

PHYTOSANITARY STATUS AND YIELD CAPACITY OF SOME SUNFLOWER HYBRIDS IN SOUTH DOBROGEA

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Abstract: Sunflower (*Helianthus annuus* L.) is cultivated in Dobrogea on about 200,000 ha, accounting 20% of the total cultivated area in Romania. The aim of this study was to reveal the sunflower hybrids suitable for being cultivated in Dobrogea under conditions of non-irrigated culture. Twenty hybrids of Romanian and foreign origin were considered. Experimental plots were organized in the field of SC SPORT AGRA SRL in Amzacea in 2019. There were analysed the yield performances and the behaviour to the main pathogens *Sclerotinia sclerotiorum*, *Phomopsis helianthi* and *Alternaria helianthi* and also to the parasitic plant *Orobanche cumana*. Rainfall in the vegetation period in 2019 amounted 134.5 mm being one of the driest years of the last decade. Phytosanitary status of plants was assessed on June 26th and July 11th. Except Clayton, all hybrids recorded a hectolitre weight over 40 kg/hl. Yields over 3000 kg/ha were obtained for 85 % of hybrids. Genesis was seeding at two different times and when it was seeding earlier the yield was higher with 1038 kg/ha. The highest degree of attack was 15% to Aromatic for *S. sclerotiorum*, 24.5% to Bellona for *P. helianthi* and 36% to Bellona for *A. helianthi*.

Key words: oil crop, hybrids behaviour, pathogens, climate change, yield indicator

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is the most important oil crop in Romania. It is the third crop in terms of agricultural area. Currently, it occupies about 1 million hectares. In Dobrogea (South-Eastern Romania), sunflower is cultivated on about 1/5 of the area of Tulcea and Constanta counties. The main pathogens which affected sunflower crop in Romania in the last years were *Alternaria helianthi* (Hansf.) Tubaki & Nishihara, *Sclerotinia sclerotiorum* (Lib) and *Phomopsis helianthi* Munt.-Cvet. et al. and parasitic plant *Orobanche cumana* Wallr.

In order to support the farmers in Dobrogea Region to correctly select the sunflower hybrids for their cultivation area, considering climate change influence, frequently, experimental plots were organized to evaluate the phytosanitary status of the assortment of hybrids (Jinga et al., 2016, 2018; Manole et al., 2018, 2019). From yields point of view, Ion et al., 2010 assessed the sunflower hybrids in the climatic conditions from the south part of the country.

The aim of this study was to reveal the sunflower hybrids suitable for cultivating in the Dobrogea Region under conditions of non-irrigated culture.

MATERIALS AND METHODS

The experimental plots were organised in 2019 in the field of SC SPORT AGRA SRL Amzacea, Constanta County (South Dobrogea Plateau in South-Eastern Romania). Twenty sunflower hybrids were evaluated in this study. They come from both foreign seed companies

and Romanian breeders. 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). The area of each plot was 560 m². The preceding crop was winter wheat. Sowing date was March 20th, the depth of 7 cm. Genesis was the only hybrid sown at two different dates, on March 20th and on April 10th (named Genesis 2 in the study).

Seed treatment aimed at preventing and controlling the attack of (i) *Botrytis* and *Sclerotinia* phytopathogens using Maxim 025 FS (fludioxonil 25g/l) at 0.6 l/100 kg, (ii) *Plasmora helianthi* using Apron XL (metalaxil 339 g/l) at 3 l/t, (iii) *Agriotes* spp. using Cruiser 350 FS (350 g/l tiametoxam) at 10 l/t.

In vegetative season, two fungicides were used to control the pathogens: Mirage 45EC (procloraz 45%) - 1 l/ha and Pictor (200g/l dimoxistrobin + 200g/l boscalid) - 0.5 l/ha.

The herbicides used against the weeds were: glyphosate, autumn application, in a dose of 2 l/ha, Frontier Forte (dimethenamid-P) in a dose of 1.5 l/ha, Racer 25EC (flurochloridone) in a dose of 2 l/ha and Pulsar Plus (25g/l imazamox) in a dose of 2 l/ha.

