DACIC- A NEW WINTER WHEAT CREATED AT ORADEA

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Abstract

The paper present some results regarding the new winter wheat cultivar created, Dacic, comparative to other ones. The cultivar Dacic vas obtained by repeated genealogical selection from hybrid combination Dropia // Atlas 66 / Fundulea 4, where ATLAS 66 / Fundulea 4 were a breeding line with the same parents with Crisana. Like Crisana too, Dacic has a good tolerance to aluminium ions toxicity, which are presents in acid soils. In addition, our new cultivar has a better resistance to fusarium head blight (FHB), is shorter, with better precocity and better grain yield potential than Crisana.

Our results demonstrated that the cultivar Dacic has good yield stability in different areas where the soils are different. In addition, it has a superior yield capacity on soils with decreased natural fertility. The bread making qualities of Dacic are good, being included in B value group regarding this character.

Key words: cultivar, wheat, yield, quality, stability, fusarium.

INTRODUCTION

In Romania, the tolerance of wheat to aluminium ions toxicity from acid soils was studied for the first time in 1987 (Bunta et al.), when started a breeding program regarding this target. The researches started with study of a large collection of genotypes, especially to genetically tolerance to aluminium. After this, we initiated genetically studies, trying to explain the heredity of aluminium tolerance in wheat (Bunta, 1999/a; Bunta, 1999/b.).

The variety Crişana, which vas, ap to the moment, the single Romanian wheat variety with high tolerance to ions toxicity, has another qualities too, like a good backing quality. Our new cultivar Dacic is the second Romanian winter wheat with high tolerance to aluminium ions toxicity, registered this year in Official Catalogue of Varietyes and Hybrids from Romania.

Its tolerance to aluminium inherited too, from the old cultivar, Atlas 66. In adition, Dacic has a good bread making quality, according to the standard values for wheat quality in Romania (812- ISO 7970/2001): hectoliter weight more than 75 kg/hl, falling number between 180-260 seconds, wet gluten more than 22%, gluten index between 65 and 80%. (Tabără et al, 2009).

Another important character for wheat is the resistance to diseases, like fusarium, an disese that can produce big damages in wheat in the years with favorable climatical conditions, like in 2019.

MATERIAL AND METHOD

The Dacic variety was created by genealogical repeted selection from hybrid combination Dropia//Atlas 66/Fundulea 4. Mor exactelly, the breeding line Oradea 128 G (Atlas 66/Fundulea 4), having the sames parents with cultivar Crisana, was crossed in 2002, in paternal position, with the cultivar Dropia.

The Romanian cultivar Fundulea 4 vas utilized like genitor becouse its high yield capacity, being the most addapted to our zone, an ideotype for north-west of Romania.

Atlas 66, an old variety from United States of America (South Carolina), has a lot of defficiences: sensibility to diseases, tall, sensitive to falling and with a too long vegetative period. Hovewer, this variety have a very high content in protein and high tolerance to aluminum ions toxicity, beeing an etalon in all genetical studyes for this character.

Dropia, an romanian cultivar, has a very good quality and precocity and is shorter than Crisana.

The hibridation Dropia/ Oradea 128 G was efectuated in the year 2002. During the period 2004 - 2007 (F_2 – F_4 generations) we selected every year plantes with aluminum tolerance, in solution with growing concentration of aluminum ions.

Beginning with the year 2008 (F_5 generation) and finishing with 2010 (hybrid generation F_7), the selection has agronomical objectives, in experimental fields, at Oradea. During 2010 – 2013 the breeding line Oradea 6X was tested in network of Romanian Agricultural Research Stations, in 8 locations, spreaded all over Romania.

Starting to 2014, the breeding line Oradea 6 X vas included for testing at Romanian State Institute for Testing and Registration of Variety. Finally, in 2019 this breeding line vas registred like variety with the name Dacic.

Simultaneoussly, we started the multiplication of seeds, than today the new variety is cultivated on more than 70 ha at Agricultural Research and Developed Station Lovrin, in west Romania.

The qualities analyses were effectuated in the wheat breeding laboratory of Agricultural Researches and Development Station Lovrin.

RESULTS AND DISCUSSION

In table 1 are presented the results regarding yield capacity of breeding line Lovrin 6X (the future cultivar Dacic) comparative to checks (Dropia, Glosa and Apullum). The results are obtained in the romanian State Institute of Variety Testing and Registration (S.I.V.T.R.), during 2014 – 2018.

Every year, our breeding line exceeded the first check (from 108% to 120%) and the averages of checks (from 107.1% to 110.4%). It must be mentionated thar the results are the averages of yields obtained in 7 locations. The maximum average level of yield vas realised by Lovrin 6X in the year 2017: 8364 kg/ha. In the same year, the breeding line Lovrin 6X realised, at Târgu Secuiesc, 9925 kg/ha (Bunta Gh., 2018).

