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COMPARATIVE EVALUATION OF MAIZE HYBRIDS UNDER IRRIGATION IN THE GREAT ISLAND OF BRĂILA

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Abstract. *This study presents preliminary results regarding the performance of maize hybrids cultivated under irrigated conditions in Great Island of Braila, one of the most important agricultural areas in Romania, characterized by high productivity potential but increasing water management challenges. The objective of the research was to identify high-performing hybrids suitable for inclusion in a doctoral study focused on optimizing maize production through differentiated irrigation methods. The data were obtained from demonstrative trials conducted during 2024 and 2025 at SCDA Braila, under uniform technological conditions. Significant variability in yield performance was observed among hybrids. In 2025, grain yields ranged from 5.9 t/ha to 12.37 t/ha, with an experimental average of 9.05 t/ha. Several hybrids exceeded the average by over 25%, demonstrating superior adaptability to irrigated conditions. In 2024, yields reached values above 14 t/ha for top-performing hybrids, confirming the high production potential under optimal water supply. The evaluation also included quality indicators such as thousand kernel weight and hectoliter mass, supporting a comprehensive assessment of hybrid performance. The selected hybrids, belonging to the same FAO maturity group, will be further tested within a multifactorial experimental design including irrigation method and sowing time. The results provide a scientific basis for improving water use efficiency and developing adaptive cultivation technologies for the specific conditions of Great Island of Braila.*

Keywords: *yield variability; water management; crop response; pedoclimatic conditions; experimental trials*

INTRODUCTION

Corn (*Zea mays* L.) is one of the most important agricultural crops in Romania, both in terms of cultivated area and its economic role and multiple uses in human and animal nutrition. In the context of climate change in recent decades, characterized by the increasing frequency of soil drought and atmospheric heat, the stability of corn production is becoming increasingly dependent on the application of irrigation and the adaptation of crop technologies to local conditions [1].

The Great Island of Braila is one of the most productive agricultural areas in Romania, benefiting from fertile soils and irrigation infrastructure [5, 6], but at the same time being exposed to climate variability, with a direct impact on the level of production. Under these conditions, the efficiency of water use, and the correct choice of hybrids become determining factors for obtaining high and stable productions. Atmospheric heat negatively influences the physiology of agricultural plants, through deficiencies in root absorption and photosynthesis, increasing evapotranspiration and resulting in leaf drying, poor pollination of flowers and lack of fruiting, i.e., seed formation [8] .

Genetic differences between corn hybrids determine their ability to capitalize on water resources and to respond to growing conditions, leading to significant variations in production even under similar technological conditions [2, 3]. The results obtained in the demonstration plots organized at the Braila Agricultural Research and Development Station (SCDA Braila)

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highlight this variability, reflected both in the level of production and in the quality parameters of the harvest, under irrigation conditions.

The comparative evaluation of a large number of hybrids, under the same environmental and technological conditions, allows the identification of performing and stable genotypes, adapted to the specific pedoclimatic conditions of the area. Such evaluations are essential for substantiating decisions regarding the choice of biological material in further research and in agricultural practice [4, 11].

The purpose of this work is the comparative evaluation of corn hybrids cultivated under irrigation conditions in Great Island of Braila, based on the results obtained in 2024 and 2025, to identify the most performing and stable hybrids. The results obtained constitute a basis for the selection of biological material used in subsequent studies on the optimization of corn production by using different irrigation methods.

MATERIALS AND METHODS

The research was carried out within the Agricultural Research and Development Station of Braila, under the specific pedoclimatic conditions of the Great Island, an agricultural area with high productive potential and irrigation infrastructure. The study was carried out in 2024 and 2025, within demonstration plots with corn hybrids cultivated under irrigated conditions.

The biological material was represented by corn hybrids from different breeders and seed suppliers, included in the demonstration plots organized annually at SCDA Braila. In 2024, 47 hybrids were analyzed, and in 2025, 52 hybrids were analyzed. The hybrids were comparatively evaluated under similar technological conditions, the aim being to highlight differences in production and quality parameters under irrigated conditions.

The applied crop technology was uniform within each experimental year. Soil work, sowing, fertilization, weed control, phytosanitary treatments and maintenance work were carried out according to the technology applied for corn cultivation in Great Island of Braila. Irrigation was applied in such a way as to ensure favorable water supply conditions throughout the vegetation period, reducing the influence of water stress on production.

