BEHAVIOR OF SOME ROMANIAN WHEAT VARIETIES IN A.R.D.S. SECUIENI PEDOCLIMATIC CONDITIONS, DURING 2019 - 2021

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Abstract

This paper includes the results obtained after testing in multiannual comparative crops of a twelve national varieties of winter wheat, thus aiming to introduce into the crop genotypes that have high adaptability to pedo–climatic conditions specific to Central Moldova and thus a stability of production. These tests were performed at Agricultural Research – Development Station Secuieni, and the material used in the field experience came from National Agricultural Reasearch and Development Institute Fundulea and Agricultural Research – Development Station Turda The studied genotypes showed the following variation of the average production: 4109 kg/ha (2019) – 3522 kg/ha (2020) – 8711 kg/ha (2021). The low productivity in the first two years of experimentation is the result of unfavorable climatic conditions for winter wheat cultivation characterized in the first agricultural year (2018 – 2019) by a dry autumn and in the second agricultural year (2019 – 2020) by a dry spring. The Semnal variety presented the highest average productivity (6501 kg/ha) and a notable adaptability to unfavorable environmental conditions, which is why we recommend it to be introduced in the zonal culture.

Key words: ecological testing, winter wheat, harvest

This cereal is one of the oldest cultivated plants, being cultivated by humans from the Middle East since 10 – 12 thousand years B.C.

Ioan Bejinariu, archaeologist of the Zalău County Museum of History and Art and his team discovered "Emmer" wheat seeds (Egyptian wheat) cultivated in the Leşmir area 6000 years ago. (www.historia.ro)

The inscriptions on the coins of the old Pontic cities confirm that wheat has been cultivated in Romania for over 2500 years. For example, the coins of the Tomis Fortress (present-day Constanța) bore on one side the face of the Goddess Demeter (Goddess of Agriculture), and on the other side, ears of wheat. (Mogârzan A., 2012)

The wheat is the most important cereal, due to its multiple use both in human nutrition (the staple food of over half the world's population) and in animal nutrition. (Robu T, 2011)

From an agronomic point of view, wheat crop is appreciated and demanded due to the ecological plasticity of the species that ensures high yields in various pedo–climatic conditions, from subtropical to continental climate and at altitudes up to 1400 m. (Robu T, 2011)

As for wheat breeding programs, they aim to create varieties well adapted to the area conditions, productive and with good stability. (Săulescu T., 1984)

The production stability is an attribute characterized by high production potential, superior production quality and good adaptation to environmental conditions. (Săulescu T *et al*, 2006)

This paper includes the results obtained after testing in multiannual comparative crops of a twelve national winter wheat varieties, thus aiming to introduce into the crop genotypes that have high adaptability to pedo-climatic conditions specific to Central Moldova and yield stability.

MATERIAL AND METHOD

The researches were carried out during period 2019 – 2021, at the Agricultural Research – Developmen Station Secuieni, and aimed at establishing the adaptability to the pedo-climatic conditions from the Center of Moldova of twelve national varieties of winter wheat, namely: Glosa, Miranda, Otilia, Pitar, Semnal, Ursita, Voinic, Abundent, Armura, Andrada, Codru, Bezostaia, creations of National Agricultural Reasearch and Development Institute Fundulea and Agricultural Research – Development Station Turda.

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[1] A.R.D.S. Secuieni

The comparative culture was placed according to the method of randomized blocks, in three repetitions, the experimental plot being of 10 sqm.

The experiment layout was done on a phaeoziom cambic soil type, weakly acidic, with a low humus content being a poorly fertile soil, little supplied with nitrogen, but with a considerable content of phosphorus and potassium in forms accessible to plants (*table 1*).

Table 1
Soil characteristics at Agricultural Research – Development Station Secuieni

Soil characteristics	Faeoziom (cernoziom) cambic	
	Value	Reading
Humus content	2.3%	weak fertile
N_T content	0.134%	poorly supplied with nitrogen
P_{acc} content	74 ppm	well to very well supplied with mobile phosphorus
K_{acc} content	221 mg/kg	good to very well supplied with potassium
pH	6.14	weak acid

The sowing density was of 550 g.g./sqm, respecting the cultivation technology specific to the cultivation area from Central Moldova (Trotuș et al.,2020).

The obtained data were processed and interpreted statistically according to the method of variation analysis (Jităreanu, 1994).

From a climatic point of view, in Secuieni area, the 2018 – 2021 agricultural years were characterized as hot and very dry.