We must underline the yield potential of another own line, Lovrin 5X (Getic), that exceeded, in 2018, even the genotype Dacic.

Table 1

Yield capacity of cultivar Dacic in S.I.V.T.R. network, 2014-2018.

Class.	Genotype	Yield (Kg/ha)	Relative yield (%)	Checks average
2014-2015				
1	DROPIA	5406	100	5920
2	GLOSA	5843	108	
3	APULLUM	6510	120	
4	LOVRIN 6X (DACIC)	6490	120	**109,3%**
2016-2017				
1	LITERA	7057	100	7578
2	GLOSA	7330	104	
3	APULLUM	7850	111	
4	ANDRADA	8076	114	
5	LOVRIN 6X (DACIC)	8364	119	**110,4%**
2017-2018				
1	LITERA	7009	100	7078
2	GLOSA	7154	102	
3	ANDRADA	7070	101	
4	LOVRIN 6X (DACIC)	7584	108	**107,1%**
5	LOVRIN 5X (GETIC)	7677	110	108,5%

To compare our new cultivar with others performants ones, in 2019 Dacic vas tested at Oradea together with 12 romanian or foreigner genotypes (table 2).

It must be mentioned that the agricultural year 2018-2019 vas extremely droughty and the intensity of fusarium atack vas at maximum level. In these unfavorable conditions, the cultivar Dacic performed well because of its drought tolerance and resistance to fusarium head blight.

Comparative to experimental average, Dacic realised 869 kg/ha in surplus, that means an 117.0% relative yield. A good reaction to these conditions had Lovrin 5X (Getic), too, the yields being the averages of 6 replications.

In all 3 years and in all 7 locations, the new wheat cultivar Dacic realised an averaged yield biger with 108.9% than the average yield of three checks.

Table 2

Yield capacity of Dacic comparative to another wheat cultivars.
Oradea, 2019

Class.	Cultivar	Yield		Diferences (kg/ha)
		kg/ha	relative (%)	
1	**DACIC**	**5973**	**117,0**	**+869**
2	OTILIA	5808	113,8	+704
3	LOVRIN 5X	5642	110,5	+538
4	UNITAR	5441	106,6	+337
5	ALEX	5216	102,2	+112
6	CIPRIAN	5151	100,9	+47
Experimental average		5104	100,0	0
7	INGENIO	5099	99,9	-5
8	LOVRIN 9T	5024	98,4	-80
9	PANNONIKUS	4857	95,2	-247
10	ANAPURNA	4816	94,4	-288
11	UBICUS	4543	89,0	-561
12	ARNOLD	4418	86,6	-686
13	CRIȘANA	4359	85,4	-745

The yield capacity is the result of the sum of all morpho-phisiological characthers. In table 3 are presented some of the characteres of Dacic, comparative to other 24 genotypes tested in an experiment at Oradea.

Because the spring of wheat vas recorded at the end of february, the number of plants vas small (363 plants/m^2 in case od Dacic). However, the number of ears/m^2 vas good, 553 in case of Dacic.

By it date of earing (18 May), our cultivar had the longest period of vegetation, a positive characteristique in the conditions of the year 2019. But the most important fact vas the resistance of Dacic to fusarium, at the same level with Otilia, Abundent and Ursita, cultivars realised at A.R.D.I. Fundulea and recognised to be the most resistants to thise disease and to another ones.

Most correlations among the yield components are negative, illustrating the difficulty of combining in one cultivar high values of more than one component, because of compensation between yield components (Mandea et all, 2019). The strongest negative correlation was found

between the number of spikes per unit area and the number of grains per spike.

Dacic had a bigest number of grains in ears with up to 2 grams/ear, fact that associated with its ears density concured in realisation of superior grain yield performance.

The height of the cultivar Dacic is around of 84 cm, a midle one that confers a good resistance to falling, even in conditions of fertilization with high quantity of nitrogen.

Table 3

Some morpho-phisiological characters of 25 wheat genotypes.
Oradea, 2019.

