

THE RESPONSE OF SOME NEW WINTER WHEAT GENOTYPES IN ARDS PITEȘTI CONDITIONS IN THE 2023-2024 AGRICULTURAL YEAR

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Abstract

Obtaining new winter wheat genotypes is of particular importance in wheat improvement, by increasing production, quality and resistance to the pedoclimatic conditions of the area. Being created under the conditions of ARDS Pitești, winter wheat lines exhibit increased resistance to aluminum ions found in the arable layer. Aluminum ions affect plants because they block the necessary mobile phosphorus, which is why it is necessary to apply amendments based on CaCO₃. The studied material was represented by the Ursita variety, considered the control variant, and 4 new winter wheat genotypes, represented by lines A4-10, A44-13, A95-13 and A57-14. The experiment is of the AxBxC trifactorial type, where factor A is represented by the genotype, factor B, the variants that were treated in the seed and the untreated ones, factor C-different fertilization doses, organized according to the randomized block method in 4 repetitions. The results were statistically processed using the parameters: production, protein content, gluten content, hectoliter mass.

Keywords: production, quality indices, resistance, treatment, wheat.

1. INTRODUCTION

Wheat is cultivated throughout the world and is an important source of food, with winter wheat being more widespread than spring wheat. Higher yields are generally obtained with winter wheat than with spring wheat, therefore breeding aimed at improving winter hardiness (Baga et al., 2007). Climate change and extreme weather events have a negative impact on the value of grain production and quality (Ghafoor et al., 2004). Plant breeding provides varieties with increased nutrient and water use efficiency, high heat and drought tolerance, disease resistance, and a high capacity to cope with increasing extreme temperatures and heavy rainfall (Braun et al., 2010). The genetic potential of a variety and the available nitrogen in the soil are primary factors determining the protein concentration in cereals (Fowler, 2003).

2. MATERIALS AND METHODS

The research was conducted in the 2023-2024 agricultural year at ARDS Pitești in the improvement laboratory, on a soil poor in nutrients, rich in aluminum ions, which causes phosphorus blockage, therefore it was necessary to apply amendments based on CaCO₃. The biological material used in the experiment was composed of the winter wheat variety *Ursita*, created by INCDA Fundulea, and 4 new winter wheat genotypes. The experiment was designed using a randomized block design

(AxBxC) with 4 replications. Factor A was represented by the genotype *Ursita* (control) and 4 new genotypes (*A4-10*, *A44-10*, *A95-13*, *A57-14*). Factor B was represented by the treated and untreated variants, the seed treatment for the treated variants was carried out with the insect-fungicide Austral Plus, 5 l/to. Factor C, represented by fertilization with 2 graduations, respectively 120 kg N/ha and 160 kg N/ha. Quality indices, respectively the protein content (P%) and gluten (G%), were carried out using the Inframatic 9500 device, and the establishment of the hectoliter mass was carried out using the Wile 2000 device.

Statistical data processing was performed using the PoliFact program.

3. RESULTS AND DISCUSSIONS

Climatic data from September 2023 to June 2024 characterize the year as warm and dry. Except for May, when a negative thermal deviation of -0.5 °C was recorded, positive thermal deviations were recorded in the other months, with values ranging between +1.72 °C in November and +6.7 °C in February. Compared to the multiannual average over the last 40 years, the average thermal deviation of this period was +3.27 °C (figure 1).