The determinations carried out monitored grain production, expressed in kg/ha, and reported to the standard humidity of 14%, grain humidity at harvest, hectoliter mass (MH, kg/hl), and mass of 1000 grains (TGM, g). For the year 2025, the percentage of production of each hybrid compared to the experimental average was also calculated.

The data obtained were processed comparatively by calculating the annual average values, the minimum and maximum values, the variation range and by identifying hybrids with higher than average yields. The analysis monitored both the individual performance of the hybrids each year and the behavior of the hybrids present in both demonstration lots, to highlight the biological material with potential for use in further research on optimizing corn cultivation.

The data were analyzed using descriptive statistical indicators (mean, range of variation), without experimental repetitions, due to the demonstrative nature of the batches specific to the preliminary analyses [12].

RESULTS AND DISCUSSIONS

The results obtained in the demonstration plots organized at SCDA Braila in 2024 and 2025 highlight a high variability of corn production under irrigation conditions, determined by the genetic peculiarities of the evaluated hybrids.

Production variability in 2025

In 2025, the production achieved varied between 5987 kg/ha and 12370 kg/ha, the experimental average being 9054 kg/ha (Table 1). The variation interval of 6383 kg/ha highlights major differences between hybrids in terms of the capacity to capitalize on irrigation conditions.

These results are consistent with studies highlighting the importance of water supply in crop productivity [11,13].

The hybrids GIRO (12370 kg/ha), IZZLI (12059 kg/ha) and DKC 4655 (11820 kg/ha) recorded yields of 128–134% compared to the average, demonstrating a high productive potential in the pedoclimatic conditions of the Great Island of Braila. The results confirm that, under uniform technology conditions, the choice of hybrid can generate production differences of over 6 t/ha.

Results obtained in 2024

In 2024, production ranged between 7450 kg/ha and 14074 kg/ha (Table 2), with a range of 6624 kg/ha and an average of 10289 kg/ha. Compared to 2025, the average production was 1235 kg/ha higher, which can be correlated with the more favorable climatic conditions of that year.

The maximum production level was recorded for the EW4836 hybrid (14074 kg/ha), followed by hybrids from the DKC and KWS ranges, confirming the high potential of the crop under optimal water supply conditions (Table 2).

Comparative analysis between years

The comparison of the results highlights the existence of hybrids with stable behavior under irrigation conditions, such as GIRO, DKC 4109, DKC 4728, FORTURIO and KXC 2454. They recorded yields close to or above average in both years, indicating good adaptability to the pedoclimatic conditions of the area.

At the same time, the differences in production between years for some hybrids suggest a significant interaction between the genetic factor and the climatic conditions specific to each year, which underlines the importance of multiannual evaluation in the selection of biological material.

The difference in average production between 2024 and 2025 (1235 kg/ha) highlights the influence of climatic conditions on the performance of hybrids, even under irrigation conditions. Figure 1 summarizes the variation in yield, highlighting both the differences between years and the high amplitude of variation between hybrids.

Quality indicators of yield

The values of 1000-grain mass (TKW) and hectoliter mass (MH) varied significantly between hybrids in both years of study, indicating differences in the structure and quality of production.

The lack of a constant direct correlation between yield and these indicators highlights the need for an integrated evaluation of hybrid performance [4].

Implications for hybrid selection

The results obtained confirm that the choice of hybrid is a determining factor in achieving production under irrigated conditions. The high variability observed justifies the need for rigorous selection of biological material for subsequent experiments.

Hybrids that have demonstrated high performance and stability between years are suitable candidates for inclusion in studies on optimizing production through different irrigation methods.

CONCLUSIONS

- The results obtained in 2024 and 2025 highlight a high variability of corn production under irrigation conditions, determined by the genetic peculiarities of the hybrids. The differences of over 6 t/ha between the extreme values confirm the importance of hybrid choice in the efficient use of water resources.
- The higher average production in 2024 compared to 2025 indicates the influence of climatic conditions on crop performance, but also the need for multi-annual evaluation of hybrids.
- Hybrids with superior performance and stability between years were identified, which can constitute adequate biological material for subsequent experiments on optimizing production through different irrigation methods.
- The presented results constitute a scientific basis for the selection of hybrids within doctoral research and contribute to the substantiation of technologies adapted to the specific conditions of the Great Island of Braila [7,9,10].

