REGARDING TO STRATEGIES OF WHEAT CULTIVATION
IN BANAT COUNTY

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ABSTRACT

One of the important objectives of the research consists in the
knowledge and new scientific progress share between neighbors of the
Banat County. During the last years yield ability experiments were carried
out in Romanian and Hungarian border localities such as: Timisoara,
Lovrin, Cenad, Curtici and Szeged respectively. Romanian and Hungarian
wheat varieties were tested. The plant capacity to fitt its biological
peculiarities to yield a high amount of economical product was the main
objective of this collaboration. The general yield average performed by
varieties in Cenad and Szeged was insignificant (d=0.21t/ha). Alex and
Kalász were the best varieties cultivated in Cenad. Alex and Holló
performed the highest yield in Szeged conditions. Hungarian variety
Verecke emphasized a high homeostasis associated with a high yield. In
comparison with controls (Delia and Öthalom) the yield differences of Alex
and Verecke were significant at P=0.001.

The tolerance to biotic stress was ranging from medium-sensitive to
sensitive on 40% and 42.9% of varieties cultivated in Cenad and Szeged
respectively. From medium-resistant to resistant were Lovrin 34 (MR-R)
and Verecke (MR).

KEYWORDS:
Wheat, Romanian and Hungarian varieties, Yield, Homeostasis

1. INTRODUCTION

In traditional wheat growing countries such as Romania and
Hungary, the new varieties (genotypes) extension had a difficult way to
get over.

From the historical point of view, the former wheat line, created in
the South-Western part of Romania and South-Eastern part of Hungary
contained a close background. The breeding objectives were changed
following the social and environmental evolution. The social interest

Even if in the Banat area the precipitation amount is large, their distribution is improper. In spring (March and April) low amount of precipitations associated with high temperatures are stress factors for plants’ growth. In June and July heavy rains frequently occurred. In Lovrin and Curtici it was the same situation in 2004 at the harvest time. Therefore the abiotic stress was a main objective in our research work.

The last registered cultivars are improved in many peculiarities and showed an excellent response to stress factors due to a high homeostasis.

The objective of the present study was to evaluate the Romanian and Hungarian wheat (Triticum aestivum) varieties for the Banat border environment. It was a good opportunity to detect good and weak characteristics and to design a new breeding strategy at the border.

2. MATERIALS AND METHODS

The last registered cultivars created in the Lovrin Agricultural Research Station, Romania and at the Cereal Research Non Profit Company, Szeged, Hungary, were involved in experiments to establish the distinct economical value in comparison with Delia Romanian and Öthalom Hungarian control wheat varieties.

Four Romanian and four Hungarian registered varieties were used in our investigation (Table 1).

Table 1: The wheat varieties used in experiment

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Originated</th>
<th>No</th>
<th>Name</th>
<th>Originated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lovrin 34</td>
<td>Romania</td>
<td>1</td>
<td>Garaboly</td>
<td>Hungary</td>
</tr>
<tr>
<td>2</td>
<td>Lovrin 41</td>
<td>Romania</td>
<td>2</td>
<td>Hollo</td>
<td>Hungary</td>
</tr>
<tr>
<td>3</td>
<td>Alex</td>
<td>Romania</td>
<td>3</td>
<td>Kalášz</td>
<td>Hungary</td>
</tr>
<tr>
<td>4</td>
<td>Romulus</td>
<td>Romania</td>
<td>4</td>
<td>Verecke</td>
<td>Hungary</td>
</tr>
<tr>
<td>5</td>
<td>*Delia</td>
<td>Romania</td>
<td>5</td>
<td>*Öthalom</td>
<td>Hungary</td>
</tr>
</tbody>
</table>

*Control variety

The experiments were conducted during 2004 in the Timisoara, Lovrin, Cenad, and Curtici experimental fields in Romania and Szeged in Hungary. Each of the locations has unique characteristics, but the Cenad and Szeged have sufficient common characteristics that can be compared. The experimental fields were organized on distinct soil quality: reach-sandy soil in Cenad and loess-chernozem soil in Szeged. There are no important differences in the general climatic evolution (temperature and rains). The differences consist in the pattern of rains distribution.

The layout of the experiment was the randomized blocks. The average yield was compared on 7 m² and 5 m² plots in Romanian and
Hungarian fields respectively. Three replications were made. The variance analysis was applied to interpret the yield data. Two-factor experiment: variety/location [10] was as followed: the Countries (A factor); the wheat varieties (B factor). In particular the differences and the statistical significance among varieties vs. locations are presented in Figure 1.