Nr.	Genotype	Density/m^2		Date of earing	Fusarium (notes)	Ears characters		Height (cm)
		plants	ears			weight (g)	numbers	
1	GLOSA	400	497.3	**7/05**	4/5	1.84	24.3	78.3
2	BOEMA	424	512.0	9/05	3,7/5	1.93	25.7	79.0
3	LITERA	335	473.3	10/05	4,7/6	1.98	26.0	80.0
4	MIRANDA	357	461.3	9/05	4,7/6	1.90	26.0	84.3
5	IZVOR	320	566.7	9/05	5,7/6	1.69	22.3	81.3
6	OTILIA	380	497.3	11/05	**3/3**	1.92	25.0	80.0
7	PITAR	324	476.0	10/05	7/7	1.82	24.7	**74.7**
8	PAJURA	337	541.3	9/05	5,3/6	1.88	24.3	76.0
9	SEMNAL	355	494.7	12/05	5/5	1.87	24.7	75.0
10	URSITA	329	541.3	10/05	3/4	1.81	23.0	78.0
11	VOINIC	345	552.0	12/05	3,7/4	**2.11**	27.0	78.3
12	ZAMFIRA	319	522.7	12/05	3,7/4	1.94	26.3	80.7
13	AMURG	393	520.0	8/05	6/7	1.75	23.7	78.3
14	ARMURA	372	521.3	14/05	4/4	1.94	26.0	85.7
15	ABUNDENT	397	537.3	13/05	3,7/4	**2.05**	26.7	80.7
16	14.078 GP 1	**427**	564.0	12/05	3/3,7	1.82	23.7	75.3
17	A4-10	379	553.3	14/05	7/8	1.50	20.7	85.0
18	ADELINA	401	578.7	11/05	4,3/5	1.63	21.3	80.7
19	ŞIMNIC 60	373	532.0	13/05	4/5	1.69	22.7	85.0
20	DACIC	363	553.3	**18/05**	**3,3/4**	**2.03**	**28.7**	84.0
21	LV. 5X	415	524.0	14/05	5,7/6	1.81	25.0	77.7
22	LV. 9T	384	557.3	15/05	6,7/8	1.74	24.3	77.7
23	LV. 6107	383	548.0	13/05	6,7/7	1.80	24.7	79.3
24	LV. 6111	391	**586.7**	13/05	5,7/6	1.83	23.7	75.0
25	BEZOSTAIA	345	548.0	17/05	4/4	1.64	21.3	**101.0**
Averages		370	530.4	11/05	4.7/5.4	1.84	24.5	80.4

Because the wheat is the most important food in human nutrition, an major importance has its quality. Dacic has a superior content of total protein (14.5%) and midle wet gluten (37.2%), but in normal parameters (table 4).

The hardness (55%) and starch content (68.9%) are in optimal parameters, thus, we can concludet that the cultivar Dacic coresponded too in regard of quality.

Yield stability ia another important character target in wheat breeding. In figure 1 is presented phenotipical variance of 25 genotipes in 8 locations during the year 2018.

The cultivar Dacic has a reduced variance at an high level of yield, being the best regarding to this character that confeerig it a very good stability of yield.

Table 4

Quality results of some Romanian wheat genotypes.
Oradea, 2019.

Class.	Genotipe	Yield (kg/ha)	Protein (%)	Wett gluten (%)	Hardness (%)	Starch (%)
1	F. 14.078 GP 1	5936,0	13,9	36,2	52	69,4
2	ABUNDENT	5865,2	14,1	37,6	50	69,1
3	OTILIA	5743,2	13,9	36,1	52	69,8
4	DACIC	5660,8	14,5	37,2	55	68,9
5	VOINIC	5491,6	14,5	38,1	50	68,6
6	LOVRIN 5X	5447,6	14,2	38,3	54	69,5
7	ARMURA	5239,8	14,7	38,5	53	69,2
8	BOEMA 1	5187,5	14,4	37,5	52	70,1
9	MIRANDA	5008,9	14,2	38,0	50	69,7
10	LOVRIN 6111	4999,9	14,1	37,5	52	69,6
11	SEMNAL	4979,3	14,2	38,3	53	69,6
12	ZAMFIRA	4977,7	14,9	39,0	52	69,2
Experimental average		**4900,3**	**14,4**	**38,1**	**52,3**	**69,4**
13	URSITA	4892,8	14,0	38,1	53	69,7
14	ȘIMNIC 60	4848,9	13,8	36,2	56	70,3
15	LOVRIN 6107	4782,6	15,1	39,9	53	68,9
16	A 4-10	4738,7	14,6	38,0	53	69,8
17	ADELINA	4671,2	13,6	34,6	53	70,0
18	GLOSA	4619,2	13,3	35,6	50	70,1
19	PITAR	4613,5	14,2	38,5	51	69,4
20	LOVRIN 9T	4483,5	14,3	38,6	52	69,6
21	PAJURA	4318,3	14,4	37,7	51	69,3
22	LITERA	4202,2	14,5	37,8	53	69,9
23	BEZOSTAIA	4105,7	**16,4**	**43,7**	54	67,3
24	AMURG	4062,8	**15,7**	**42,8**	53	68,0
25	IZVOR	3630,6	14,6	37,9	51	69,9

The new cultivar Dacic has a good tolerance to acid soils wich are characterized by low pH, low natural fertility and aluminium ions toxicity. Figure 2 is suggestive for this. Dacic has the best yielding capacity in unfavorable pedological and climatical condition, comparative to another 24

varieties tested in the same conditions. Another Romanian winter wheat with good reaction to unfavorable condition of environment are: Boema, Litera, Miranda and Trivale (Voica and Lazăr, 2017).

