td>7</td>
<td>A2B5C3</td>
<td>1,3</td>
<td>11,3</td>
<td>74,8</td>
<td>13</td>
<td>3</td>
<td>20</td>
<td>24</td>
<td>214</td>
<td>8,7</td>
<td>1,31</td>
</tr>
<tr>
<td>8</td>
<td>A2B5C4</td>
<td>1</td>
<td>11,3</td>
<td>75,4</td>
<td>14,5</td>
<td>3</td>
<td>20</td>
<td>26</td>
<td>170</td>
<td>8,9</td>
<td>1,31</td>
</tr>
<tr>
<td>9</td>
<td>A2B5C6</td>
<td>1,5</td>
<td>11,3</td>
<td>74,4</td>
<td>12,2</td>
<td>3</td>
<td>20</td>
<td>22</td>
<td>199</td>
<td>8,5</td>
<td>1,20</td>
</tr>
</tbody>
</table>

Impurities of wheat for panification according the requirements must be up to 3%, and relative humidity should be 14%. As can be seen from Tables 1, 2 and 3 of the wheat varieties studied, all experimental variants are placed within the values of wheat for bread. Test weight value is considered very good if it exceeds 78 kg / hl, good if between 75 - 78 kg / hl and satisfactory if found between 70 - 75 kg / hl.

Following determinations is shown (in tabel 1, 2 and 3) that:
- the Arieșan wheat variety, from 9 variants only one experimental variant (A2B1C1) fall in good wheat quality for bread, the remaining experimental variants having values below 75 kg / hl ranging in wheat for bread-satisfactory quality.
- the Apullum variety wheat, all experimental variants have values over 75 kg / hl, and therefore falls under good wheat bread quality.
- the Dumbrava variety wheat, from 9 of the experimental variants, 4 variants have values over 75 kg / hl, including wheat in very good quality class for bread, the rest of them being below this value, wheat having satisfactory quality.

The wet gluten arrange wheat in class of very good quality, if its value exceeds 26%, class quality between 24 - 26% and satisfactory 22%.

As can be seen in Tables 1.2 and 3 all the experimental variants of wheat that were studied have the wet gluten under 22% , wheat which falls into the class of poor quality.

Index of deformation of wet gluten for very good wheat quality is between 5 - 10 mm. From tests we see that in the 27 experimental variants of the 3 corresponding wheat varieties studied only 4 variants of the variety Arieșan have values of 5 mm, the rest are under this value so, the flour from the wheat will be strong.
The extending index of wheat gluten is arranging in quality classes referring to obtained flour. Thus the extension index for very good bakery flour have values 15-20 cm, good flour for bread 20 - 35 m and satisfactory flour 35 - 45 cm, and at higher values than 45 cm is weak flour for bread. As can be seen in Tab. 1, Tab. 2 and Tab. 3 the extend index falls in the values of a good bread flour.

Gluten index for panificable grain, according to Stas must have values min. 25%. Analysing obtained gluten index values in the tables we see that the quality of wheat in general is good.

Index of falling (FN - Falling number) characterizing the activity of starch from wheat, given by the alpha-amylase activity, which affect the quality of wheat used for bread.

Optimal value for panifations wheat falls between 180 - 260 sec.

Grain with FN values over 300 sec. are satisfactory, while those with values below 160 sec. have an unsatisfactory panificable value.

By falling index, we see from tables 1.2 and 3 the following:
- the Arieşan wheat variety, from 9 experimental variants, 8 were between 160 and 262 sec., wheat which falls into the class of very good and only one variant (A1B1C1) values are more than 300 sec. sending wheat in satisfactory quality class.
- the Apullum wheat variety, from 9 experimental variants, 6 were between 252 and 296 sec. surrounding wheat in very good quality class and only 3 variants (A1B4C1, A1B4C6, A2B4C1) have values above 300 sec., wheat quality is satisfactory for baking.
- the Dumbrava wheat variety, from 9 experimental variants, 8 were between 169 and 274 sec., wheat quality is very good and only one variant (A1B5C4) have value under 160 sec. wich makes the wheat unsatisfactory for breadmaking.

The protein substances is the most important component of grain, in terms of nutrition and panificable features of wheat. The protein content of wheat grains is very high, ranging between 8 - 24% under the conditions of our country.

At studied wheat varieties, Arieşan, Apullum and Dumbrava, the protein content is estimated at approx. 14-16%.

The protein content of wheat grains is genetically determined, and strongly influenced by climatic conditions and the nitrogen supply of soil.

According determination in the tables we see that the protein content is lower than the estimates ranging from 8, 2-10, 3% of all experimental variants from wheat varieties studied.

Wheat ash is in small amount about 2%, being located especially in peripheral parts of grain. Mineral substances are phosphorus, potassium, magnesium, but ash is poor calcium.

As can be seen in tables 1, 2 and 3, all wheat studied experimental variants have an ash content which falls in the values specified in the speciality literature.

CONCLUSIONS

Research made on wheat varieties Arieşan, Dumbrava and Apullum and results allow us to draw the following conclusions:

- The wheat quality index are strongly influenced by climatic conditions of the experimental year 2008
- The test weight had values of 72 kg / hl to 78 kg / hl, of which notes the variety of wheat Apullum with values of 77 - 78 kg / hl.
- wet gluten content was between 11.4 and 19.4% which ranks wheat in unsatisfactory class for panification. This is due to exceeding the optimal timing of harvest due to unfavorable weather conditions
• The distortion and expansion index of all analyzed samples is classifying wheat in the good quality class.
  • gluten index has values between 21 and 35%, so wheat is part of the class of satisfactory quality for breadmaking.
  • The wet gluten, gluten index and protein values are increasing with increasing of nitrogen dose. At experimental variants we can note that nitrogen fertilization at the resumption of vegetation in spring leads to a slight increase of the wet gluten, gluten index and protein values.
  • Regarding the falling index, from the 27 experimental variants corresponding to 3 wheat studied varieties, 22 variants fall within the class of very good quality.
  • By the followed quality indicators at the 3 studied wheat varieties, it can be concluded that wheat is generally satisfactory in terms of quality.
  • Making a good wheat quality for bread is only possible if you take into account ecological factors, biological and technological, and any intervention that causes imbalances, can determine the quality of bread wheat.

REFERENCES

10. Official catalog of varieties of crop plants in Romania in 1985, Bucharest
11. Official catalog of varieties of crop plants in Romania in 1992, Bucharest
12. Official catalog of varieties of crop plants in Romania in 2003, Bucharest