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EFFECT OF WEATHER CONDITIONS ON GROWTH AND YIELD OF WINTER WHEAT

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Abstract

The reaction of winter wheat cultivars in four highly different climatical years, especially regarding the temperature and rainfall, suggested the necessity of stability analyses of their yield. For cultivar recommendation in north-east region if Romania, we evaluated the cultivar ecological plasticity. The paper presents the production results obtained from 44 Romanian varieties of winter wheat grown under pedoclimatic conditions at Ezareni Farm – Iasi Didactic Station, under non-irrigation regime.

The best yield stability had Glosa, Andrada and Bezostaia 1 cultivars. The highest yields have been achieved by Unitar[3], Ursita[4], Mirandal FDL[4], Voinic[3], Otilia[4], T.143-11[3] cultivars, with a [3]three/[4]four years average over 6 t/ha. They have a good yielding ability related to different climatic conditions.

Key words: *Triticum aestivum*, winter wheat, yields, wheather

The main objective of agricultural activity is the obtainment high and stable yields year after year, so that, the large and incalculable variations of environment factors does not strongly affect the yield level. Under optimum conditions, the yield stability is more important than higher yields especially in sustainable agriculture (Rosielle A.A. and Hamblin J., 1981).

The interactions between genotype and environment has an important role in the breeding programs to the releasing of cultivars with specific adaptation to both favourable and unfavourable climatic conditions. The interactions are complex because of very different environmental factors (site, soil, climate) as well as of cultivar traits and features.

In the last years, the tendency of main fluctuations from one year to another as regards the rainfall and temperatures has been emphasized.

During 2015–2019, in Romania, fluctuations from one extremely rainy year (2017) to a droughty one (2018), were registered, as rainfall recorded during the winter wheat vegetation period.

The present paper emphasizes the Romanian winter wheat cultivars with the best yield stability during the last four years, in the North-eastern part of Romania, contributing to a better understanding of their reaction to the stress factors.

MATERIAL AND METHOD

During the last four years (2015-2019), the behavior of 43 Romanian winter wheat cultivars besides the former Bezostaia 1, were studied. Twelve cultivars were studied for a period of four agricultural years: Bezostaia 1 (control variant.), Andrada, Codru, Glosa, Izvor, Miranda FDL, Otilia, Pajura, Pitar, Semnal, T.123-11, Ursita. Eight were studied for a period of four agricultural years: 11424 G1, Dumbrava, T.124-11, T.19-10, Unitar, T.109-12, T.143-11, Voinic. Four were studied for a period of two agricultural years: Zamfira, T.118-11, T.95-12, Litera, and twenty were studied just for an agricultural year: Zamolxe, Zina, Amurg, Armura, Abundent, L5X, T.25-14, T.51-14, T.57-14, T.59-14, T.7-15, Vestitor, Voevod, 11368 G1, 11838 G8, Boema, T.150-11, T.42-05, T.55-01, T.62-01.

The field experiment was carried out at the Didactic Station of Iasi – Ezareni Farm of "Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine, situated in the in north-eastern region of Romania at latitudes of $47^0$07'36" N, longitude $27^0$30'45"E and altitude 125 m above mean sea level.

The general climatic condition of Iasi area is classified as pronounced continental temperate climate with mean annual rainfall of about 550-600 mm out of which 68 percent rainfall is received during warm season. Maximum and minimum temperature ranges between 38^0C (August) -22^0C (January).

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RESULTS AND DISCUSSIONS

The effects of climate change represent a significant threat to global food security, not only by increasing global average temperatures, estimated at 1.5-2°C during the 20th and 21st centuries, but also through increasing the frequency and severity of extreme weather events. The increase of heat waves, drought, floods and the pressure exerted by pests create direct demands on crops, which leads to reduced yields (Ilangumaran G. *et al*, 2018).

The first decade of the 21st century has positioned the north-eastern area of Romania in an unprecedented position. The region of Moldova is forced, lately, to face very hot and drought and very humid and rainy periods. These climatic events in some cases exceed the relevant meteorological observations, some of them varying strongly from the multiannual average values recorded so far (Machidon O., 2017).

