Current Trends in Natural Sciences
Vol. 13, Issue 25, pp. 260-267, 2024
https://doi.org/10.47068/ctns.2024.v13i25.031
Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521
Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

THE BEHAVIOR OF SOME CORN HYBRIDS IN THE CONDITIONS OF ALBIC LUVOSOL FROM SCDA PITEȘTI-ALBOTA, IN 2023

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Current Trends in Natural Sciences

Abstract
Climate developments in recent years have shown annual and seasonal variations with large amplitudes in terms of temperature, rainfall, and other factors that have influenced the stability of maize production in a negative way. In Romania, the areas most vulnerable to extreme agricultural drought are the southern and southeastern areas, especially Dobrogea, Baragan, southern Oltenia, Wallachia and Moldova, respectively, large maize growing areas.
Increasing the stability, as well as the level of performance of corn yield is possible only by creating genotypes that show tolerance to water stress.
The purpose of the research was to observe the behavior of some creations obtained in two breeding centers, in the climatic conditions and of the albic luvosol of the Pitesti Agricultural Research and Development Station. The biological material consisted of five hybrids from each center, of which the Turda 335 hybrid with a yield of 85 % and the Magnus hybrid with the mass of one thousand grains with a value of 248 g stood out.

Keywords: drought, hybrids, production, MTG, tolerance.

1. INTRODUCTION

Maize is an important agricultural crop, both nationally and globally, which emerges from the extensive areas on which it is grown, the place occupied in the structure of agricultural crops (Chețan, 2022) and the multiple uses of corn grains in: human nutrition, industry, animal feed. Therefore, the level of production and economic efficiency of maize crops are issues of national interest (Sarca et al., 2007).The use of corn hybrids with the ability to achieve large, stable and high quality yields is one of the most important factors in increasing the efficiency of maize cultivation (Sarca and Ciocăzanu, 1993).The diversity of pedoclimatic conditions requires the cultivation of a wider range of hybrids, from the very early to the semi-late hybrids. They are created in maize breeding centers, adapted to specific conditions in areas that raise some particular problems caused by: thermal regime, frost-free interval, climatic diversity, relief and soils often with different particularities.The climatic characteristics of maize growing areas have changed, through average temperatures above the multiannual average value, as well as through the alternation between periods (April-May-June) with low temperatures and abundant rainfall, followed by months (July and August) with high temperatures, soil drought and atmospheric drought, during periods of maximum water consumption of plants.

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2. MATERIALS AND METHODS

This material presents data obtained in 2023, in the pedoclimatic conditions of the resort, respectively in the High Plain of Pitesti. The soil in which the experimental field was located is of stagnant albic luvosol type, with an acidic pH (5,3), a clay structure (clay content 30%), poorly supplied with nitrogen (Nt = 0,159 %) and phosphorus (P = 89 mg/kg), moderately supplied with potassium (K = 84 mg/kg) and with a humus content in the arable horizon of about 2,21 %. Characteristic of this type of soil is the high content of mobile aluminum ions in the arable layer, of 0.92-1.39 mg/Al exchangeable/100 g soil.

5 hybrids from SCDA Turda and 5 hybrids from INCDA Fundulea were studied, which were grown in non-irrigation conditions. The culture technology was the one recommended by the research station..

The sowing was carried out with the planter, on 28-04-2023, at a depth of 6 cm, with a density of 65,000 plants/ha, each plot consisted of 6 rows, with an area of 7 m²/plot. The experimental method was that of blocks, in 4 repetitions.

Table 1. Experimental corn hybrids

Hybrid		Type of hybrid	Year of approval	FAO Group
Hybrid Turda	Turda 165	HT	2002	270 - early
	Turda 332	HS	2014	380- semi-early
	Turda 344	HT	2017	380- semi-early
	Turda 335	HS	2021	380- semi-early
	Turda 2020	HS	2021	380- semi-early
Hybrid Fundulea	Amurg	HS	2022	360- semi-early
	Magnus	HS	2021	350- semi-early
	Miraj	HS	2022	390- semi-early
	Felix	HS	2019	460- semittardiv
	F423	HS	2015	470- semittardiv

HS = Simple hybrid; HT = trilinear hybrid

During the growing season of maize, the main phenophases were noted, and in the final phase, grain production determinations and their quality were made.