Soil fertilization was made using two complex fertilizers: 10.20.0 + 20 SO₃ (of which 2 organic N) - 300 kg/ha and 40.0.0+13 SO₃ -150 kg/ha. Foliar fertilization was performed with N12/P60 - 2 kg/ha and 145 SO₃, 5 MgO, 100 B, 2 Cu, 25 Fe, 50 Mn, 0.5 Mo, 20 Zn - 2 kg/ha.

The harvest was performed in August 21th for all hybrids.

Phytopathological assessments of plants were performed on June 26th and July 11th, 2019. The degree of attack (DA%) was calculated using formula $F \times I/100$ (F - frequency of the attacked organs, I - intensity of organs attack).

Hectolitre weight was determined by hectolitre instrument and expressed as kilogram per hectolitre (kg/hl).

Amount of precipitation (mm) for the January-August period of the last six years in Amzacea area was recorded (Table 1).

Table 1. Amount of precipitation (mm) during January-August for the last six years in Amzacea area

Year	Precipitations (mm)
2014	606
2015	347
2016	396
2017	344
2018	568
2019	178.5

RESULTS AND DISCUSSIONS

Considering the total amounts of precipitation during January - August in the Table 1, it is noted that 2019 was the driest year in the last six years in the zone.

Among the quality indicators the hectolitre weight was evaluated due to it gives a view about the seed capacity to dehull. When hectolitre weight is above 40 kg/hl, seeds are more difficult to dehull (GRDC, 2017). Almost all of the hybrids tested had values over 40 kg/hl (except Clayton - 39.9 kg/hl) (Figure 1).

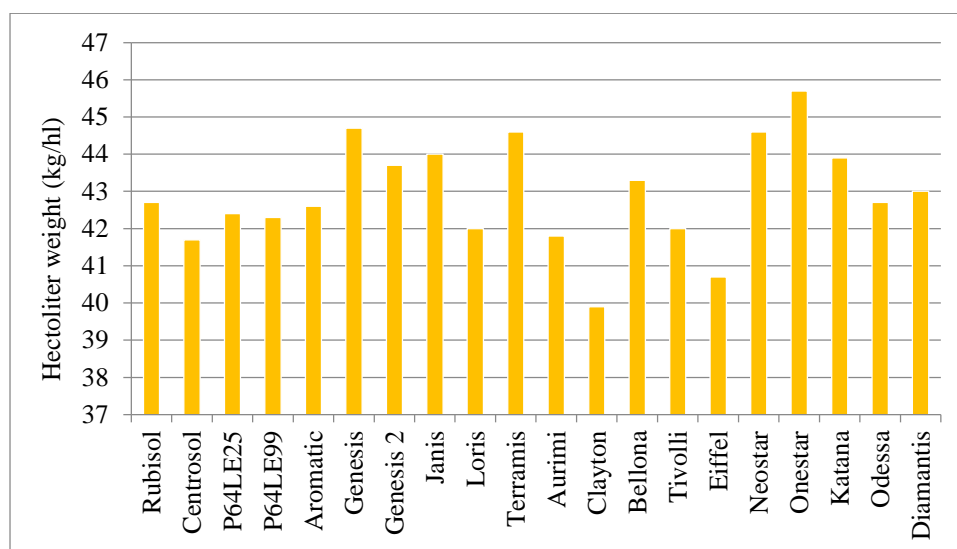


Figure 1. Hectolitre weight (kg/hl)

The sunflower hybrids had yields between 2534 and 4525 kg/ha. Only three hybrids recorded yields under 3000 kg/ha. The average yield from the experimental plots was 3668 kg/ha exceeding the national average yield of 2805 kg/ha reported for 2018 by INS (2018).

For Genesis, the yield has decreased (<1038 kg/ha) when sowing was delayed by 21 days (Figure 2). The literature results show that a higher duration for seed maturity increases yield in sunflower crop (Jonhson & Jellum, 1972; Ahmed et al., 2015; Demir, 2019) and it can come with an earlier flowering due to their genetic features.