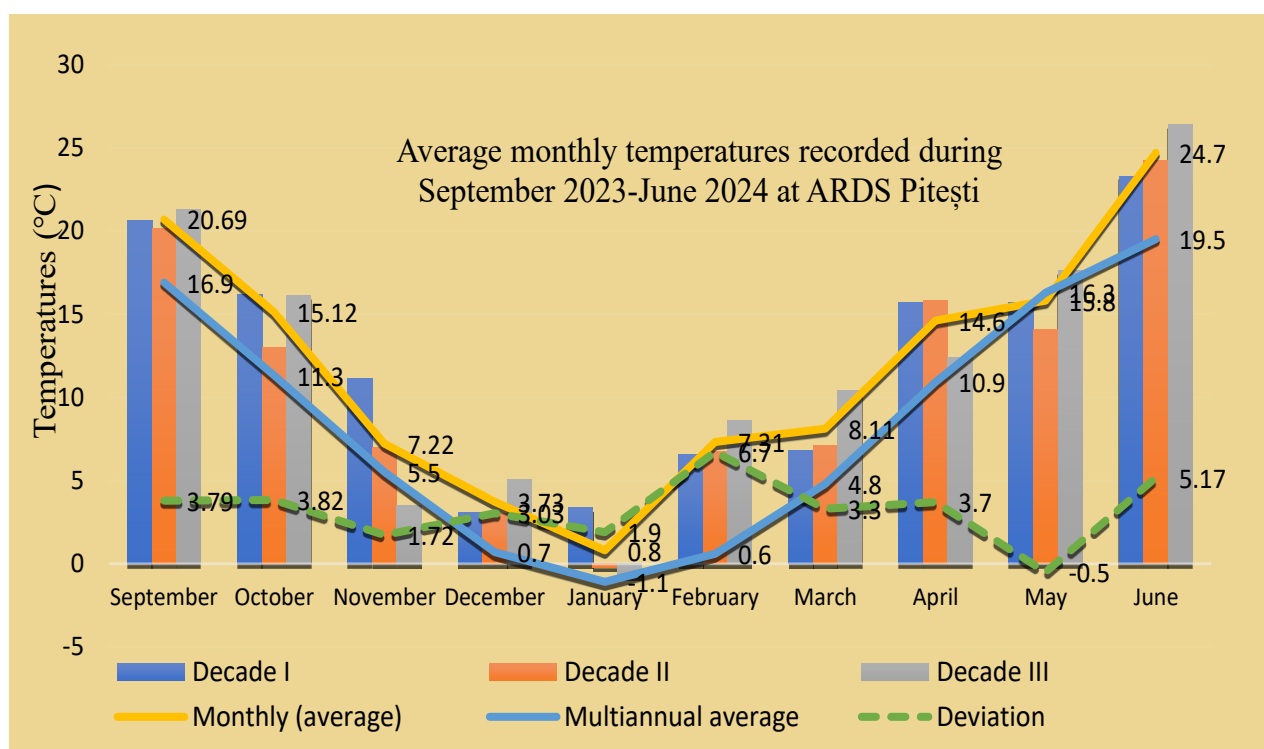


Figure 1. Average monthly temperatures recorded at ARDS Pitești

From, Figure 2 it can be seen that the precipitation recorded during this period had values below the multiannual average, except for January which was characterized as a rainy month, with an excess of 28.5 mm compared to the multiannual average of this month, and March as being closer to the multiannual average of the month. A deficit of -208.1 mm of precipitation is observed during this period compared to the 40-year multiannual average.