The processing of experimental data was done according to statistical methods, program variance analysis (PoliFact) and establishment of limit differences (DL 5%, 1% and 0.1%).

In order to establish the quality of grains, the protein content (P%), starch and oil content was determined with the Inframatic IM 9500 device.

Grain moisture at harvest was carried out with the humidometer - Granomat PFEUFFER GmbH

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3. RESULTS AND DISCUSSIONS

1.Characterization of climatic factors in maize vegatation

As for the rainfall recorded between March and September, they had values below the multiannual average, with negative deviations in : March 13.9 mm, May 26.7 mm, June 24.0 mm, July 45.5 mm, August 43.3 mm, September 15.3 mm.

April was characterized as rainy with an excess of 12.9 mm compared to the multi-year average of the month. Sowing was carried out under these conditions on 28-04 2023.

Thus, the period (March 2023 – September 2023) was characterized as a warm period, with a positive thermal deviation of 1.5 ºC, compared to the multiannual average over 40 years and with a deficit in terms of precipitation of 155 mm, deficit also recorded during the period of maximum water consumption of maize (panicle appearance, grain formation) (tabel 2)

The period March-September 2023, started with March with higher temperatures compared to the multiannual average (positive thermal deviation 2.4ºC), followed by April and May, characterized as colder than the multiannual average, with negative thermal deviations (April 0.9 ºC, May 0.7 ºC) and continuing with four warm months with positive thermal deviations (June 0.51 ºC, July 2.48 ºC, August 2.98 ºC, September 3.79 ºC) .

The average temperature of the period March-September was 17.4 ºC and recorded a positive thermal deviation of 1.5 ºC compared to the multiannual average of the period of 15.9 ºC (tabel 2)

Table 2. Climatic condition 2023 (CORN)

		March	April	May	June	July	August	September	Amount	Average	Abat.+-
TEMPERATURE	Dec.I	6.15	7.68	13.55	18.53	22.95	22.98	20.65		16.07	
	Dec.II	6.45	10.9	14.8	19.73	26.18	23.87	20.13		17.44	
	Dec.III	9.09	11.35	18.35	27.07	24.02	25.98	21.3		19.59	
	Monthly average	7.23	9.98	15.57	21.77	24.38	24.28	20.69		17.7	
	Multi-annual average	4.8	10.9	16.3	19.5	21.7	21.3	16.9		15.91	
	Deviation	2.43	-0.92	-0,73	2.27	2.68	2.98	3.79			1.79
PRECIPITATION	Dec.I	-	45.6	9.1	17.2	6.4	9.4	4.5	92.2		
	Dec.II	6.9	18.9	21.5	26.8	15.8	1.3	35	126.2		
	Dec.III	17.1	5.3	23.2	25.6	13.4	5.7	3.1	93.4		
	Monthly average	24	69.8	53.8	69.6	35.6	16.4	42.6	311.8		
	Multi-annual average	38	55.9	80.5	93.6	81.1	59.7	52.9	461.7		
	Deviation	-14	13.9	-26.7	-24	-45.5	-43.3	-10.3			-149.9

2.Grain production and quality.

Regarding the production results of the hybrids created at INCDA Fundulea, we have values of 4007 kg/ha for the Twilight hybrid and 7803 kg/ha for the Magnus hybrid, with significantly positive differences from the control for the Magnus hybrid and very distinctly significantly negative for the Twilight hybrid.