The number of days to heading and maturity were recorded and 0 – 100% lodging scale estimation was done three times (Table 2).

The leaf disease reaction for Lr: R-resistant; MR-moderately resistant; MS-moderately resistant; S-sensitive and incidence (Leaf area percent covered by pathogens) was checked in both localities. Identification of powdery mildew (Erysiphe graminis f.sp. tritici), rusts (Puccinia recondita, P. graminis f.sp. tritici, P. striiformis) and Septoria diseases (Septoria tritici Blotch or S. nodorum Blotch) was considered.

3. RESULTS

The varieties began heading 200 to 205 days after sprout while in control (Delia) heading began after 206 days. The earliest-heading variety Lovrin 32 headed 6 days before control. The heading of the Alex and Holló varieties took place a day later.

The complete maturity took place between 258 and 268 days on Romulus and Delia respectively. Due to high temperature the complete maturity took place in 7 – 10 days after physiological maturity.

For the Banat area a short period of grain filling up is important to prevent the yield lost due to July high temperatures. Drought had a little effect, but high temperature reduced the yield components and grain quality [1].

For almost all varieties in Cenad conditions with high air humidity the lodging resistance was lower than in Szeged. The Hungarian variety Holló pointed out the most sensitive lodging susceptibility in Cenad and insignificant degree in their steppe native place. In both locations Alex also pointed out high lodging susceptibility. A very good lodging homeostasis revealed Kalász; Lovrin 34 and Lovrin 41. Romulus pointed out a good lodging resistance. Very low homeostasis showed Holló, Garaboly, Verecke and Alex. Even if the lodging resistance is a breeding important objective following dwarf plants and strong radicular system, in humid conditions the root system is less developed and dispersed near the surface, leading to lodging. In drought conditions the root system was well and deeply developed, preventing the lodging.

The plant height varied between 90.0 cm (Lovrin 34 and Verecke) and 100.0 cm (Alex and Holló). The highest plant varieties were most sensitive to lodging.

The biotic stress is a very important plant feature. The chemical control assay is expensive and generated more resistant pathogens. To manipulate inheritance plant potential is cheaper, no-pollution and safet. In our region the diseases resistance is the most important biotic stress peculiarity. For this reason the disease evaluation was made in different plant stages (straw formation, heading and before leaf drought; Table 3).
### Table 2: The heading and maturity number of days and lodging resistance in Cenad conditions

<table>
<thead>
<tr>
<th>Varieties</th>
<th>No of days to:</th>
<th>No of days to:</th>
<th>Type of maturity:</th>
<th>Lodging</th>
<th>Type of maturity:</th>
<th>Lodging</th>
<th>Plant height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>heading</td>
<td>logistic</td>
<td>complete</td>
<td>plant</td>
<td>heading</td>
<td>logistic</td>
<td></td>
</tr>
<tr>
<td>Lovrin 34</td>
<td>200</td>
<td>253</td>
<td>263</td>
<td>0.5/1*</td>
<td>90.0</td>
<td>Garaboly</td>
<td>202</td>
</tr>
<tr>
<td>Lovrin 41</td>
<td>202</td>
<td>253</td>
<td>260</td>
<td>0.5/0*</td>
<td>93.0</td>
<td>Holló</td>
<td>205</td>
</tr>
<tr>
<td>Alex</td>
<td>205</td>
<td>251</td>
<td>261</td>
<td>2.0/3</td>
<td>99.5</td>
<td>Kalász</td>
<td>204</td>
</tr>
<tr>
<td>Romulus</td>
<td>204</td>
<td>251</td>
<td>258</td>
<td>0.5/0*</td>
<td>94.0</td>
<td>Verecke</td>
<td>204</td>
</tr>
<tr>
<td>Delia</td>
<td>206</td>
<td>258</td>
<td>268</td>
<td>1.0/-</td>
<td>92.3</td>
<td>Othalom</td>
<td>-</td>
</tr>
</tbody>
</table>