The characteristics of the climate of a region are very important for the geographical environment of the respective region, for the life of the people in that area, as well as for the economic activities, or of another's activities developed in that area. As a whole, the climate of the north-eastern part of Romania can be characterized by the presence of favourable features, but on this background are frequently observed climatic events which limited the high potential of this geographical area. Sometimes, the manifestations of climatic elements and phenomena are quite unusual, creating real difficulties for people and damaging the economy (Săulescu N. *et al*, 2006, Vasilescu L. *et al*, 2014).

Having in view that the experiments were performed under field conditions, the results were influenced by the climatic factors specific to the analyzed period. *Table 1* presents the air temperatures, rainfall and relative humidity registered at Ezareni Farm – Iasi Didactic Station during March-July, 2015-2019. The climatic data on the air temperature, rainfall recorded during the studied period were carefully analyzed for comparisons between the four studied agricultural years, as well as for observing the trends of evolution of air temperature over time.

Table 1

Climatic conditions at Ezareni Farm – Iasi Didactic Station, during 2016-2019

		March	April	May	June	July
Air Temperature (^{0}C)						
Multiannual average (^{0}C) (last century)		**3.1**	**10.2**	**16.0**	**19.5**	**21.2**
2016	Month average (^{0}C)	6.5	13.3	15.3	20.9	22.6
	Deviation (^{0}C)	+3.4	+3.1	-0.7	+1.4	+1.4
2017	Month average (^{0}C)	8.0	10.0	16.1	21.1	21.6
	Deviation (^{0}C)	+4.9	-0.2	+0.01	+1.6	+0.04
2018	Month average (^{0}C)	1.2	15.4	18.7	20.8	21.3
	Deviation (^{0}C)	-1.9	+5.2	+2.7	+1.3	+0.1
2019	Month average (^{0}C)	7.3	10.6	16.1	21.9	21.2
	Deviation (^{0}C)	+4.2	+0.4	+0.1	+2.4	0.0
Rainfall (mm)						
Multiannual sum (mm) (last century)		**28.4**	**43.9**	**55.9**	**82.6**	**69.3**
2016	Month sum (mm)	33.8	76.2	70.4	142.4	24.0
	Deviation (mm)	+5.4	+32.3	+14.5	+59.8	-45.3
2017	Month sum (mm)	107.0	140.4	72.8	71.6	84.4
	Deviation (mm)	+78.6	+96.5	+16.9	-11.0	+15.1
2018	Month sum (mm)	56.8	18.0	16.8	216.0	136.6
	Deviation (mm)	+28.4	-25.9	-39.1	+133.4	+67.3
2019	Month sum (mm)	40.4	62.6	125.2	113.8	24.2
	Deviation (mm)	+12.0	+18.7	+69.3	+31.2	-45.1

Between 2015-2019, in the experimental field of the Ezareni Farm, 44 winter wheat genotypes were tested, in terms of production stability (*figure 1*).

