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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

imposed a high yield performance. The environmental conditions assigned more complex objectives: tolerance/resistance to biotic and abiotic stress. It means disease resistance and heat/drought [2] salt [9] and heavy metals [4; 11] tolerance respectively. The last registered cultivars created in *Lovrin Agricultural Research Station, Romania* and at the *Cereal Research Non Profit Company, Szeged, Hungary*, are responding to these requests.

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 *Othalom* 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

No	Name	Originated	No	Name	Originated
1	Lovrin 34	Romania	1	Garaboly	Hungary
2	Lovrin 41	Romania	2	Hollo	Hungary
3	Alex	Romania	3	Kalász	Hungary
4	Romulus	Romania	4	Verecke	Hungary
5	*Delia	Romania	5	*Öthalom	Hungary

*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 m^2 and 5 m^2 plots in Romanian and

Hungarian fields respectively. Three replications were made. The variance analysis was applied to interprete 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* olso 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

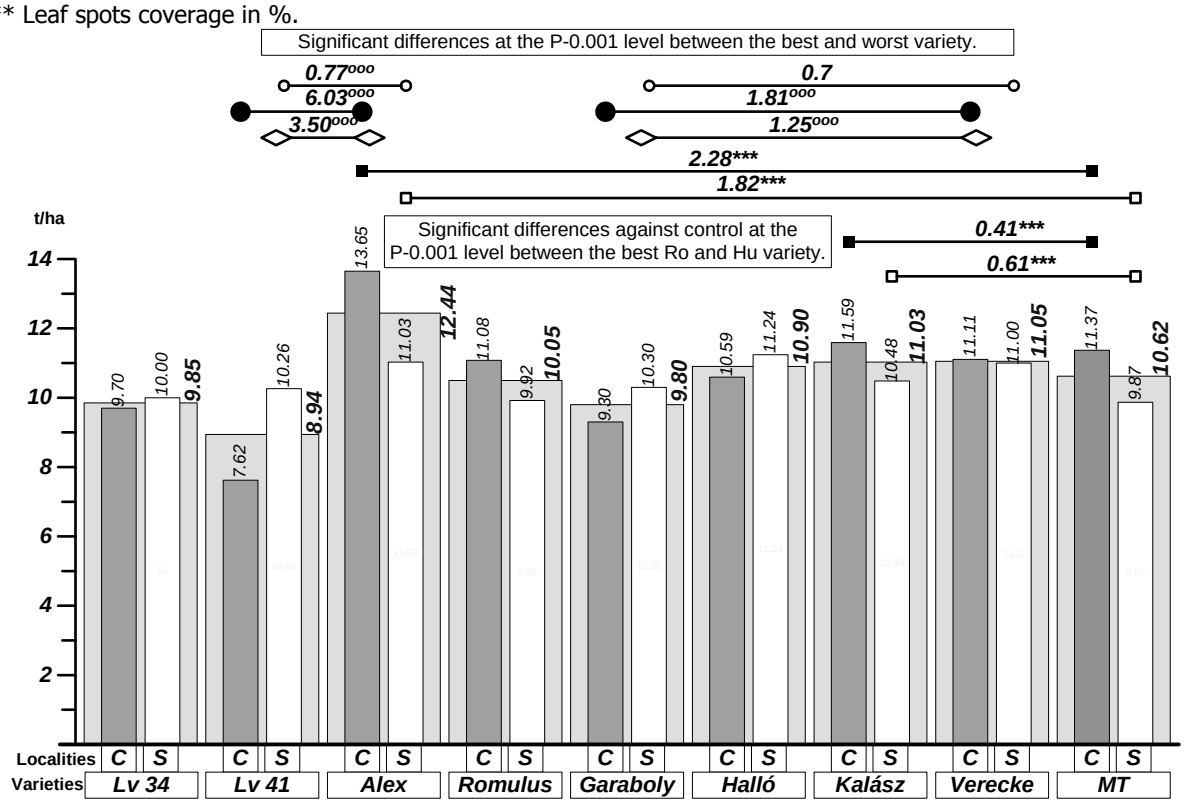
Varietyes	No of days to:			lodg-ing	Plant height (cm)	The variety	No of days to:			lodg-ing	Plant height (cm)
	head-ing	type of maturity:					head-ing	type of maturity:			
		physio-logical	com-plete					physio-logical	com-plete		
Lovrin 34	200	253	263	0.5/1*	90.0	*Garaboly*	202	250	257	1.5/0*	86.3
Lovrin 41	202	253	260	0.5/0*	93.0	*Holló*	205	255	265	5.3/1*	102.0
Alex	205	251	261	2.0/3*	99.5	*Kalász*	204	250	257	0.5/0.3*	94.3
Romulus	204	251	258	0.5/0*	94.0	*Verecke*	204	252	259	3.0/1.7*	90.0
Delia	206	258	268	1.0/-*	92.3	*Othalom*	-	-	-	-/0*	-

*The data noted in *Szeged* conditions

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

Variety	The coverd leaf area (%)		Leaf spots (%)		Variety	The coverd leaf area (%)		Leaf spots (%)	
	Cenad	Szeged	Cenad	Szeged		Cenad	Szeged	Cenad	Szeged
Lovrin 34	65MR-R	70MR-R	30 / 7	20 / 7	Garaboly	50MS-S	40MS-S	20 / 7	10 / 5
Lovrin 41	50MS	100S	10 / 5	-	Holló	85S	80S	10 / 7	5 / 7
Alex	70MS-S	60MS-S	20 / 7	10 / 7	Kalász	30MS-S	30MS-S	20 / 5	10 / 7
Romulus	55MS-S	100S	20 / 7	10 / 7	Verecke	20MR-R	5MR	50 / 7	60 / 7
Delia	30MS-S	-	10 / 7		Othalom	-	100S	-	10 / 7

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



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 0.04t/ha is small and without significance (P0.05 =1.014t/ha). Between Cenad and Szeged conditions the Romanian varieties revealed insignificant differences (d= 0.19t/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<$d_{0.05}$= 0.29 and significant on *Lovrin 34* and *Halló* d= 0.30*<$P_{0.01}$= 0.38 and d= 0.65>$P_{0.001}$= 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 (>$P_{0.001}$).

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.[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.

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