

## SUNFLOWER HYBRIDS IN THE CLIMATIC CONDITIONS OF THE YEAR 2020 IN CONSTANTA COUNTY - SOUTH EAST OF DOBROGEA, ROMANIA

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**Abstract.** *The experimental field was placed in Amzacea, Constanta County at S.C. SPORT AGRA S.R.L., Center of Development, on the highway 38, 20 km. far from Bulgarian border. Constanta County had the largest weight regarding the surface cultivated in Romania with sunflower crop between 10-12%. The most drought area in Romania is Dobrogea (average 1961-1990: 464 mm. rainfall). Climatic change in recent years has accentuated this tendency. The number of hybrids taken into account in our experiment were twenty. Genesis has been planted in two periods of the time. When the planting was delayed the yield was decreased 303 kg/ha. The aim of this study was i) the behaviour of the hybrids in the unbelievable dry conditions, ii) to see the yield and the behaviour of sunflower hybrids to the attack of main pathogens - Sclerotinia sclerotiorum, Phomopsis helianthi, Orobanche cumana, iii) how the planting date influence de yield, iii) the importance of the pesticides used.*

**Keywords:** sunflower, technological improvement, pest behaviour, yield, drought

### 1. Introduction

Constanta County (Dobrogea area), had the largest weight regarding the surface cultivated in Romania with sunflower crop (11.10%) from arable land in 2020, and 20.63% from Constanta area arable land (General Direction of Agriculture and Development, Constanta, 2020) [4].

Nowadays there is a wide offer for sunflower hybrids which means without a screening of them is hard to decide which are the most suitable for every region. It should exist experimental fields not only for sunflower but for other important crops related to a specific region. The hybrids must be from different seed companies eliminating any suspicions. In Dobrogea such experiments were made over the years (Jinga et al., 2016; Manole et al., 2018a, 2018b, 2019) [5, 7, 8, 9] which provided results for yield in very dry conditions, behavior to the attack of the main pathogens and quality indices. Here is the first paragraph. The line spacing options are: single, 0 before the paragraph and 6 points after.

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The purposes of this study were: (i) to study the behaviour of the hybrids in the unbelievable dry conditions, (ii) to evaluate the yield and the behaviour of sunflower hybrids to the attack of main pathogens – *Orobanche cumana*, *Sclerotinia sclerotiorum*, *Phomopsis helianthi*, *Alternaria helianthi*, (iii) to assess how the planting date influence de yield, and (iv) to appreciate the importance of the pesticides use.

## 2. Materials and Methods

The experimental plots were organized in 2020 in the field of SC SPORT AGRA SRL Amzacea, Constanta County (South-East of Romania) (Figure 1). The number of hybrids taken into account have been twenty. The soil is a cambic chernoziom with a deeper profile than other chernozioms, a blackish-brown soil of 40-50 cm thickness, medium texture (Demeter, 2009) [2].

The content of nutrients was: mobile P index -72; N index -4; K index -200; humus -3.11%; neutral pH -7.2. The area of each plot was 672 m<sup>2</sup>. The preceding crop was winter wheat. Planting date was March 12<sup>th</sup>. Depth of planting 7-8 cm. in considerations of moisture of the soil.



**Fig. 1.** Experimental field of SC SPORT AGRA SRL Amzacea, Constanta County, 2020 (Original)

The seeds have been treated against (i) *Botrytis* and *Sclerotinia* phytopathogens using Maxim 025 FS (fludioxonil 25g/l) at 0.6 l/100 kg, (ii) *Plasmopara helianthi* using Apron XL (metalaxil 339 g/l) at 3 l/t. In order to protect the seeds were'nt been treated before planting with neonicotinoids (iii) *Tanymecus dilaticollis* Gyll.. Right here it's a most infested area for Romania point of you. We have used after emergence of the crop insecticides two times in order to protect the crop.

Two fungicides were used in vegetative season, to control the pathogens: Mirage 45EC (procloraz 45%) - 1 l/ha 8-10 leaves, and Pictor (200g/l dimoxistrobin + 200g/l boscalid) - 0.5 l/ha before flowering.

To control weeds, the herbicides used were: glyphosate, autumn application, in a dose of 2 l/ha, Frontier Forte (dimetenamid-P) in a dose of 1.4 l/ha, Racer 25EC

(fluorocloridon) in a dose of 2 l/ha, mixed up before emergence and Pulsar Plus (25g/l imazamox) in a dose of 2 l/ha (used only for the imazamox resistant hybrids), at 6-8 leaves. Sulfonylurea was been applied for the hybrids resistant to the herbicides tribenurom methyl 30g./ha.

