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BEHAVIOR OF SOME WINTER WHEAT CULTIVARS UNDER DOBROGEA CONDITIONS

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Abstract

The paper analyzes the behavior of 10 winter wheat genotypes, under 2012-2016 specific conditions, on south-east part of Romania at ARDS Valu lui Traian, Constanta. The cultivars under study had a good behaviour and a different reaction to environmental conditions during 2012-2016. The rainfalls and temperatures from testing period were characterized by large fluctuations, so that, the yield ranged from one year to another. The yields registered by the cultivars under test, generally was affected by the climatic conditions: the highest yields being obtained in 2016 an year with good rainfall and temperatures level, while the lowest ones in the driest year, 2014. Yield stability has been estimated using the relationship between yield of each variety and average of trial, analysis of variance coefficient. In average, on five years, the genotypes Ostrov, Miranda and Faur had the better results. Ostrov genotyp manifested a higher yield stability, Miranda, Faur and Litera had a better stability under contrasting environmental conditions. The purpose of the study was to evaluate the yield performance and stabilities to make the better recommendations about adapted winter wheat cultivars under contrasting environmental conditions, for area farms.

Key words*: winter wheat, contrasting environmental conditions*.

INTRODUCTION

Climate change from the last time emphasized the extreme variations that cause serious consequences for agricultural production. Therefore this paper aims to analyze the behavior of ten genotypes of Romanian winter wheat in the Dobrogea region of Romania based on multiannual comparative crops tests, to make recommend the culture of the wheat varieties better adapted to the area (Săulescu et al., 2006).

As a result of very different environmental factors, and the varieties of characters and traits, interactions between genotype and environment occurred as determined in improvement process to create new varieties with specific adaptability to adverse and favorable climatic conditions (Negru, 2009).

Plant responses to water stress depends on several factors, such as the stage of development of the plant, duration and severity of stress period and wheat genetic variety (Beltrano and Marta, 2008).

A strategy selection should take into account early flowering, grain filling period, a late maturity period, a large number of grains per ear, the great ear weight to increase yields in drought conditions (Kiliç and Yağbasanlar, 2010).

New varieties of winter wheat must combine a high production potential and a good resistance to biotic and abiotic stress conditions, to achieve and get a stable production from year to year (Săulescu et al., 2006).

Growing in every area of more varieties distinguishable from one another, varieties with wide adaptability to environmental conditions can diminish to obtain low yields in unfavorable years (Mustăţea et al., 2008).

The diversity of the wheat varieties range created in our country report an improved resistance to adverse environmental conditions and increased resistance to biotic and abiotic culture, thus contributing to the stability and increased crop production potential (Săulescu et al., 2007).

These genotypes of winter wheat study was done in order to highlight the most suitable in terms of production capacity, but also constant production from year to year as well as resistance to unfavorable environmental factors (Săulescu et al., 1980).

In the last period the creation process of new genotypes has been substantially shortened using modern biotechnological methods

through the rapid homozygosity by Zea system, varieties Faur and Glosa being obtained by this method (Giura and Mihailescu, 2000).
This paper aims to analyze the behavior of a ten genotypes of Romanian winter wheat, in Dobrogea area, based on comparative multi-annual crops tests, in order to recommend the better wheat varieties culture suited for expansion in south-east of Romania.
In the wheat variety cultivation technology, wheat genotype is the essence, therefore choosing varieties that will grow but not adapted to drought conditions can, like all other investments in the wheat crop to be recovered only partially (Mustăţea et al., 2003).

MATERIALS AND METHODS

Research has been made in ARDS Valu lui Traian conditions, Constanţa, on a vermic chernozem soil, with clay texture, humus content 3.53%, Phosphorus content 0.165%, water field capacity 261.8 mm, wilting coefficient 0-80: 99.0 mm, low moisture ceiling 178.0 mm, pH (water): 7.4.
Comparative culture was placed after the subdivided parcels method in three repetitions without repeating basic scheme with 6.72 m^2 plot harvest conditions without irrigation. Previous plant was rape and seeding density was 550 germinating grains/m^2.
The varieties studied were characterized, each of the five years, both from the point of view of production capacity, as well as the morphological characters.
The data presented in this paper refers to the behavior of 10 genotypes of winter wheat (Dropia, Boema, Delabrad, Faur, Glosa, Izvor, Litera, Miranda, Ostrov, Alex) under optimal fertilization with nitrogen and phosphorus in five years (2012-2016) with very different climatic conditions in terms of temperature and rainfall.
Using regression analysis it was determined the reaction of each genotype to the environment and the average production of all varieties in the same environmental conditions (Brukner şi Frohberg, 1987).
Production stability was appreciated using regression coefficient and the average production (Finlay şi Wilkinson, 1963).