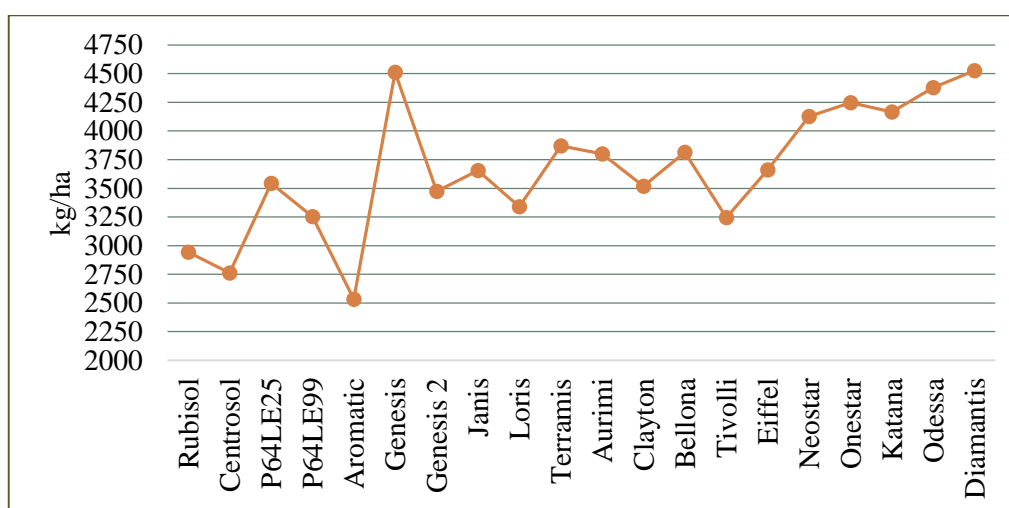


Figure 2. Yield (kg/ha) at 9% humidity registered for all hybrids

The assessments for pathogens attack were performed in order to select the most tolerant hybrids, because after the flowering period it is difficult to apply a fungicide treatment. No attack of *S. sclerotiorum* was observed on June 26th while on July 11th only the Rubisol hybrid was damaged.

Attack of *P. helianthi* was under 1% for all hybrids at the first assessment. At the second assessments (Figure 3), attack increased up to 30% in case of the Tivoli hybrid. The least attacked was the Aromatic hybrid (1%).

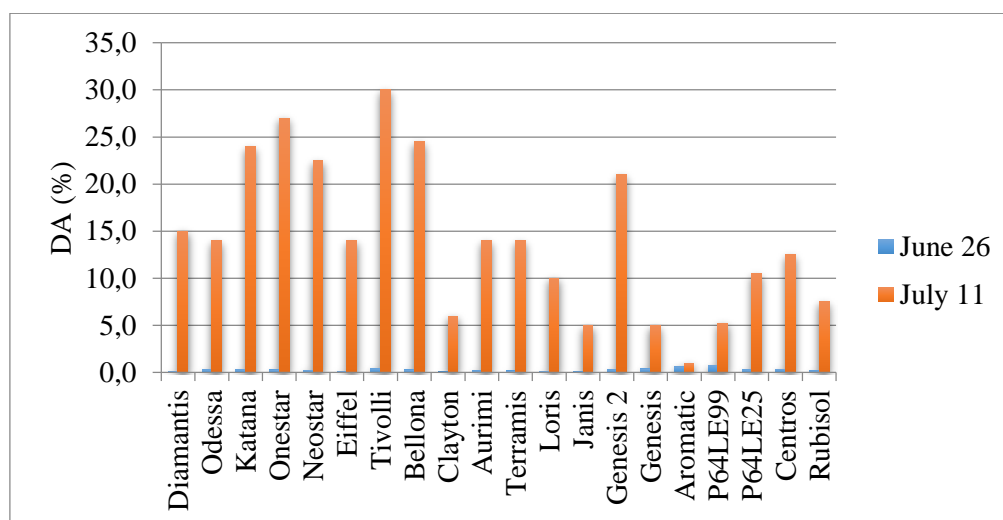


Figure 3. Assessments for *P. helianthi* attack

A. helianthi was detected on all hybrids being the disease with the highest degree of attack. At the first assessments, the DA values were under 5% for all hybrids. At the second assessments, the DA values reached up to 33.25% and 36% for Tivoli and Bellona, respectively. Aromatic was the most tolerant with a DA of 3% (Figure 4).

