

TESTS ON SOME SUNFLOWER HYBRIDS WITH IMPROVED DRAUGHT AND EXTREME TEMPERATURE RESISTANCE

Popescu C.V. (1), Claudia Borleanu (2), Bora C. (2)

(1) University of Craiova, Faculty of Agronomy, 19, Libertății Str. Craiova, Dolj, Romania; E-mail: catalin.popescu@gmail.com;

(2) Research and Development Agricultural Station Simnic – Craiova, 54, Bălcești Str., Craiova, Dolj, Romania E-mail: constantinbora@yahoo.com;
scda_simnic@yahoo.com

Keywords: sunflower, hybrid, draught, temperature, yield

ABSTRACT

In the paper, there are presented the results registered from the tests performed on the productivity of some sunflower hybrids, in the pedoclimatic conditions of the Research and Development Agricultural Station (S.C.D.A.) Șimnic – Craiova.

The main objective of the performed tests was to determine the sunflower hybrids' behavior in dry conditions. 49 hybrids were tested in 2016 - 2017 – a dry year, when for the months of June and August there were no rainfalls registered.

Although these dry conditions affected the yields, 6 hybrids within the tested range registered over 2000 kg/ha, closely followed by other 3 hybrids. The lowest registered yield was 976 kg/ha.

INTRODUCTION

Since sunflower crop is grown in Romania under different climatic conditions, there is a wide range of sunflower cultivars present, their production behavior research under various conditions being very necessary (Popescu C.V., 2016). The creation of new hybrids and sunflower lines with improved drought and extreme temperatures tolerance is more than necessary in the actual climatic conditions.

In Romania, new and modern sunflower hybrids with improved yields are tested, along with new cropping technologies both in dry and irrigated conditions (Popescu C.V. et al., 2012, 2016). Drought and associated effects can cause serious damage to crops. In Oltenia region the drought is frequent, only two years out of ten being favorable for the crops (Urechean et al., 2008; Urechean and Bonea, 2017).

MATERIALS AND METHODS

Within the frame of the ADER 1.1.3 project - „*Creation of sunflower hybrids with improved drought and extreme temperatures resistance*” for the **sunflower** crop, a multiple hybrids trial was established. Seeding of the trials was done on the 12.04.2017 and as fertilizers there were used 250 kg/ha complex fertilizers (20.20.0) and the weeds were controlled using DUAL GOLD, using 1,5 l/ha, preemergent.

Harvest took place on the 7th of September 2017.

RESEARCH RESULTS

The climate's characteristics are presented in table 1. It can be observed that:

- the annual monthly average temperature was superior by 0,6 °C to the multiannual monthly average - within the month of June, the monthly temperature was superior by 3 °C to the multiannual monthly average;
- the registered rainfall for 6 months was net inferior to the multiannual monthly average;
- the total rainfall was inferior to the multiannual monthly average by 81,7 mm;

- between 16th of Mai and the 18th of September only 89 mm rainfall was registered, on the 2nd and the 3rd of July;
- within an interval of 125 days, practically only 2 days registered rainfall.

Table 1

Climatic data

Month	Temperature (°C)			Rainfall (mm)		
	Monthly average	Multiannual monthly average	Difference	Monthly average	Multiannual monthly average	Difference
October	10,3	11,8	-1,5	63,3	44,5	18,8
November	5,2	5,5	-0,3	75,2	44,9	30,3
December	-0,3	0,4	0,1	5,0	45,1	-40,1
January	-5,1	-1,4	-3,7	11,1	32,7	-21,6
February	1,6	1,0	0,6	31,2	30,6	0,6
March	9,8	5,6	4,2	32,1	33,7	-1,6
April	11,1	11,8	-0,7	71,1	46,0	25,1
May	16,7	16,9	-0,2	74,2	66,9	7,3
June	23,4	20,4	3,0	0	67,9	-67,9
July	24,2	22,6	1,6	89,2	61,5	27,7
August	25,4	22,1	3,3	0	48,9	-48,9
September	19,4	17,5	1,9	26,0	42,4	- 16,4
Total/average	11,8	11,2	0,6	483,4	565,1	- 81,7

Data registered for the trials presented in table 2 are showing that:

- the first floral button / bud was issued between 10.06.2017-19.06.2017;
- the earliest floral buds were registered by hybrids ranked in the list between 47 and 49;
- flowering took place between 28.06-03.07.2017;
- with respect to the plant height, the hybrid no. 19 registered a height of 138 cm;
- the diameter of the calathidium varied between 11 and 19 cm.