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In the case of hybrids created in Turda, production had values between 4502 kg / ha in the case of Turda 332 hybrid and 5534 kg / ha in the case of Turda 335 hybrid, with significantly negative differences for Turda 335 hybrids with very significant negative differences for Turda 332 and Turda 344 hybrids.
For the Fundulea hybrids the yield ranged from 63 % for the Twilight hybrid, 82 % for the Magnus hybrid and the F432 hybrid.For Turda hybrids the yield was between 80% for Turda 344 hybrid and 85% for Turda 335 hybrid.
The hybrids from Fundulea had the mass of one thousand grains with values between 186 g for the Twilight hybrid and 248 g for the Magnus hybrid, while in Turda it had values between 218 g for the Turda 2020 hybrid and 274 g for the Turda 335 hybrid (table 3).

Table 3. Production of maize hybrids in the two breeding centres in 2023

Var.	Production of grains kg/ha								Randament %				MMB g			
	Fundulea hybrids				Turda hybrids											
	Hybrid	Grain Prod. Kg/ha	Diff. ± from the witness.	Meaning.	Hybrid	Grain Prod. Kg/ha	Diff. ± from the witness	Meaning	Fundulea hybrids		Turda hybrids		Fundulea hybrids		Turda hybrids	
1.	F423 Mt.	7608	-		T 165	5059	-		F423	82	T 165	82	F423	242	T 165	232
2.	Felix	7483	-125	-	T. 332	4502	-557	°°°	Felix	81	T 332	81	Felix	200	T 332	264
3.	Magnus	7803	195	*	T 344	4645	-414	°°°	Magnus	82	T 344	80	Magnus	248	T.344	224
4.	Amurg	4007	-3601	°°°	T 335	5534	475	***	Amurg	63	T 335	85	Amurg	186	T 335	274
5.	Miraj	7321	-287	°°	T 2020	4946	-113	°	Miraj	80	T 2020	81	Miraj	226	T 2020	218
$\bar{X}$		6844				4937				78		82		220		242
DL5% DL1% DL0,1%		153,60 215,36 304,39				85,29 119,50 169,02				1,90 2,67 3,78		1,21 1,70 2,41		26,02 36,48 51,57		19,52 27,37 38,69

The protein content of the Fundulea hybrids has values between 9,1 % and 12 % with very distinct meanings, significant negative for the felix and miraj hybrids and distinguished significantly negative for the magnus hybrid.
For Turda Hybrids, the protein content has values between 8.9% and 10.1%, distinctly significantly positive for Turda Hybrid 332 and significantly positive for Turda, 2020 (tabel 4).

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Table 4. Protein content of hybrids grown in 2023

Variants	Fundulea hybrids				Turda hybrids			
	Variants	Protein %	Difference from mt	Significance	Variants	Protein %	Difference from mt	Significance
1.	F423-mt	11.8	-	-	T 165-mt	8.9	-	-
2.	FELIX	9.2	-2.6	ooo	T 332	10.1	1.2	**
3.	MAGNUS	10.1	-1.7	oo	T344	9.0	0.1	-
4.	AMURG	12.0	0.2	-	T 335	9.0	0.1	-
5.	MIRAJ	9.1	-2.7	ooo	T 2020	9.8	0.9	*
X		10.4				9.4		
LSD 5% **LSD 1%** **LSD 0.1%**			1.1 1.6 2.4				0.8 1.1 1.5	

The starch in the Fundulea creations ranged from 68.4 % in the Twilight hybrid to 72.2 % in the Miraj hybrid. Felix hybrid having a starch content with a significant positive difference from the control.

In Turda hybrids, starch had values between 71% for Turda 344 hybrid and 73.3% for Turda 335 hybrid, with distinctly significant negative differences for Turda 332 and Turda 344 hybrids (table 5).

Table 5. Starch content of hybrids

Variants	Fundulea hybrids				Turda hybrids			
	Variants	Starch %	Difference from mt	Significance	Variants	Starch %	Difference from mt.	Significance
1.	F423-mt	69.4	-		T 165-mt	72.8	-	
2.	FELIX	71.9	2.5	*	T 332	71.1	-1.7	oo
3.	MAGNUS	70.3	0.9	-	T344	71.0	-1.8	oo
4.	AMURG	68.4	-1.0	-	T 335	73.3	0.5	-
5.	MIRAJ	72.2	1.8	-	T 2020	73.2	0.4	-
X		70.4				72.3		
LSD 5% **LSD 1%** **LSD 0.1%**			2.2 3.0 4.3				0.9 1.2 1.8	

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3. Correlations between the characters studied

In the case of Fundulea hybrids, a positive correlation was obtained only between grain production and starch content (r = 0,658). The other correlations presented were negative with values of -0.534 for the correlation between grain production and oil percentage, between grain and protein production by -0.601; The most obvious was between protein and starch of -0.967(Figures 1- 8).