The effects of different climatic conditions from one year to another from the experimentation period determined the specific reaction of wheat genotypes submitted most significantly by the yields achieved and by morphology.

RESULTS AND DISCUSSIONS

From recorded data at Valu Traian ARDS during 2012-2016 was observed that year 2012 was the driest, when was recorded a total rainfall of 394.9 mm with 43.7 mm below the annual average in 75 years. As shown in Figure 1 with the exception of May, mostly months were recorded below the annual average rainfall in all the years of experimentation period. 2014 was the best year in that which concerns the rainfall recorded when it recorded 755.3 mm, 316.7 mm more than the annual average. On Figure 1 can be seen recorded rainfall, which have been very fluctuating, patchy distributed monthly and from year to year throughout the test duration, but the annual averages recorded were above the multiannual average recorded in 75 years.

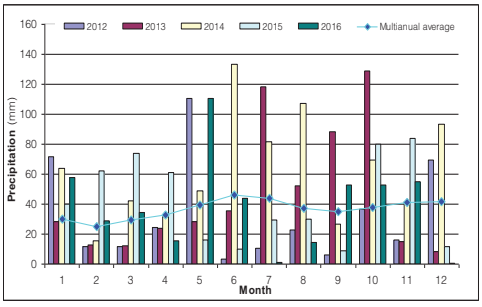

Figure 1. Rainfall registered in SCDA Valu lui Traian in 2012-2016

Temperatures recorded in the five-year period of the experience confirms global warming and also aridity trend of Dobrogea area when they recorded values of annual average temperatures over the survey period (Figure 2).
From Table 1 it is observed that the lowest productions were obtained in the years 2014 (4920 kg/ha) and 2015 (4935 kg/ha) and in 2016 the highest yields 7128 kg ha.

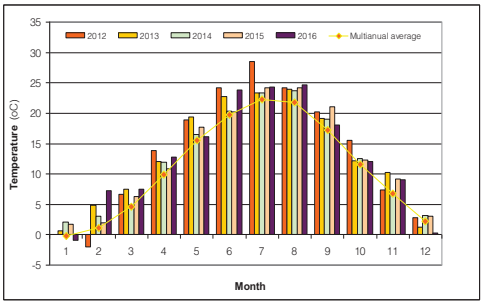

Figure 2. Temperatures registered in Dobrogea in 2012-2016

Watching the average yields of each genotype in the studied period is seen that the Miranda variety with 6155 kg/ha achieved the highest production followed by Faur variety with 6035 kg/ha, Dropia and Alex variety achieving the lowest production (5407-5408 kg/ha). Boema variety achieved the lowest yield of all studied varieties during testing performance with a significant negative difference from the average yields.

Boema variety (8025 kg/ha) and Faur (7908 kg/ha) have made the biggest productions significant distinct and Litera varieties, Miranda and Ostrov was highlighted by significant production.

This five years of experimentation although, from the point of view of weather conditions shows the tendency of developments in the last decade, we believe that is enough to interpret all possible outcomes we performed testing both the error experimentation and testing to interactions with the years (Table 2).

Table 1. Wheat yields obtained at ARDS Valu lui Traian in 2012-2016

No.crt	Genotip	2012	2013	2014	2015	2016	Average
1	DROPIA	5576	6202	4599	4406	6254	5407
2	BOEMA	5381	6217	5308	41630	8025**	5819
3	DELABRAD	5455	5882	4631	4830	7640*	5688
4	FAUR	5722	5849	4777	5917	7908**	6035
5	GLOSA	5993	5980	5036	4767	7021	5759
6	IZVOR	5421	6023	5234	5071	7212	5792
7	LITERA	5764	5995	5019	4979	7749*	5901
8	MIRANDA	6999	7469	4958	5189	6161*	6155
9	OSTROV	6379	5928	5240	5073	7280*	5980
10	ALEX	5733	5928	4396	4953	6028	5408
	Average	5842	6147	4920	4935	7128	5794
	P 5%						437.17
	P 1%						577.77
	P 0.1%						746.92

From Table 2 is distinguish Boema variety with the biggest difference between high and low production of the same variety, during experimentation period (3862 kg/ha).