During the winter wheat vegetation period, the deviation from the temperatures multiannual average was of +0.9ºC (1st and 3rd year), +2.3ºC (2nd year). Thus, the vegetation periods of the winter wheat crops from the experimentation years were characterized as normal, respectively warm (*figure 1*).
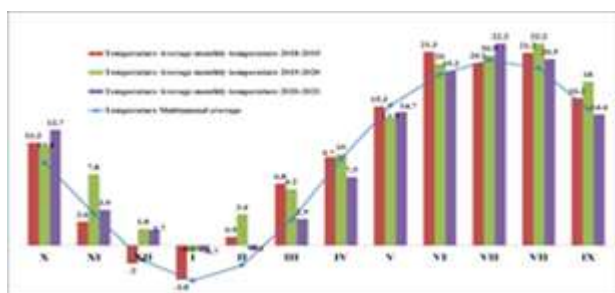

Figure 1 **Average temperatures from Agricultural Research – Development Station Secuieni, 2018 – 2021**

From a pluviometric point of view, the three agricultural years were characterized by being very dry; but during the winter wheat vegetation period, the deviation from the multiannual average was between 29.3 mm (May 2019) and -45.7 mm (April 2021). The dynamics is shown in *figure 2*.
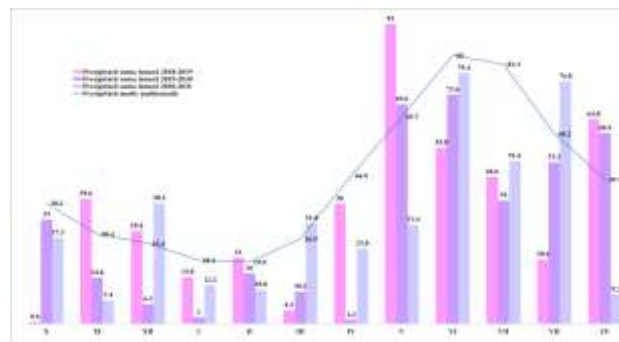

Figure 2 **Precipitation dynamics from Agricultural Research – Development Station Secuieni, 2018 – 2021**

RESULTS AND DISCUSSIONS

The yield stability for winter wheat is given by the varieties with a high yield potential, a higher yield quality and a better adaptation to biotic and abiotic environmental conditions. The achieved genetic progress has been constant and obvious for all important traits, and the accumulation of valuable genes in the current germplasm allows solving new challenges, especially of those related to climate change. (David, 2007)

The tested winter wheat varieties were differentiated according to some agronomic characteristics shown in *table 2*.

Table 2
Agronomic characteristics studied for winter wheat genotypes, Agricultural Research – Development Station Secuieni , 2019 – 2021

Genotyp	Ears/ sqm	Grains/ Ear	Grain/spike weight (g)	Harvest index
Glosa	784	31.34	1.39	0.403
Miranda	731	32.92	1.42	0.360
Otilia	669	38.56	1.48	0.352
Pitar	697	37.33	1.52	0.409
Semnal	792	39.21	**1.76**	0.405
Ursita	**797**	35.75	1.50	0.397
Voinic	720	36.86	1.46	**0.411**
Abundent	731	40.07	1.48	0.359
Armura	**609**	**41.56**	1.47	0.361
Andrada	667	36.98	1.55	0.360
Codru	673	36.67	1.66	0.387
Bezostaia	750	**30.07**	**1.28**	**0.351**
Control	**718**	**36.44**	**1.50**	**0.376**

The average yields obtained for the studied genotypes varies broadly in the three studied agricultural years, the yield value being maximum in the third year, 2020 – 2021, when the average experience recorded a yield of 8711 kg / ha, while in the other two years, the yield values were of 3522 kg / ha in 2019 – 2020 and 4109 kg / ha in 2018 – 2019.

The productivity differences of the experienced genotypes in the studied years are the result of the climatic conditions.

The fall of 2018 were manifested by a severe drought that led to a deficient emergence of winter wheat with a negative effect on the yield that had an average value of 4109 kg / ha, and the spring of 2020 was characterized by low temperatures, cool days stressing and delaying thus the development of plants, which at the end of the vegetation had an average productivity of 3522 kg / ha.

The yield variation during the first year of experimentation (2018 – 2019) had values between 2962 kg / ha (Codru variety) and 5238 kg / ha (Semnal variety).