*The data noted in Szeged conditions

### Table 3: Attack intensity of different pathogens in Cenad and Szeged

<table>
<thead>
<tr>
<th>Variety</th>
<th>The covered leaf area (%)</th>
<th>Leaf spots (%)</th>
<th>Variety</th>
<th>The covered leaf area (%)</th>
<th>Leaf spots (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cenad</td>
<td>Szeged</td>
<td>Cenad</td>
<td>Szeged</td>
<td>Cenad</td>
</tr>
<tr>
<td>Lovrin 34</td>
<td>65MR-R</td>
<td>70MR-R</td>
<td>30/7</td>
<td>20/7</td>
<td>Garaboly</td>
</tr>
<tr>
<td>Lovrin 41</td>
<td>50MS</td>
<td>100S</td>
<td>10/5</td>
<td>-</td>
<td>Holló</td>
</tr>
<tr>
<td>Alex</td>
<td>70MS-S</td>
<td>60MS-S</td>
<td>20/7</td>
<td>10/7</td>
<td>Kalász</td>
</tr>
<tr>
<td>Romulus</td>
<td>55MS-S</td>
<td>100S</td>
<td>20/7</td>
<td>10/7</td>
<td>Verecke</td>
</tr>
<tr>
<td>Delia</td>
<td>30MS-S</td>
<td>-</td>
<td>10/7</td>
<td>-</td>
<td>Othalom</td>
</tr>
</tbody>
</table>

* Lr: 0 – 100 % of leaf area covered by fungus; Reaction: R- resistant, MR-moderately resistant, MS-moderately sensitive, S-sensitive.

** Leaf spots coverage in %.

Significant differences at the P-0.001 level between the best and worst variety.

Significant differences against control at the P-0.001 level between the best Ro and Hu variety.

Comparison between yield average of different wheat varieties created in Romania and Hungary and tested against controls (Delia and Öthalom) in Cenad and Szeged (2004)

1. P-0.05 = 1.014t/ha ns-no significant difference between general averages/countries (A factor).
2. *** and ooo – positive and negative differences at the level P-0.001.

According to the leaf area covered by fungi (%; Lr evaluation) most of the varieties were middle-sensitive to sensitive (MS-S). Between Cenad and Szeged no significant differences in biotic stress was observed. In
Cenad and Szeged MS-S were 40% and 42.9% varieties respectively. Only Lovrin 32 and Verecke pointed out moderately - resistant to resistant and moderate-resistance capacity respectively. Lovrin 41, Romulus and Holló, emphasized the highest sensitivity (S).

The former evaluated peculiarities are involved in the yielding capacity. Even if the yield variability was larger in Cenad conditions varying from 7.62t/ha to 13.65t/ha the average per agrobiological system was higher than in Szeged conditions (10.57t/ha>10.53t/ha). The yield average in Cenad was 10.49t/ha with a small difference against the performed yield in Szeged conditions (10.30t/ha). The same insignificant difference was established for the Hungarian varieties in case of Cenad and Szeged cultivation.

Significant differences in yielding capacity were pointed out by varieties. The comparison of yield average performed in Cenad and Szeged pointed out a high and good homeostasis for Verecke and Lovrin 34 and Halló respectively. The yield difference was insignificant for Verecke: d= 0.11<d0.05= 0.29 and significant on Lovrin 34 and Halló d= 0.30*<P0.01= 0.38 and d= 0.65>P0.001= 0.55 t/ha respectively.

In all comparisons with the best Romanian variety Alex and the weakest variety Lovrin 41 the yield differences were significant (Fig. 1). Between Verecke the best Hungarian variety and Garaboly the weakest one the differences were smaller but significant (>P0.001).

The highest average yield for the evaluated varieties was in Cenad on Alex and Kalász varieties (13.65t/ha and 11.59t/ha respectively). The best yielding varieties in Szeged were Alex and Holló revealing 11.03t/ha and 11.24t/ha respectively.

The climatological circumstance of the sowing period with precipitation at the germination conducted to a uniform and explosive sprouting, the first condition for strong and high yielding plants. Good water provisioning in April and in May provided the spike organogenesis. The climatic patterns in Cenad are reflected in the large differences of grain yield of varieties.

4. DISCUSSION

The obtained data are in concordance with our previous observations.[5] In Cenad and Lovrin wheat varieties performed better than in Timisoara and almost at par with Curtici.[3] Such ability was mentioned for drought stress environments as it frequently happens in Banat springs and early summers.[6] In Timisoara the wheat and other cereals behavior was in a high dependence with environment conditions.[3,4] Hungarian varieties had a good tolerance to most cereal diseases and the highest homeostasis. This peculiarity as it was mentioned by many breeders [7,8] is the result of an intensive breeding program for homeostasis. The differentiation in requirements between Hungarian wheat and between them and the Romanian ones is obvious in our
conditions. The Hungarian having a later heading would allow more flexible utilization.\textsuperscript{[12]} For Banat the breeding efforts must be done to improve some of the main wheat constrains: to allow increases significant yield stability, tolerance to biotic and abiotic factors.

REFERENCES