Table 2

Sunflower hybrids – registered yield results 2017

No.	Date of the floral button / bud	Date of the flowering	Plant height (cm)	Calathidium diameter (cm)	No. plants per plot	Physiological maturity
1	19.06	3.07	104	17	101	25.08
2	19.06	2.07	106	19	80	25.08
3	19.06	2.07	105	18	74	25.08
4	19.06	1.07	108	18	78	25.08
5	16.06	3.07	107	18	100	25.08
6	16.06	1.07	96	17	101	23.08
7	16.06	3.07	103	15	97	23.08
8	16.06	3.07	101	16	93	18.08
9	16.06	2.07	117	16	80	18.08
10	16.06	3.07	116	15	86	18.08
11	16.06	1.07	126	14	94	18.08

No.	Date of the floral button / bud	Date of the flowering	Plant height (cm)	Calathidium diameter (cm)	No. plants per plot	Physiological maturity
12	16.06	30.06	132	14	92	18.08
13	19.06	29.06	123	14	88	18.08
14	16.06	30.06	129	17	86	8.08
15	16.06	1.07	127	14	80	8.08
16	16.06	2.07	116	15	98	8.08
17	14.06	1.07	120	14	86	14.08
18	14.06	30.06	125	16	91	14.08
19	14.06	1.07	138	16	88	14.08
20	14.06	2.07	137	16	75	8.08
21	14.06	28.06	107	13	95	14.08
22	14.06	29.06	107	13	99	16.08
23	14.06	29.06	101	15	91	25.08
24	14.06	1.07	102	16	78	25.08
25	14.06	29.06	105	17	94	22.08
26	14.06	28.06	108	16	68	22.08
27	19.06	1.07	101	15	100	22.08
28	19.06	30.06	98	16	95	22.08
29	19.06	30.06	103	17	94	14.08
30	19.06	30.06	99	16	88	16.08
31	19.06	1.07	94	16	100	18.08
32	19.06	29.06	94	15	97	25.08
33	19.06	29.06	96	11	91	25.08
34	14.06	29.06	106	16	90	25.08
35	19.06	2.07	105	16	87	25.08
36	16.06	1.07	128	16	84	22.08
37	16.06	30.06	113	18	91	22.08
38	16.06	2.07	133	17	93	18.08
39	16.06	2.07	114	15	81	25.08
40	16.06	2.07	105	15	87	25.08
41	16.06	2.07	110	16	95	8.08
42	16.06	1.07	111	15	63	25.08
43	19.06	2.07	107	17	100	25.08
44	19.06	30.06	129	18	102	18.08
45	19.06	2.07	122	15	98	22.08
46	19.06	30.06	116	14	89	22.08
47	10.06	1.07	111	14	65	14.08
48	10.06	1.07	103	19	61	14.08
49	10.06	1.07	109	18	54	14.08

The laboratory results have shown (table 3) that:

- the registered yields varied between 976 kg/ha and 2.168 kg/ha;
- although in the months of June and August practically there was no rainfall registered, six of the hybrids registered yields over 2.000 kg/ha;
- TGM, varied between 32.5 - 58.5 g.

Table 3

Sunflower hybrids – registered laboratory results 2017

No.	Kg / plot harvest	U% at harvest	Yield kg/ha	Yield kg/ha at STAS standard U%	TW hectoliter mass (Kg/hl)	TGM thousand grain mass (g)
1	4.35	7.68	1942	1971	46.0	42.7
2	4.00	8.52	1786	1793	44.2	41.2
3	3.80	8.75	1697	1701	45.8	43.3
4	3.03	9.13	1351	1348	46.2	42.0
5	4.10	7.94	1831	1852	47.0	35.7
6	3.40	7.67	1518	1541	49.2	35.0
7	4.45	7.49	1987	2020	44.2	35.2
8	3.88	6.83	1730	1772	45.4	32.7
9	3.30	6.69	1473	1511	43.9	57.2
10	3.08	6.68	1373	1408	44.8	51.5
11	3.40	6.43	1518	1561	44.1	53.0
12	2.65	6.49	1183	1216	42.9	51.0
13	3.13	6.44	1395	1434	44.0	47.9
14	3.30	6.73	1473	1510	44.1	49.7
15	2.85	7.19	1250	1272	46.1	42.9
16	3.20	6.53	1429	1467	42.6	46.1
17	2.98	6.21	1150	1185	42.5	43.8
18	2.58	6.26	1150	1184	42.5	50.1
19	2.75	6.35	1228	1263	41.9	55.2
20	2.45	6.50	1094	1124	40.9	58.5
21	4.13	6.57	1842	1891	44.2	40.0
22	3.43	6.77	1529	1565	43.60	36.6
23	4.78	9.12	2132	2129	42.0	47.7
24	4.08	10.41	1820	1792	42.8	38.9
25	4.23	10.27	1886	1860	42.5	42.8
26	4.10	10.44	1830	1797	43.2	40.5
27	4.48	7.66	1998	2028	46.7	43.7
28	4.05	7.62	1808	1836	46.3	37.5
29	3.78	6.74	1685	1727	47.7	39.0
30	4.20	7.76	1875	1902	45.6	34.9
31	3.05	6.99	1362	1389	46.4	39.2
32	4.78	7.43	2132	2168	47.0	42.3
33	2.58	6.70	1150	1179	43.3	45.4
34	4.00	6.77	1786	1830	47.2	35.5
35	4.05	8.24	1808	1820	43.1	51.2
36	3.48	8.89	1551	1550	41.8	56.3
37	4.08	7.86	1819	1843	41.0	42.8
38	3.55	6.91	1585	1621	46.4	42.3
39	2.83	6.73	1261	1293	45.6	38.0
40	3.78	9.87	1641	1628	45.5	42.5
41	4.73	7.12	2109	2153	45.5	41.8
42	2.80	6.27	1250	1288	43.2	45.6
43	4.73	9.15	2110	2107	43.4	44.0
44	3.80	6.47	1886	1939	41.8	41.6