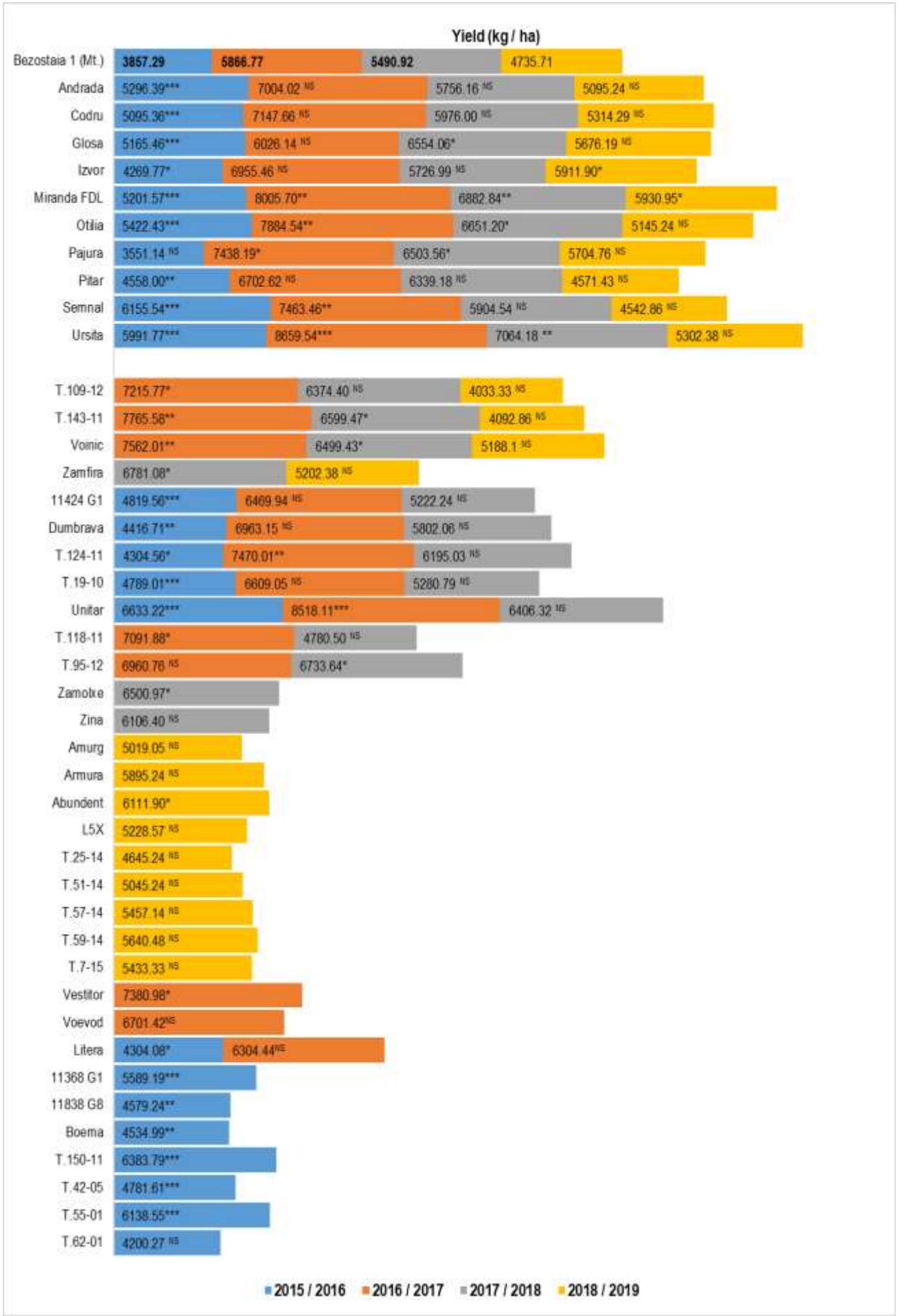

Figure 1 **Yields recorded between 2015-2019**

The average yields recorded at the surface unit was (per ha), in most cases, were above the control genotype, Bezostaia 1.

The highest yields were registered in 2017, and the lowest yields were registered in 2016. In the last two years of experiments were recorded medium yield values.

The highest yields were recorded in 2017, wen between March and June was recorded the highest rainfall.

The driest period, was recorded in 2018, but in this year before sowing was recorded a high level of precipitation which favored the good emergence and development of wheat plants in autumn.

CONCLUSIONS

The best yield stability had Glosa, Andrada and Bezostaia 1 cultivars. The highest yields have been achieved by Unitar[3], Ursita[4], Mirandal FDL[4], Voinic[3], Otilia[4], T.143-11[3] cultivars, with a [3]three/[4]four years average over 6 t/ha. They have a good yielding ability related to different climatic conditions.

REFERENCES

Ilangumaran G., Lamont R.J., Smith L.D., 2018 - *The role of the phytomicrobione in maintaining biofuel crop in a changing climate.* In: Lal K.P., Kumar S.A., Prakash T.S., Sudheer K., Microbes for Climate Resilient Agriculture, John Wiley & Sons.

Machidon O.M., 2017 - *The winter trends in air temperature and atmospheric precipitation in the Moldova region (Romania)*. Present Environment and Sustainable Development 11(1), pp. 183-193.

Rosielle A.A., Hamblin J., 1981 - *Theoretical aspects of selection for yield in stress and non-stress environments*. Crop Sci., 21 (6): 943–946.

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

Vasilescu L., Alionte E., Bude A., 2014 - *Winter barley varieties and lines behavior regarding the yield and quality stability, during 2008-2013*, at NARDI Fundulea. AN. I.N.C.D.A. FUNDULEA, VOL. LXXXII, 69-82.