Compared to the experience control variety (4109 kg / ha) the Codru variety registered production differences of -1147 kg / ha, statistically interpreted as negatively very significant (such as the varieties Miranda and Andrada), the Semnal variety has seen an increase in production of 1129 kg / ha, statistically interpreted as very significant (such as Ursita variety) and Voinic variety has an significant incrase in production (*table 3*).

The year 2020 was marked by a variation of yield between 2703 kg / ha at Bezostaia variety, which recorded a difference in production compared to the control (-819 kg / ha) statistically interpreted as negatively very significant and 4386 kg / ha for the Abundent variety, which had a statistically assured production increase, interpreted as very significant of +864 kg / ha.

Also the genotyps Semnal and Otilia had production increases interpreted statistically as distinctly significant and significant and the Ursita variety recorded a production deficit statistically interpreted as negatively very significant (*table 3*).

In the last year of experimentation, the yield varied in very wide limits, from 6860 kg / ha as recorded at the Bezostaia variety to 10223 kg / ha at the Semnal variety.

The genotypes studied, in the last year of experimentation, 2021, recorded production increases interpreted statistically as being significant (Ursita, Voinic and Codru varieties) and very significant (Semnal variety), but also, there were genotypes that recorded statistically assured production deficits as negatively significant (Otilia variety) and negatively very significant (Pitar and Bezostaia variety). (*table 3*)

Table 3

Average yields of winter wheat varieties, Agricultural Research – Development Station Secuieni, 2019 – 2021

Genotyp	2019	2020	2021
	Average product (kg / ha)		
Glosa	4275	3255	8640
Miranda	3473^{000}	3592	8350
Otilia	4266	3862*	7920^{0}
Pitar	4119	3457	7423^{000}
Semnal	5238***	4041**	10223***
Ursita	5235***	2806^{000}	9757**
Voinic	4457*	3220	9677**
Abundent	4130	4386***	8933
Armura	3817	3782	8430
Andrada	3223^{000}	3618	8550
Codru	2962^{000}	3547	9770**
Bezostaia	4113	2703^{000}	6860^{000}
Control	**4109**	**3522**	**8711**
DL 5%	307	312	696
DL 1%	417	425	946
DL 0,1%	559	569	1267

During the experimented period (2019 – 2021) the most productive winter wheat variety was Semnal, which recorded an average yield of 6501 kg / ha, and the least productive was the Bezostaia variety, which had an average yield of 4559 kg / ha (*figure 3*).
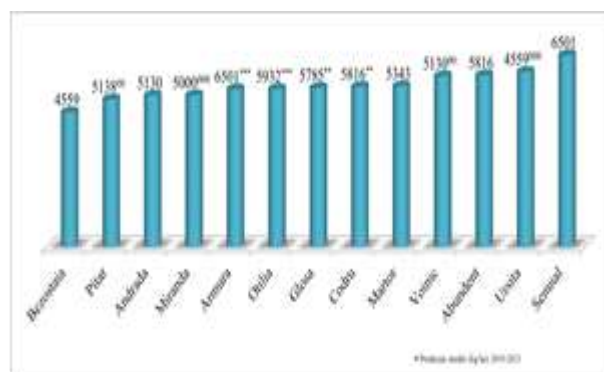
Figure 3 **Average yields of the studied genotypes at Agricultural Research – Development Station Secuieni, 2019 – 2021**

CONCLUSIONS

In the period 2019 – 2021, the winter wheat productions obtained for the tested genotypes varied according on the climatic conditions which were very different from one agricultural year to another.

The most unfavorable agricultural year for the winter wheat crop was 2019 – 2020; year in which, in addition to drought and heat, the hail phenomenon was added, but among the genotypes studied, productive varieties were noted even in such conditions.

According to the average experience, the highest production was registered in the agricultural year 2020 – 2021, of 8711 kg / ha, followed by 4109 kg / ha in 2018 – 2019, and the lowest production was 3522 kg / ha, in the agricultural year 2019 – 2020.

Among the genotypes experienced, the highest average yeld was achieved at the Semnal variety, namely 4041 kg / ha in the most unfavorable year, up to 10223 kg / ha in the most favorable year.

The Semnal variety stands out with a high productivity and a remarkable adaptability to unfavorable environmental conditions, which is why we recommend it to be introduced in the zonal agriculture.

High average yields were also obtained at varieties such as Ursita (4559 kg / ha), Abundent (5816 kg / ha) and Voinic (5130 kg / ha).

ACKNOWLEGMENTS

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