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MORPHOLOGICAL, BIOCHEMICAL AND PRODUCTIVITY VARIATIONS IN SUNFLOWER (*HELIANTHUS ANNUUS* L.) HYBRIDS

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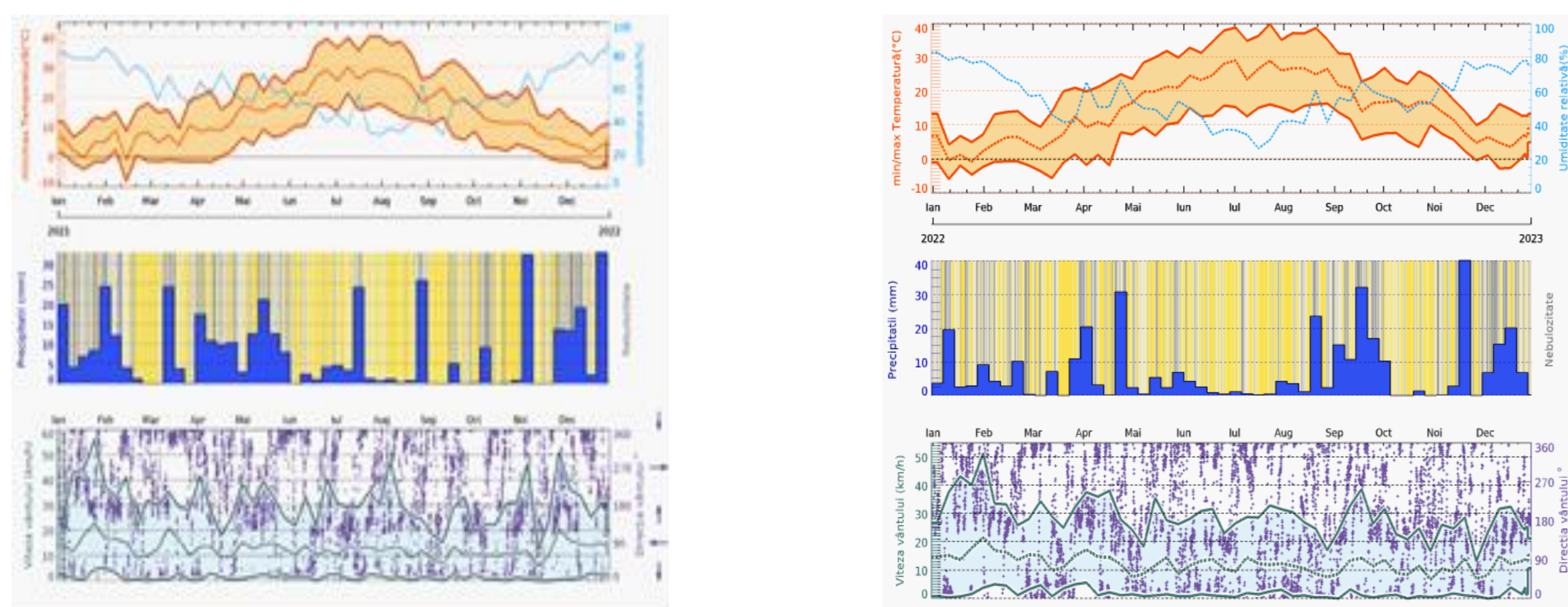
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Abstract: Sunflower (*Helianthus annuus* L.) is one of the cultivated species with great use potential, which leads to finding permanent solutions for the efficient valorisation of this plant as a source of lipids, proteins, and carbohydrates, especially in the context of the continuous diversification of energy sources and raw materials for the industrial and agricultural sectors. The paper analyses the reaction of *Helianthus annuus* L. genotypes to the soil, temperature, and humidity conditions of the Crișurilor Plain, in conjunction with the cultivation technology recommended for this species. The results were obtained during 2021 - 2022, the experiment being single-factor, in four replicates, with five established hybrids. The sunflower genotypes used as experimental variants were as follows: V1 - Performer; V2 - Ilinca 115; V3 - Inkasun IR; V4 - Bravo SU; V5 - Florasun. Among the parameters analysed in the tested hybrids, we mention: vegetation period, plant height, capitulum diameter, the mass of 1000 achenes, hectolitre mass of achenes, achene production, as well as percentage content of achenes in lipids, proteins, and carbohydrates. The results obtained were then interpreted in terms of economic efficiency, recommending the Crișurilor Plain as a suitable region for growing the tested hybrids

Introduction: *Helianthus annuus* L.: oleaginous plant native to America; complex use in human food, animal feed and industry; On earth, the cultivated area is approx. 16 million hectares; On earth, the cultivated area is approx. 16 million hectares; Romania cultivate approximately 1 million ha; ROMANIA achieved an annual production of over 2 million tons. Considering the current issue, this paper tests the behavior of five sunflower hybrids in pedoclimatic conditions from the Crișurilor Plain through morphological, biochemical and production observations, in order to implement effective alternatives for the optimal utilization of this multifunctional plan.