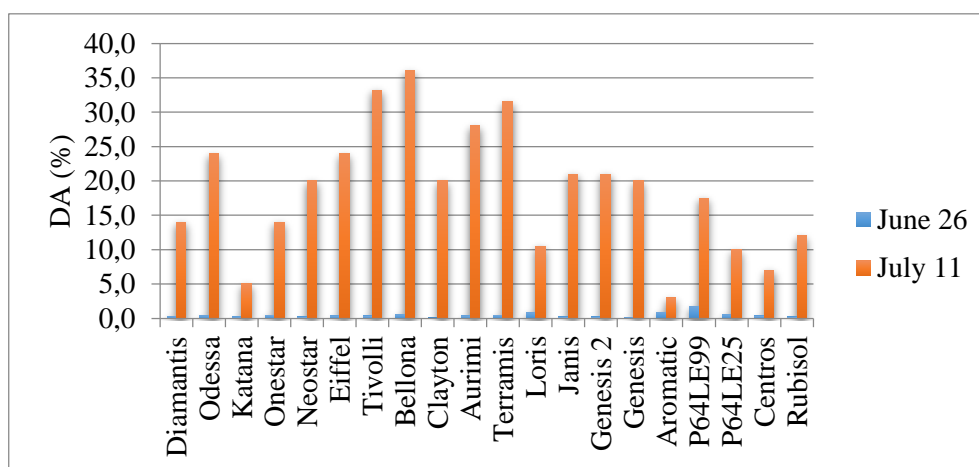


Figure 4. Assessments for *A. helianthi* attack

The parasitic plant *O. cumana* could be controlled using resistant hybrids. Rîșnoveanu et al. (2016) showed that new virulent populations of the parasite are present in Dobrogea. All the hybrids had a DA under 2% at the first assessment. The attack remained at a low level at the second assessments, only three of them having values over 10% (Aurimi, Centros, Rubisol) (Figure 5).

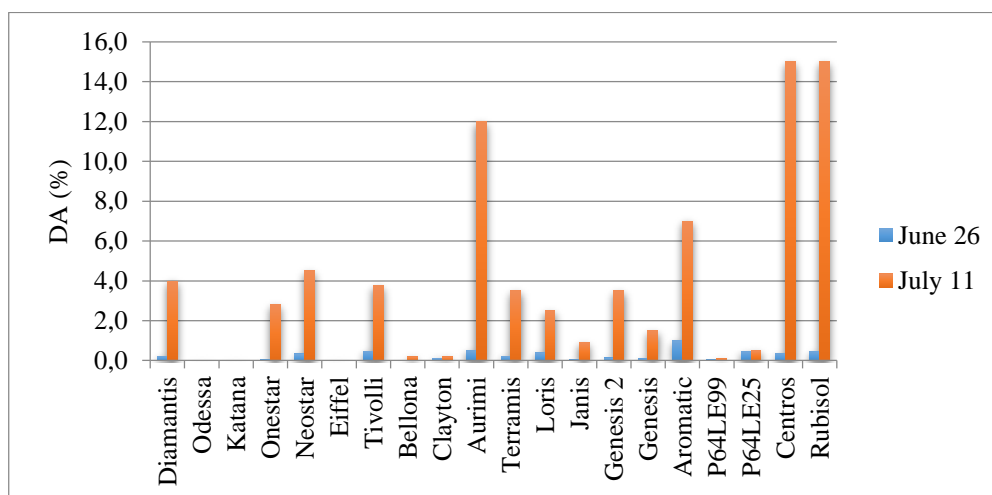


Figure 5. Assessments for *O. cumana* attack

CONCLUSIONS

Yields over 3000 kg/ha were obtained for 85% of the sunflower hybrids experimented at SC SPORT AGRA SRL Amzacea, Constanta County (South Dobrogea Plateau in South-Eastern Romania) in the hydric stress context of 2019. It means a good yield capacity of hybrids in these conditions. An earlier seeding time increased the yield with over 1000 kg/ha.

The seeds of 95 % of the hybrids showed a good dehull resistance as a result of hectolitre weight value over 40 kg/hl.

The *Alternaria helianthi* pathogen was the most aggressive comparative to *Sclerotinia sclerotiorum* and *Phomopsis helianthi*.

Most hybrids showed a good behaviour to *S. sclerotiorum* attack. Centros was the most susceptible hybrid to *S. sclerotiorum* and *O. cumana* attack while Aromatic was the most tolerant to *P. helianthi*, *S. sclerotiorum* and *A. alternata*.

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