No.	Kg / plot harvest	U% at harvest	Yield kg/ha	Yield kg/ha at STAS standard U%	TW hectoliter mass (Kg/hl)	TGM thousand grain mass (g)
45	3.95	8.49	1763	1770	43.0	39.4
46	2.75	7.20	1228	1252	42.6	42.0
47	3.00	6.66	1340	1373	45.3	46.7
48	2.13	6.40	949	976	45.8	48.1
49	2.18	7.08	971	991	44.8	48.9

CONCLUSIONS

The climatic conditions of the testing period were characterized by an annual average temperature superior by 0,6 °C to the multiannual, a month (June) with registered temperature superior by 3 °C to the multiannual value, a total rainfall inferior to the multiannual monthly average by 81,7 mm and an interval of 125 days practically with only 2 days of rainfall, which influenced the yield and other parameters of the tested sunflower hybrids:

- the first floral button / bud was issued between 10.06.2017-19.06.2017;
- the earliest floral buds were registered by hybrids ranked in the list between 47 and 49;
- flowering took place between 28.06-03.07.2017;
- with respect to the plant height, the hybrid no. 19 registered a height of 138 cm;
- the diameter of the calathidium varied between 11 and 19 cm.

Although these dry conditions affected the yields, 6 hybrids within the tested range registered over 2000 kg/ha, closely followed by other 3 hybrids. The lowest registered yield was 976 kg/ha.

BIBLIOGRAPHY

1. **Popescu, C.V., Bora, C., Lulea, C., Duicu, I., Rogojina M., 2002 - Impactul secetei asupra productiei de floarea soarelui cultivata in zona centrala a Olteniei, Lucrari Stiintifice S.C.A. Simnic, XIV, 293-298, ISBN 973-99263-6-3;**
2. **Popescu C.V., Bora C., 2009 - The rational use of water as a main method to combat drought, Analele Universității din Craiova, seria Agricultură – Montanologie – Cadastru. Vol. XXXIX, pag. 455 - 459.**
3. **Popescu C.V., Bora C., 2009 - Oportunitatea irigației culturilor agricole in zona centrala a Olteniei, Editura SITECH, Craiova.**
4. **C. V. Popescu, Mirela Paraschivu, C. Bora, Ioana Claudia Borleanu. 2012 – Research on the yields of soybean and sunflower cultivars in the pedo-climatic conditions of A.R.D.S. SIMNIC – CRAIOVA. 65 years of higher agronomic education and 50 years of higher horticulture education in Craiova, Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series. Vol 42, series 2, pag. 414 - 418;**
5. **C.V. Popescu, Claudia BORLEANU, C. BORA, 2016 – Measurements concerning some yield elements on sunflower cultivars in the climatic conditions of 2016 at SCDA Simnic – Craiova. Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series Vol 46, series, pag. 235 - 231;**
6. **Urechean V, Bonea D., 2017 - Estimate of drought tolerance at some maize hybrids grown in the Central Oltenia zone with using stress tolerance indices .17th International Multidisciplinary Scientific GeoConference SGEM, Conference Proceedings, 29 June - 5 July, Vol. 17, Issue 61, 681-688 pp, DOI: 10.5593/sgem2017/61/S25.089**
7. **Urechean V., Bonea D., Constantinescu E., 2008 - The influence of the hydric stress on the capacity of growth and development at the sunflower. Bulletin USAMV Cluj-Napoca, vol. 65, pp 123-128.**