By its ability to ensure stable grains yield in unfavorable soil conditions, the new wheat cultivar Dacic is recommanded to be cultivate in hil zone but not only there. It is able to valorise in efficient manner the soils with high natural fertility or high levels of fertilizants.

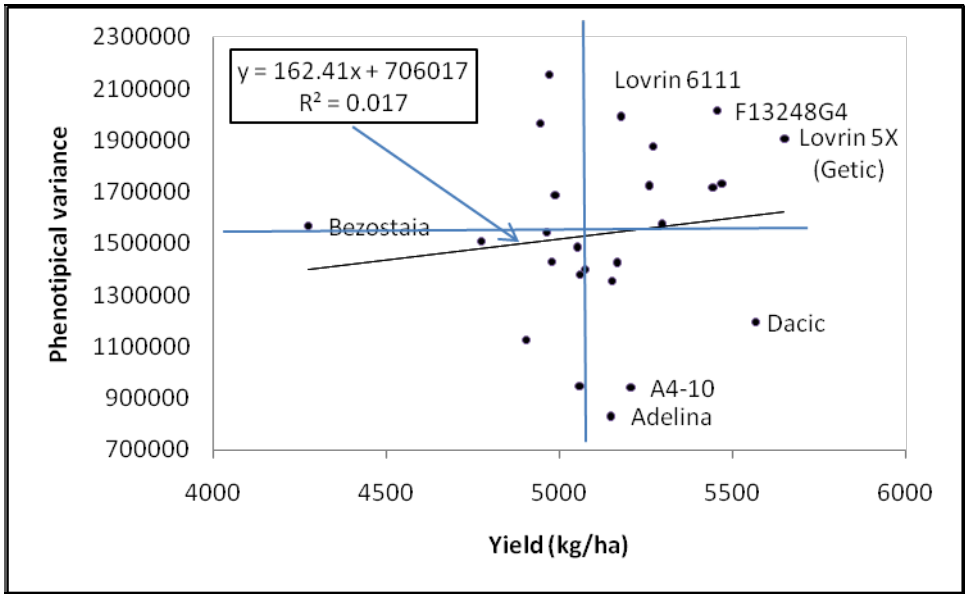

Fig. 1. Yield stability of Dacic cultivar comparative to other genotypes.

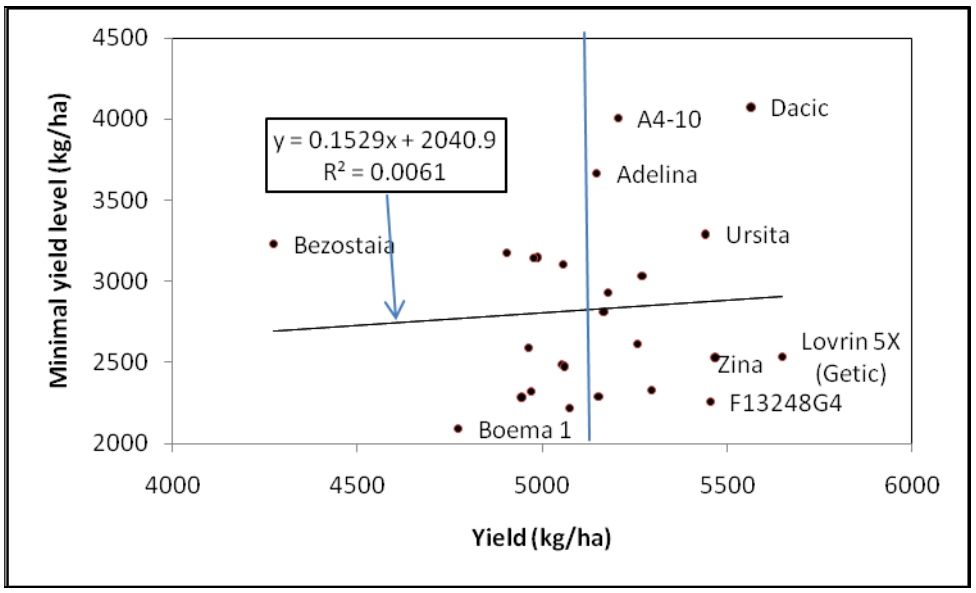

Fig. 2. Yield capacity of Dacic in unfavorable pedo-climatical conditions.

CONCLUSIONS

The cultivar Dacic is a new genotype that has a good yield capacity in favourable and unfavourable soil conditions.

By its resistance to fusarium head blight and drought tolerance, the new cultivar is superior to the most spread ones in our zone.

The bread making quality of Dacic is corresponding to standard parameters.

The cultivar Dacic is recommended to be cultivated in Tisa Plain, Transylvania and north of Moldavia.

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