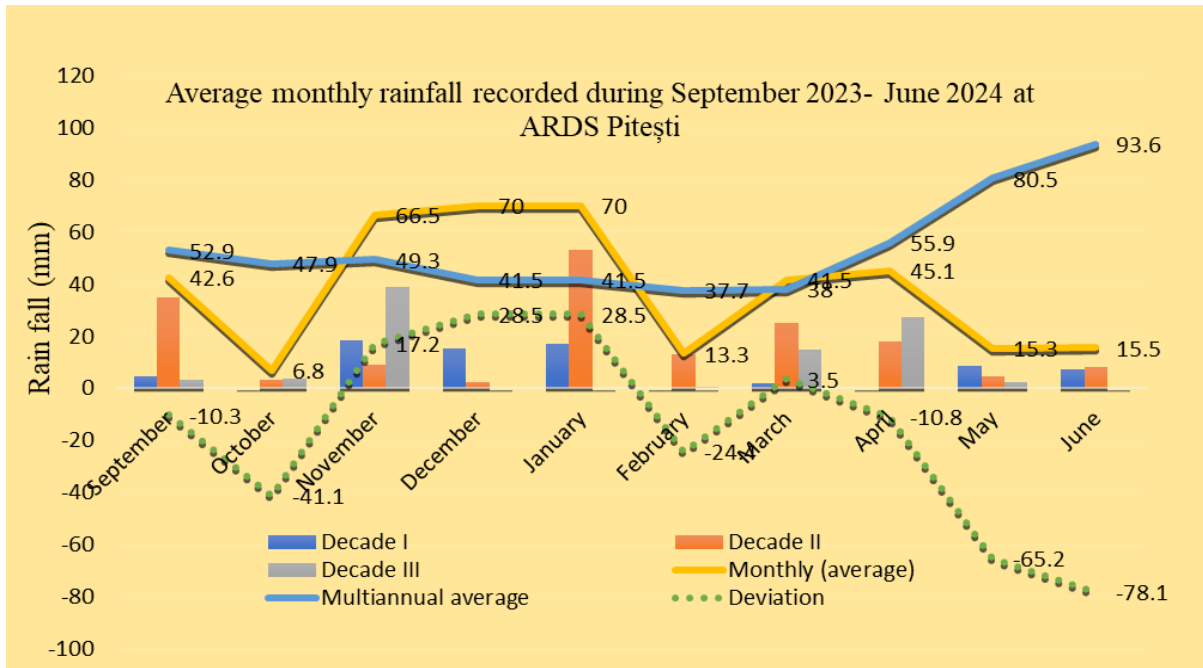


Figure 2. Average monthly rainfall recorded at ARDS Pitești

Table 1. Interactions between genotype, treatment, fertilization rates on production

Genotype	Treatment	Fertilization	Production (kg/ha)	%	Difference	Significance
Ursita	Untreated	120(kgN/ha)	6135.00	100.0	0.00	Control
A4-10			7039.25	114.7	904.25	-
A44-13			6860.50	111.8	725.50	-
A95-13			6483.50	105.7	348.50	-
A57-14			5717.75	93.2	-417.25	-
Ursita	Untreated	160(kgN/ha)	6164.25	100.0	0.00	Control
A4-10			6986.75	113.3	822.50	-
A44-13			6657.75	108.0	493.50	-
A95-13			6416.00	104.1	251.75	-
A57-14			5702.50	92.5	-461.75	-
Ursita	Treated	120(kgN/ha)	6185.25	100.0	0.00	Control
A4-10			7020.50	113.5	835.25	-
A44-13			7114.25	115.0	922.00	-
A95-13			6445.00	104.2	259.75	-
A57-14			5750.25	93.0	-435.00	-
Ursita	Treated	160(kgN/ha)	6285.50	100.0	0.00	Control
A4-10			7227.25	115.0	941.75	-
A44-13			7172.25	114.1	886.75	-
A95-13			19345.75	307.8	13060.25	**
A57-14			5883.75	93.6	-401.75	-
					LSD (p 5%)	8385.32
					LSD (p 1%)	11503.46
					LSD (p 0.1%)	15680.48

From the genotype-treatment-fertilization dose interaction (table 1) it is observed that A95-13, the treated variant, fertilized with 160 kg N/ha, recorded a distinct positive difference in production compared to the *Ursita* control. In contrast, the other genotypes did not record any differences compared to the control.

Cereal protein formation depends on the accumulation of nitrogen from plants and its translocation into the grain during the filling phase (Zhao et al., 2000). In table 2, interaction between genotype-treatment-fertilization rates, A95-13 treated and untreated variant, fertilized with 160 kg N/ha, obtained a significantly positive difference in protein content compared to the control. The other new wheat genotypes recorded, in both treated and untreated variants, fertilized with both doses of nitrogen, very significantly positive differences compared to the *Ursita* control.

Table 2. Interactions between genotype, treatment, fertilization rates on protein content

Genotype	Treatment	Fertilization	Protein (%)	%	Difference	Significance	
Ursita	Untreated	120(kgN/ha)	14.18	100.0	0.00	Control	
A4-10			14.03	98.9	-0.15	-	
A44-13			15.08	106.3	0.90	***	
A95-13			14.80	104.4	0.63	***	
A57-14			15.45	109.0	1.28	***	
Ursita	Untreated	160(kgN/ha)	14.20	100.0	0.00	Control	
A4-10			14.05	98.9	-0.15	-	
A44-13			14.93	105.1	0.72	***	
A95-13			14.55	102.5	0.35	*	
A57-14			15.48	109.0	1.28	***	
Ursita	Treated	120(kgN/ha)	14.20	100.0	0.00	Control	
A4-10			14.28	100.5	0.07	-	
A44-13			15.10	106.3	0.90	***	
A95-13			14.83	104.4	0.62	***	
A57-14			15.68	110.4	1.47	***	
Ursita	Treated	160(kgN/ha)	14.35	100.0	0.00	Control	
A4-10			14.38	100.2	0.02	-	
A44-13			15.33	106.8	0.97	***	
A95-13			14.73	102.6	0.38	*	
A57-14			15.65	109.1	1.30	***	
					LSD (p 5%)	0.30	
					LSD (p 1%)	0.42	
					LSD (p 0.1%)	0.58	

The interaction between genotype-treatment-fertilization on gluten content (table 3) showed that the A95-13 genotype, the untreated variant fertilized with 160 kg N/ha, recorded a significantly positive difference, while the treated variant, fertilized with the same dose, obtained a distinctly significantly positive difference compared to the *Ursita* control. In the case of the other genotypes, the

differences recorded were highly significantly positive, except for the A4-10 genotype which did not obtain significant differences compared to the parent.