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Table 1

Results obtained in 2025 (irrigation conditions, SCDA Brăila)

No	Hybrid	Production	% compared with average	HM (kg/hl)	TGM (g)	U%
1	GIRO	12370	134	68.6	284.7	14.2
2	IZZLI	12059	131	71.7	281.8	13.7
3	DKC 4655	11820	128	66.6	224.9	13.2
4	ADONISIO	11358	123	71.7	274.7	13.7
5	DKC 4533	11235	122	69.7	244.7	13.0
6	5330C	11229	122	73.0	291.3	13.5
7	FORTURIO	10895	118	69.9	271.9	13.5
8	KXC 2454	10758	116	69.2	264.8	13.6
9	KASHMIR	10394	112	67.6	260.3	13.7
10	LDZ23414	10143	110	73.1	275.6	13.0
11	DKC 4712	10101	109	70.7	259.3	13.2
12	AZUMAYA	10099	109	72.5	284.9	13.4
13	LAURO	9941	108	70.9	231.2	13.0
14	DKC 4109	9907	107	70.2	215.5	13.1
15	5110C	9838	106	71.0	270.4	13.5
16	KXC 3432	9819	106	66.2	274.5	13.4
17	LID 3165C	9677	105	73.8	239.4	12.9
18	HYPOLITO	9434	102	67.4	313.3	13.9
19	DKC 4728	9165	99	72.2	279.5	13.1
20	DKC 4433	9129	99	70.0	222.1	13.1
21	OKLAHOMA	9116	99	73.1	224.9	12.8
22	DKC 3400	9055	98	73.0	271.8	12.8
23	DKC 3527	9011	98	72.6	220.0	13.1
24	DKC 4125	8946	97	70.0	217.4	13.2

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No	Hybrid	Production	% compared with average	HM (kg/hl)	TGM (g)	U%
25	Stine 9808 HP	8908	96	73.5	226.7	14.5
26	DKC 4933	8877	96	69.3	259.4	13.0
27	HSF 10953-19	8819	95	69.0	259.4	14.7
28	HSF 2129-22	8803	95	72.8	217.4	13.1
29	LID 2020C	8748	95	73.3	270.2	12.8
30	DKC 4231	8644	94	69.6	243.2	13.1
31	Stine 9734E	8635	93	72.2	243.7	14.0
32	DKC 5810	8631	93	69.6	228.5	13.4
33	DKC 5016	8596	93	65.9	241.3	13.2
34	MAGNUS	8531	92	71.6	226.9	13.2
35	HSF 7151-18	8506	92	67.8	200.3	13.8
36	OLTENIO	8422	91	67.3	216.8	13.7
37	DKC 5092	8398	91	68.0	221.1	13.5
38	AMURG	8236	89	68.4	200.9	13.1
39	HSF 1214-17	8200	89	68.2	215.6	13.4
40	DKC 5812	8200	89	69.0	218.4	13.9
41	DKC 5404	8108	88	69.1	200.9	13.1
42	DKC 5911	8007	87	69.0	224.1	14.0
43	DKC 5709	7976	86	68.4	214.1	13.5
44	DKC 4031	7883	85	69.0	251.2	13.2
45	HSF 10959-14	7792	84	74.2	216.3	13.9
46	DKC 4897	7587	82	67.2	224.7	13.4
47	DKC 5206	7266	79	68.4	226.9	13.0
48	HSF 2213-21	7237	78	73.8	251.7	13.9
49	HSF 1032-17	7066	76	73.7	206.3	13.2
50	HSF 2127-22	6964	75	75.4	204.4	13.3

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No	Hybrid	Production	% compared with average	HM (kg/hl)	TGM (g)	U%
51	Stine 9714HP	6289	68	69.2	208.6	14.0
52	Stine 9401HP	5987	65	68.8	231.5	13.3

Average: 9054 kg/ha; MH = 70.3 kg/hl; TKW = 241.3 g; U = 13.4%
Note: Production is expressed at standard humidity of 14%.