The soil was fertilized using complex fertilizers (18.46.0 + 20 SO<sub>3</sub>) 200 kg/ha and nitrogen in vegetation two trips using 150kg/ha plus 100 kg/ha.

Foliar fertilizers were performed using two complex fertilizers: 12.60.0 - 2 kg/ha and 145 SO<sub>3</sub>, 5 MgO, 100 B, 2 Cu, 25 Fe, 50 Mn, 0.5 Mo, 20 Zn - 2 kg/ha.



**Fig. 2.** Sowing (Original)



**Fig. 3.** Temperature of the soil in the moment of sowing (Original)



**Fig. 4.** Experimental field, 5-6 leaves (Original)

Phytopathological assessments of plants were performed on July 17<sup>th</sup> over the main pathogens: *Phomopsis helianthi* Munt.-Cvet. et al., *Sclerotinia sclerotiorum* (Lib.) de Bary, *Alternaria helianthi* (Hansf.) Tubaki & Nishihara and the parasite *Orobanche cumana* Wallr.. The degree of attack (DA%) was calculated using formula  $F \times I/100$  (F - frequency of the attacked plants I - intensity of plants attack).



**Fig. 5.** *Orobanche cumana*, Onestar (Original)

Technological sheet includes data about number of plants/m<sup>2</sup> after emergence, flowering and harvesting date and the yield at 9% moisture kg/ha.

Rainfall during 2020 in Amzacea, reveal that, 2020 was the driest year at the time has been with 133 mm. rainfall during the growing season compared with 2019 when the rainfall sum was 178.5 mm (Table 1).

**Table 1.** Rainfall during 2019 and 2020 growing season of sunflower (Amzacea, Constanta)

	Month								Sum
	Jan.	Feb.	March	Apr	May	June	July	Aug.	
Days	The growing season 2019: Rainfall (mm) for 10-day periods								Sum
1-10	10	0	10	19	0	10	12	7	68
11-20	26	8	0	1	6	4	22	0	67
21-31	0	0	6	15.5	12	0	10	0	43,5
Sum	36	8	16	35.5	18	14	44	7	178,5
Days	The growing season 2020: Rainfall (mm) for 10-day periods								Sum
1-10	0	20	0	0	18	4	29	2	73
11-20	0	0	0	4	0	10	0	0	14
21-31	2	8	16	6	14	0	0	0	46
Sum	2	28	16	10	32	14	29	2	133
Days	Average 1961-1990: monthly values of rainfall (mm)								Sum
1-31	27.7	24.0	29.1	31.8	37.7	47.1	38.9	37.4	464.0



**Fig. 6.** The height of the hybrids (Original)



**Fig. 7.** The height of the hybrids (Original)

### 3. Results and Discussions

The very dry conditions of the year 2020 has affected the height of the hybrids between 70 cm. (FD15E27, Genesis) to 105 cm.(P64LE25, P64LE99).

The diseases can affect the yield and hybrids presented a DA greater or less due to their resistance linked with the climatic conditions.

In 2020, the attack of *Sclerotinia sclerotiorum* all of twenty hybrids were'nt been affected. *Phomopsis helianthi* and *Orobanche cumana* had a lower DA average. ES Genesis CL 2 and SY NX82214 (Onestar) CLP had a great DA average for pathogens and parasite combined (8,12% - 7%) (Table 2).

**Table 2.** Phytosanitary status (DA%) – July 17 2020

Hybrid	Pathogen			Parasite
	<i>Sclerotinia sclerotiorum</i>	<i>Phomopsis helianthi</i>	<i>Alternaria helianthi</i>	<i>Orobanche cumana</i>
<i>ES Genesis CL</i>	0	8	10	1
<i>ES Genesis CL 2</i>	0	10	20	2.5
<i>ES Janis CL</i>	0	5	12	0
<i>ES Anthemis CLP</i>	0	10	8	0
<i>ES Terramis CL</i>	0	12	15	0
<i>Loris CLP</i>	0	8	10	0
<i>Coloris CL</i>	0	10	6	0
<i>SY Odessa CLP</i>	0	8	0	0
<i>SY Diamantis CL</i>	0	11	0	0
<i>SY NX82212 (Nexus) CLP</i>	0	12	8	0
<i>SY NX82214 (Onestar) CLP</i>	0	20	8	2
<i>RGT Absolute CL</i>	0	12	14	0
<i>RGT Eiffell CL</i>	0	16	10	0
<i>FD15CL44</i>	0	10	8	2.5
<i>ES Aromatic SU</i>	0	0	2	3
<i>SY NX81220 SU</i>	0	15.5	12	0
<i>P65LE99</i>	0	6	10	0
<i>P64LE25</i>	0	2	8	0
<i>P64LE137</i>	0	8	10.5	0
<i>FD15E27</i>	0	10	7	0
<i>FD18E41</i>	0	8	12	0.2



All the hybrids tested had over 6 plants/ m<sup>2</sup> after emergence which means a good an uniform emergence. The average yield of the tested hybrids exceeded the County average yield, because majority of the area cultivated with sunflower have been destroyed of the unbelievable dry conditions with an average yield around 900-1,000 kg/ha (General Direction of Agriculture and Development, Constanta) [4].