The smallest differences production in different environmental conditions recorded varieties Alex, Dropia and Glosa.

Lower average production than average experience besides Alex, Dropia and Glosa made also Delabrad and Izvor varieties.

The reaction of genotypes to contrasting environmental conditions can be observed in Table 2 after regression coefficient, where genotypes can differentiate into two categories:

1 - genotypes adapted to adverse environmental conditions (b < 1): Dropia, Glosa, Izvor, Miranda, Ostrov, Alex.

2 - genotypes adapted to favorable environmental conditions (b>1): Boema, Delabrad, Faur, Litera.

For better wheat varieties identification with good adaptability to different environmental conditions, beside the regression coefficient was pursued the regression constant. The two regression parameters determined varieties dividing into two categories:

1 - genotypes adapted to adverse environmental conditions (b<1 when "a" is positive), Dropia, Glosa, Izvor, Miranda, Ostrov and Alex.

2 -genotypes adapted to favorable environmental conditions (b>1 when "a" has negative values): Boema, Delabrad, Faur, Litera.
Analysis of variance for grain yield of winter wheat varieties in the 2012-2016 period highlighted the very significant effects, also for varieties, environmental conditions, and for genotype x environment interactions (Table 3). This shows that the varieties had a different behavior from one year to another.

Table 2. Average yields, minimum, maximum and amplitude of 10 wheat varieties production and their response of parameters to variation in environmental conditions

No. crt	Genotyp	Production (kg/ha)				Parameters		
		Average	Maximum	Minimum	Amplitude	a	b	r^2
1	DROPIA	5407	6254	4406	1848	0.87	323	0.84
2	BOEMA	5819	8025	4163	**3862**	1.44	-2564	0.86
3	DELABRAD	5688	7640	4631	3009	1.26	-1654	0.94
4	FAUR	6035	7908	4777	3131	1.06	-116	0.72
5	GLOSA	5759	7021	5036	1985	0.95	222	0.96
6	IZVOR	5792	7212	5071	2141	0.89	581	0.9
7	LITERA	5901	7749	4979	2770	1.18	-991	0.94
8	MIRANDA	6155	7469	5189	2280	0.7	2093	0.34
9	OSTROV	5980	7280	5073	2207	0.92	606	0.9
10	ALEX	5408	6028	4396	1632	0.68	1496	0.44
	Average	5794	7128	4920	2208			

Table 3. Analysis of variance for the production of wheat genotypes

Variation source	***SP***	***GL***	***PM***	F Factor
A Factor:years of experimentation	102271800	4	25567940	7.225***
Erorr A	28307090	8	3538386	
B Factor:genotypes	8194287	9	910476	2.51*
Interplay A*B	28476240	36	791006	2.18*
Erorr B	32576540	90	361961	

Table 4. Production of wheat obtained at ARDS Valu lui Traian in 2012-2016

No. crt	Genotip	Production kg/ha	% to:		Variation coefficient (s%)
		Years Average	Wt	Genotypes Average	
1	DROPIA (Wt)	5407	100	94	8.71
2	BOEMA	5819	110	104	14.34
3	DELABRAD	5688	107	101	12.00
4	FAUR	6035	114	107	11.44
5	GLOSA	5759	109	102	8.95
6	IZVOR	5792	109	103	8.72
7	LITERA	5901	111	105	11.26
8	MIRANDA	6155	116	110	10.96
9	OSTROV	5980	113	106	8.98
10	ALEX	5408	102	96	7.06
	Average	5794	109	100	9.23

Following yields obtained at ARDS Valu lui Traian during test and making a classification it is noted that in the first place is Miranda varieties (6155 kg/ha), followed by Faur (6035 kg/ha) and Ostrov (5980 kg/ha) (Table 4). Boema and Delabrad varieties recorded the highest values of the variation coefficient (14.34-12.00%) so they have a stable production, lower than other varieties studied. From table 4 which showing differences between media productions and wheat variety witness Dropia, we can say that it has not been exceeded by Alex varieties, the remaining varieties studied surpassing wheat variety witness.