Material and method: The experiments were conducted over two years, 2021 and 2022. In order to achieve the proposed objectives, a single-factor experiment was conducted with five sunflower hybrids under optimal technology conditions in four replicates, the experimental variants being represented by the following genotypes: V1 - Performer, V2 - Ilinca 115, V3 - Inkasun IR, V4 - Bravo SU, V5 - Florasun and V6 - media (www.madr.ro/ISTIS, 2020). The analysis was carried out to determine morphological indices: plant height, calatid diameter, 1000-grain mass (GMB), hectolitre mass (MH), quality indices: percentage protein and carbohydrate content in achene and lipid content in seed, and productivity/economic indices: grain yield (kg/ha), value of grain production (lei/ha) and profit (euro/ha).

Results and discussions: The climatic conditions in 2021 did not differ significantly from the multi-year average, but the 2022 was a dry year with high temperatures that affected plant growth and development.



Average temperature and precipitation values: January-December 2021 (a) and January-December 2022 (b) in Arad. (https://www.meteoblue.com - Arad Weather Archive, 2021, 2022).

Table 1. Influence of climate and soil conditions on the vegetation period in sunflowers

No.	Genotype	Vegetation period (days)		Average for 2021/2022		Difference (days)
		2021	2022	zile	%	
1	Performer	117	114	115,5	98	-2
2	Ilinca 115	116	113	114,5	97	-3
3	Inkasun IR	122	119	120,5	103	3
4	Bravo SU	117	115	116	99	-1
5	Florasun	123	119	121	103	3
6	Control (average)	119	116	117,5	100	-

Table 2. Influence of climate and soil conditions on plant height in sunflowers

No.	Genotype	Plant height (cm)		Average for 2021/2022		Difference (cm)
		2021	2022	cm	%	
1	Performer	171	164	167,5	90	-18
2	Ilinca 115	185	171	178	96	-7,5
3	Inkasun IR	203	191	197	106	11,5
4	Bravo SU	195	185	190	102	4,5
5	Florasun	201	189	195	105	9,5
6	Control (mt)	191	180	185,5	100	-

Table 3. Influence of climate and soil conditions on capitulum diameter in sunflower

No.	Genotype	Capitulum diameter (cm)		Average for 2021/2022		Difference (cm)
		2021	2022	cm	%	
1	Performer	24	20	22	110	2
2	Ilinca 115	18	17	17,5	88	-2,5
3	Inkasun IR	24	22	23	115	3
4	Bravo SU	19	18	18,5	93	-1,5
5	Florasun	20	18	19	95	1
6	Control (mt)	21	19	20	100	-

Table 6. Influence of climate and soil conditions on achene production in sunflowers

No.	Genotype	Achene production (kg/ha)		Average for 2021/2022		Difference (kg/ha)
		2021	2022	kg/ha	%	
1	Performer	3850	3060	3455	102	75
2	Ilinca 115	3930	3100	3515	104	135
3	Inkasun IR	3820	2950	3385	100	5
4	Bravo SU	3750	2880	3315	98	-65
5	Florasun	3650	2810	3230	96	-420
6	Control (mt)	3800	2960	3380	100	-

Table 7. Influence of climate and soil conditions on achenes lipid/oil content

No.	Genotype	Lipids/Oil (%)		Average for 2021/2022		Difference (%)
		2021	2022	kg/ha	%	
1	Performer	47,5	44,5	1589	46,0	3,4
2	Ilinca 115	47,5	43,5	1599	45,5	2,9
3	Inkasun IR	41,5	40,5	1388	41	-1,6
4	Bravo SU	41	40	1343	40,5	-2,1
5	Florasun	40,5	39,5	1292	40	-2,6
6	Control (average)	43,6	41,6	1440	42,6	-

Table 10. Influence of climate and soil conditions on the economic efficiency of sunflower crops

Genotype	Seed production (kg/ha)			Value of seed production (RON/ha)			Profit (RON/ha)			Difference compared to control (RON/ha)
	2021	2022	Average	2021	2022	Average	2021	2022	Average	
Performer	3850	3060	3455	7700	7344	7522	4400	3644	4022	170
Ilinca 115	3930	3100	3515	7860	7440	7650	4560	3740	4150	298
Inkasun IR	3820	2950	3385	7640	7080	7360	4340	3380	3860	8
Bravo SU	3750	2880	3315	7500	6912	7206	4200	3212	3706	-146
Florasun	3650	2810	3230	7300	6744	7022	4000	3044	3522	-330
Control (m)	3800	2960	3380	7600	7104	7352	4300	3404	3852	-

Conclusions: In this study we analysed the reaction of *Helianthus annuus* L. genotypes (Performer, Ilinca115, Inkasun IR, Bravo SU, Florasun) to the soil, temperature, and humidity conditions of the Crișurilor Plain, including morphological, biochemical, production and economic aspects. The Ilinca115 hybrid showed the best performance in regards to the achene production, biochemical composition and profits, while the weakest performance was for Florasun hybrid. Overall, the tested genotypes have shown to be well adapted to the pedoclimatic conditions of the study area, results in average profits of 3852 RON. The results obtained show that the Crișurilor Plain is a suitable region for the cultivation