Table 2

Results obtained in 2024 (irrigation conditions, SCDA Brăila)

No	Hybrid	Production	% compared with average	HM (kg/hl)	TGM (g)	U%
1	EW4836	14074	137	66.4	252.83	13.1
2	DKC5110	13183	128	69.1	264.41	13.0
3	DKC4897	12546	122	69.3	274.26	13.2
4	BANATO	12517	122	70.2	263.61	13.0
5	DKC4728	12505	121	71.7	220.52	12.8
6	DONJUAN	12450	121	70.4	271.46	13.3
7	DKC5404	12003	117	70.8	251.87	13.2
8	P9911	11919	116	72.7	356.72	17.7
9	P0260	11631	113	73.6	301.51	17.2
10	DKC5911	11566	112	72.0	247.37	14.3
11	DKC5709	11223	109	70.4	251.16	13.3
12	GIRO	11138	108	69.95	275.27	13.3
13	DKC4109	11087	108	69.9	218.43	13.0
14	FORTURIO	10885	106	68.1	259.07	13.4
15	DKC5206	10845	105	70.2	256.31	13.3
16	P9975	10658	104	72.0	278.94	17.5
17	ROUA4020	10629	103	72.65	241.71	13.25
18	ROUA3425	10518	102	71.65	248.10	13.7
19	P9944	10517	102	68.7	317.90	17.7
20	SEMPER	10365	101	67.5	381.22	20.4
21	ROUA380	10351	101	72.65	256.58	13.35
22	P9610	10303	100	72.96	325.78	15.4
23	ROUA3124	10064	98	69.95	248.33	13.2

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No	Hybrid	Production	% compared with average	HM (kg/hl)	TGM (g)	U%
24	DKC4611	10016	97	70.3	250.42	13.0
25	DKC4908	9927	96	65.2	211.40	12.9
26	ROUA3520	9852	96	67.4	252.76	13.1
27	OS3397	9834	96	69.8	349.62	19.3
28	DKC5092	9767	95	68.0	232.25	13.0
29	DKC5016	9703	94	66.8	249.45	13.0
30	DKC4231	9549	93	70.7	265.22	13.1
31	DKC5810	9533	93	69.4	253.90	13.9
32	DKC4433	9279	90	64.4	229.35	12.9
33	DKC4391	9132	89	67.7	245.66	13.0
34	DKC5812	9075	88	71.8	226.60	13.6
35	SPARTAN	8858	86	73.1	273.16	16.7
36	SUM305	8522	83	69.1	375.00	20.1
37	KXC 2454	8420	82	70.6	254.93	13.3

Average: 10289 kg/ha; MH = 69.77 kg/hl; TKW = 264.27 g; U = 14.34%
Note: Production is expressed at standard humidity of 14%.

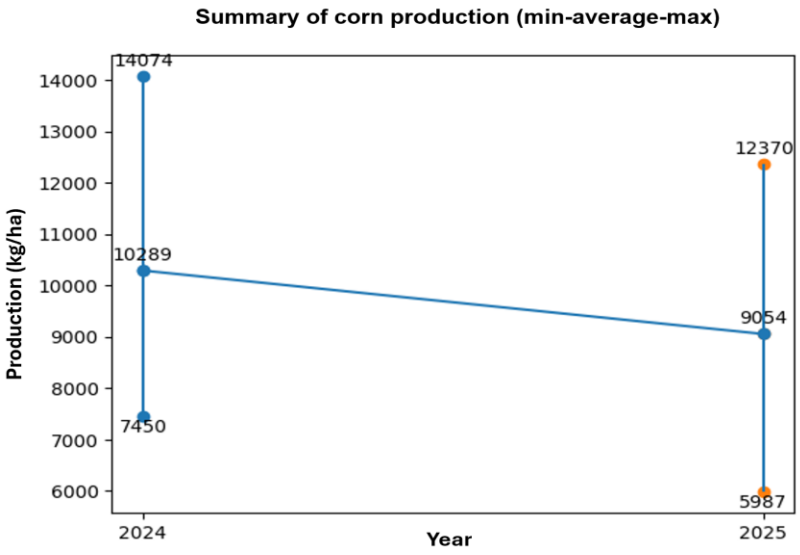

Figure 1. Summary of corn production (minimum, average and maximum) in 2024 and 2025, under irrigation conditions, at SCDA Brăila