The best hybrid from those twenty hybrids wich have been tested in the experimental field was FD15E27 with 1,914 kg/ha, belongs to National Agricultural Research and Development Institute Fundulea, Romania, followed by P64LE25 with 1,779 kg/ha.

Except Genesis 2 all the hybrids had over 6 plants/ m<sup>2</sup> after emergence. Flowering date was different due their genetic hybrids. Considering the hybrids, all of them had a yield lower than the other years because this year was unforgettable looking to the very dry conditions.

In 2020, when Genesis was planted with a delay of 22 days the yield has decreased with almost 303 kg/ha (Table 3). Same results were recorded in literature showed a higher duration for seed maturity increases yield in sunflower crop (Jonhson and Jellum, 1972; Ahmed et al., 2015; Demir, 2019) [6, 1, 3].

**Table 3.** Technological sheet for sunflower - 2020

Hybrid	No. of plants/m <sup>2</sup> after emergence	Flowering date	Harvesting date	Yield at 9% moisture (kg/ha)
<i>ES Genesis CL</i>	6.5	June 21	August 11	1,593
<i>ES Genesis CL 2</i>	5.5	July 8	August 18	1,290
<i>ES Janis CL</i>	6.5	June 25	August 11	1,428
<i>ES Anthemis CLP</i>	6.5	June 25	August 11	1,774
<i>ES Terramis CL</i>	6.5	June 28	August 11	1,555
<i>Loris CLP</i>	6.5	June 29	August 18	1,420
<i>Coloris CL</i>	6.5	July 2	August 18	1,514
<i>SY Odessa CLP</i>	6	June 25	August 18	1,357
<i>SY Diamantis CL</i>	6.5	June 27	August 18	1,415
<i>SY NX82212 (Nexus) CLP</i>	6.5	June 25	August 11	1,345
<i>SY NX82214 (Onestar) CLP</i>	6	June 25	August 11	1,227
<i>RGT Absolute CL</i>	6.5	July 2	August 11	1,565

<i>RGT Eiffell CL</i>	6.5	July 2	August 18	1,341
<i>FD15CL44</i>	6.5	June 29	August 18	1,343
<i>ES Aromatic SU</i>	6.5	June 26	August 11	1,617
<i>SYNX81220 SU</i>	6.5	June 20	August 11	1,432
<i>P65LE99</i>	6.5	June 29	August 18	1,537
<i>P64LE25</i>	6.5	June 29	August 18	1,779
<i>P64LE137</i>	6.5	June 29	August 11	1,745
<i>FD15E27</i>	6.5	July 2	August 18	1,914
<i>FD18E41</i>	6.5	July 2	August 18	1,375



**Fig. 8.** Harvesting day 2020 (Original)



**Fig. 9.** Harvesting day 2020 (Original)



## Conclusions

(1) *Sclerotinia sclerotiorum* no any chance for attack and *Alternaria helianthi* had a lower attack, also *Phomopsis helianthi*, *Orobanche cumana* had a lower attack. The hybrids planted in March 12<sup>th</sup> had a lower attack of pathogens: ES Genesis March *Orobanche cumana* DA 1%, *Alternaria helianthi* DA 10%, *Phomopsis helianthi* DA 8% , ES Genesis April *Orobanche cumana* DA 2,5%, *Alternaria helianthi* DA 20%, *Phomopsis helianthi* DA 10%.

(2) When the planting was delayed the yield was decreased with 303 kg/ha(ES Genesis planted in April 4<sup>th</sup> yielded up 1,290 kg/ha and ES Genesis planted in March 12<sup>th</sup> 1,593 kg/ha).

(3) Taking into consideration the special climatic conditions, for plants cultivation, in Dobrogea area – South-Eastern Romania, it must be established the best cultivars, adapted to this situation.

(4) Testing sunflower hybrids which already are commercialized in the seed market, or some new hybrids, it could be recomanded the best ones, suitable for this area.

(5) The results in 2020 were very different regarding the climatic conditions, the cultivated plants being high influenced about dryness.

(6) All important pathogens had not conditions for developing in 2020, so, their attack was significantly lower in this year. The same situation was for de attack of the parasite *Orobanche cumana*.

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