CONCLUSIONS

On average during the studied period the biggest productions have achieved by varieties: Miranda, Faur, Ostrov şi Litera.

They were identified varieties adapted to adverse environmental conditions (b<1): Dropia, Glosa, Izvor, Miranda, Ostrov, Alex but also varieties adapted to favorable environmental conditions (b>1): Boema, Delabrad, Faur, Litera.

The new varieties have a better adaptability to contrasting environmental conditions and potential for higher production than Dropia wheat variety witness.

Among the varieties studied evidenced variety Miranda with the best production potential, variety well adapted to adverse environmental conditions.

Growing varieties with wide adaptability to environmental contrasting conditions can minimize risks production decrease in unfavourable years.

The diversity of the range of wheat varieties created in Romania, confirm an improved resistance to adverse environmental conditions and increasing resistance to biotic and abiotic on the new varieties, thus contributing to the stability and increased crop production potential.

REFERENCES

Beltrano J., Marta G.R., 2008. Improved tolerance of wheat plants (*Triticum aestivum* L.) to drought stress and rewatering by the arbuscular mycorrhizal fungus *Glomus claroideum*: effect on growth and cell membrane stability. Brazilian Journal of Plant Physiology 2008, vol.20, n.1, p. 29-37.

Brukner Pl., Frohberg R.C., 1987. Stress tolerance and adaptation in spring wheat. Crop Science, 27:31-37.

Finlay K.W., Wilkinson G.N., 1963. The analysis of adaptation in a plant breeding program. Aust. J. Agr. Ress, 14, 6: 742-754.

Giura A., Mihăilescu Al., 2000. Metode moderne de reducere a duratei programelor de ameliorare la grâu şi orz. În: „Metode de cercetare în cultura plantelor" Edit. Agris, Bucureşti: 17-36.

Kiliç H., Yağbasanlar T., 2010. The Effect of Drought Stress on Grain Yield, Yield Components and some Quality Traits of Durum Wheat (*Triticum turgidum* ssp. *durum*) Cultivars. Bot. Hort. Agrobot. Cluj 38 (1): 164-170.

Mustăţea P., Săulescu N.N., Ittu Gh., G., Păunescu Gabriela, Stere Ioana, Tanislav N. Zamfir, M.C. Voinea I., 2003. Diferenţe genotipice în rezistenţa grâului la secetă, evidenţiate în condiţiile anului 2002. An. I.N.C.D.A. Fundulea, LXX: 8-15.

Mustăţea P., Săulescu N.N., Ittu Gh., Tican C., Lobonţiu I., Bunta Gh., 2006. Pre-harvest amylase activity and sprouting in Romanian wheat cultivars. Romanian Agricultural Research, 23: 1-6.

Negru Silvia, 2009. Comportarea unor soiuri de grâu de toamnă la S.C.D.A. Secuieni. Anale INCDA Fundulea, LXXVII: 25-30.

Săulescu N.N., Popa Stela, Păcurar I., 1980. Noi soiuri romîneşti de grâu comun de toamnă şi extinderea lor în producţie. Producţia vegetală. Cereale şi plante tehnice, XXXII:3-8.

Săulescu N.N., Ittu Gh., Mustăţea P., Păunescu G., Stere I., Nistor Gh., Rînchiţă L., Voinea I., 2006. Comportarea unor soiuri de grâu de toamnă româneşti în condiţii contrastante de aprovizionare cu apă. Probleme de genetică teoretică şi aplicată, 38 (1-2): 21-29.

Săulescu N.N., Ittu Gh., Ittu M., Mustăţea P., 2007. Cinci decenii de ameliorare a grâului la Fundulea, AN. I.N.C.D.A. Fundulea, VOL. LXXV, 2007, Volum Jubiliar, Genetica şi Ameliorarea Plantelor.