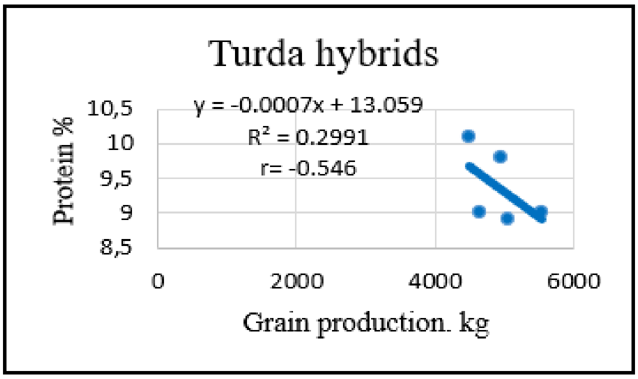

Figure 1.Correlation between grain production and protein

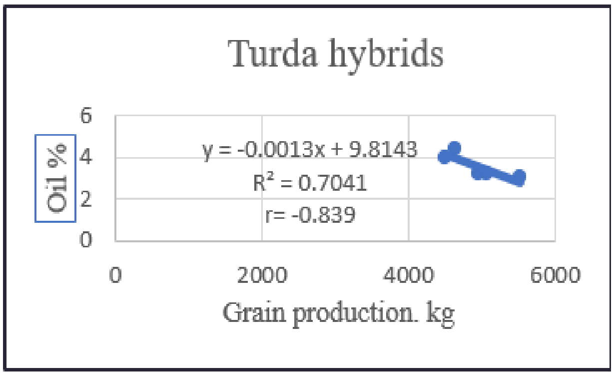

Figure 2.Correlation between grain and oil production

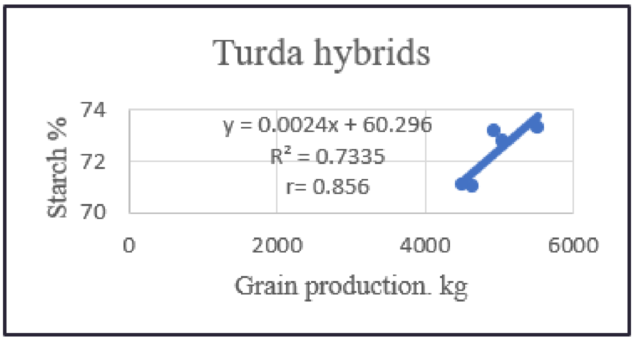

Figure 3.Correlation between grain production and starch

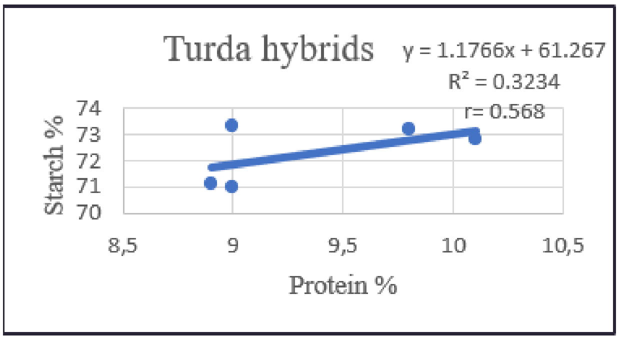

Figure 4. Correlation between protein and starch

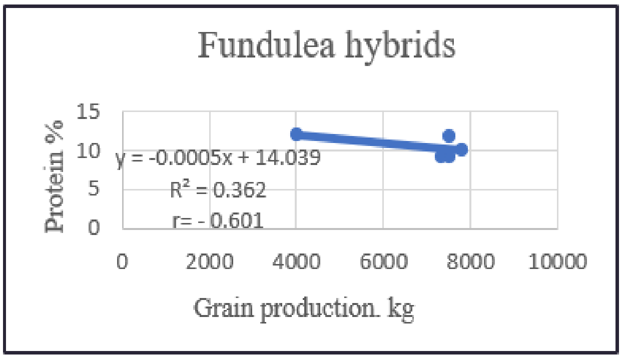

Figure 5.Correlation between grain production and protein

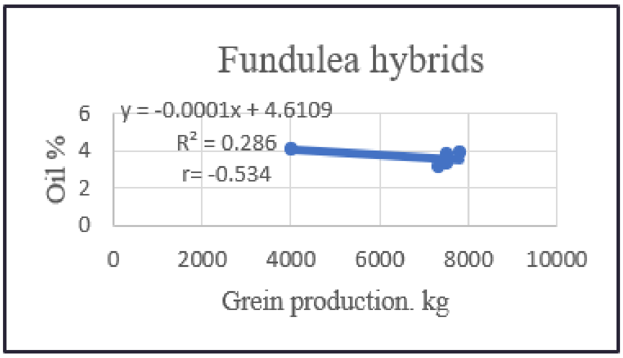

Figure 6.Correlation between grain qnd oil production

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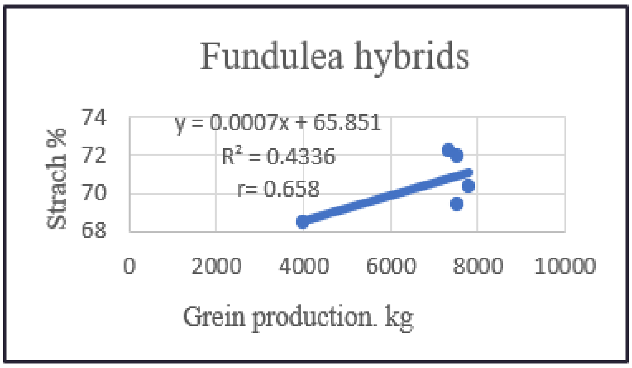

Figure 7.Correlation between grain production and starch

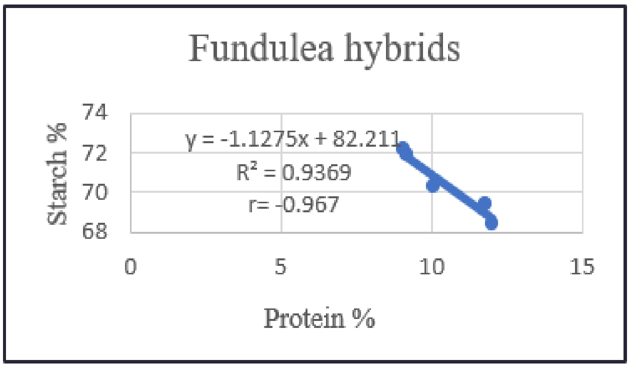

Figure 8. Correlation between protein and starch

Figures 9. Hybrid Turda 165

Figures 10. Hybrid Turda 332

Figures 11. Hybrd Turda 344

Figures 12. Hybrid Turda 335

Figures 13. Hibrid Turda 2020

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4. CONCLUSIONS

The climatic conditions recorded during the growing season had marked effects on the main characteristics and characteristics that determined the production, the genotypes studied behaving differently depending on their genetic constitution.

Early forms are more drought-resistant, but production potential is lower. As a result of fluctuations in environmental factors, a large variation in production was observed. The yields obtained by maize genotypes were directly influenced by the amount of rainfall during the growing season and especially during the period of maximum consumption for water of plants (panicle appearance and grain formation).

The mass of a thousand berries was characteristic of each hybrid individually, with maximum values of 250-260 g.

Among the tested hybrids, the Turda 335 hybrid and the Magnus hybrid stood out.

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