Table 3. Interactions between genotype, treatment, fertilization rates on gluten content

Genotype	Treatment	Fertilization	Gluten (%)	%	Difference	Significance
Ursita	Untreated	120(kgN/ha)	28.35	100.0	0.00	Control
A4-10			28.03	98.9	-0.32	-
A44-13			30.50	107.6	2.15	***
A95-13			29.88	105.4	1.53	***
A57-14			31.45	110.9	3.10	***
Ursita	Untreated	160(kgN/ha)	28.25	100.0	0.00	Control
A4-10			28.13	99.6	-0.13	-
A44-13			30.03	106.3	1.78	***
A95-13			29.03	102.7	0.77	*
A57-14			31.63	111.9	3.38	***
Ursita	Treated	120(kgN/ha)	28.45	100.0	0.00	Control
A4-10			28.68	100.8	0.22	-
A44-13			30.63	107.6	2.17	***
A95-13			30.03	105.5	1.57	***
A57-14			32.03	112.6	3.58	***
Ursita	Treated	160(kgN/ha)	28.75	100.0	0.00	Control
A4-10			28.83	100.3	0.07	-
A44-13			31.08	108.1	2.32	***
A95-13			29.75	103.5	1.00	**
A57-14			32.03	111.4	3.28	***
					LSD (p 5%)	0.64
					LSD (p 1%)	0.89
					LSD (p 0.1%)	1.23

In table 4, from the interaction between genotype-treatment-fertilization on hectoliter mass, it is observed that the genotype A4-10, both in the case of treated and untreated variants, fertilized with both doses of nitrogen, recorded a very significant negative difference compared to the *Ursita* control. In the case of the other genotypes, no significant differences were recorded compared to the control.

Table 4. Interactions between genotype, treatment, fertilization rates on HM

Genotype	Treatment	Fertilization	HM (kg/hl)	%	Difference	Significance
Ursita	Untreated	120(kgN/ha)	83.18	100.0	0.00	Control
A4-10			78.68	94.6	-4.50	000
A44-13			83.83	100.8	0.65	-
A95-13			84.25	101.3	1.07	-
A57-14			82.98	99.8	-0.20	-
Ursita	Untreated	160(kgN/ha)	83.30	100.0	0.00	Control
A4-10			78.53	94.3	-4.78	000
A44-13			84.03	100.9	0.72	-
A95-13			84.03	100.9	0.72	-
A57-14			82.60	99.2	-0.70	-
Ursita	Treated	120(kgN/ha)	83.02	100.0	0.00	Control
A4-10			79.25	95.5	-3.77	000
A44-13			82.70	99.6	-0.32	-
A95-13			84.33	101.6	1.30	-
A57-14			83.05	100.0	0.03	-
Ursita	Treated	160(kgN/ha)	83.98	100.0	0.00	Control
A4-10			78.15	93.1	-5.82	000
A44-13			83.48	99.4	-0.50	-
A95-13			84.48	100.6	0.50	-
A57-14			82.90	98.7	-1.07	-
LSD (p 5%)					1.39	
LSD (p 1%)					1.91	
LSD (p 0.1%)					2.63	

4. CONCLUSIONS

Due to the negative correlation between production and quality, the wheat lines did not register very significant positive differences in terms of production, compared to the *Ursita* control.

Lines A44-13 and A57-14 in the treated and untreated variants fertilized with both the dose of 120 and 160 kg N/ha respectively obtained a very significant positive difference in terms of protein content.

Regarding gluten content, the A95-13 line in the untreated variants fertilized with a dose of 160 kg N/ha recorded a significantly positive difference and for the treated variants, fertilized with the same dose, the line obtained a distinctly significantly positive difference, compared to the *Ursita* control.

From the genotype x treatment x fertilization interaction on MH (kg/hl) only line A4-10 recorded a highly significant negative difference both in the case of untreated variants and fertilized with 120, respectively 160 (kg/ha), and in the case of treated variants and fertilized with 120, respectively 160 (kg/ha), compared to both the *Ursita* control.

5. REFERENCES

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