

SUNFLOWER CULTIVAR BEHAVIOR AT THE BROOMRAPE ATTACK IN SOUTH-EASTERN AREA OF ROMANIA

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Abstract: In Romania, one of the most dangerous parasites on the plants is the Broomrape (*Orobanche sp.*). Within the sunflower fields there was identified the population of weedy broomrapes of *Orobanche cumana* Wallr. This specie has shown a significant dissemination, especially in the south and south-eastern area of the country. On sunflower cultures in the areas heavily infested with the Broomrape especially in the south and south-eastern area of the country, such as are those in Dobrogea, the losses reach 30- 70% of the harvest. This paper presents a study regarding the behavior of some sunflower cultivars against *O. cumana* studied under natural contamination conditions at S.C. Sport Agra SRL Amzacea, Constanta county, best results have showed the following hybrids: Festiv, Turbo, Neoma, Alego and Sunay.

Key words: *Orobanche sp.*, sunflower cultivars, herbicides.

INTRODUCTION

Sunflower (*Helianthus annuus L.*) is an important oil seed crop of the world and it ranks third in production next to groundnut and soybean (Byrareddy, 2008; Satish & Shrivastava, 2012).

The importance of sunflower as source of edible oil and high quality protein is continuously increasing. The yield stability and the agronomic and economic efficiency of sunflower cultivation depend on the influence of genotype, the level of applied technology, and the presence of an important number of diseases caused by the attack of parasitic pathogens (Gulya et al., 1994).

Broomrapes (*Orobanche sp.*) which belong to the family Orobanchaceae are obligate parasitic flowering plants. Broomrape (*Orobanche cumana* Wallr./*O. cernua* Loefl.) attacks sunflower crop in parts of Europe, the Near East and China. In recent years the parasite migrated to Western Europe, in 2007 the parasite attacked the sunflower crops in France. Yield losses due to *Orobanche* attack range from 5 to 100% depending on the region and the crop. The broomrape's virulence increased significantly in the last two decades due to a short crop rotation and the use of non-resistant sunflower hybrids, causing a loss of yield and oil production (Pricop & Cristea, 2012).

Method of control and management for each parasite includes: crop rotation, herbicides, clean seeds, sowing dates, biological control and genetic resistance (Ramaiah, 1987). Among all tested methods worldwide, the chemical method was proved to be a necessity for a modern agriculture. Previous and late studies have shown that imidazolinone (IMI) herbicides applied onto IMI resistant sunflower effectively controls *O. cernua* by rapid absorption, translocation and accumulation in the root attached parasite.

The aim of this work is to evaluate the resistance of several sunflower commercial hybrids treated with the herbicide Pulsar 40 towards *Orobanche* sp. parasite.

MATERIALS AND METHODS

The experiments were developed at S.C. Sport Agra SRL Amzacea, in Constanta County in 2013. The sunflower cultures were seeded after *Vicia sativa*, and there were performed studies regarding the behavior of several hybrids towards the *Orobanche cumana* parasite. Sixteen international and local sunflower hybrids were tested in field conditions (figure 1), under natural broomrape infestation regarding their resistance to this parasite.

Another field trial, using the same sunflower hybrid NK Neoma, consisted in applying the same herbicide, Pulsar 40, in two variants: the first one with specific doses for experimental plot 1, in 1.2 l/ha. Within plot 2, the herbicide was first applied in a dose of 0.5 l/ha during the 2-4 leaves pheno-phase for weeds control, and later (7-8 leaves) applied in a 0.7 l/ha dose especially in order to control the *O. cumana* parasite. s



Figure 1. Experimental sunflower field

RESULTS AND DISCUSSIONS

The environmental conditions of year 2013 have been favorable for the parasite attack within the sunflower cultures from Amzacea area, Dobrogea County. A spring season with normal precipitations in May and June, was followed by a long drought period in July and August, which was very favorable for the development of the sunflower cultures' parasite.

From the 16 tested hybrids, it can be observed the very good behavior of 3 Romanian hybrids, respectively *Favorit*, *Festiv* and *Turbo* with no record of *O. cumana* attack and also 4 hybrids from international collection *Sanay*, *Rigasol*, *Alego* and *Tristan*, which also showed absolute resistance (figure 2). A very good behavior presented also *Sany* hybrid, with 0.24% rate of attack. The results are presented in table 1.



Figure 2. Hybrids *Favorit* and *Alego* - zero *O. cumana* attack



Figure 3. Hybrid *Flora* – highest *O. cumana* Wallr. attack

Table 1. Behavior of some sunflower cultivars to *O. cumana* attack

Hybrid	<i>Orobanche cumana</i>		
	F (%)	I (%)	AE (%)
FAVORIT	0	0	0
FESTIV	0	0	0
TURBO	0	0	0
SELECT	50	11	5.50
PERFORMER	12	23	2.76
SUPER	29	7	1.74
CORIL	16	12	1.92
SANAY	0	0	0
RIGASOL	0	0	0
ALEGO	0	0	0
TRISTAN	0	0	0
FERTI	11	2	0.22
SAMBRO	24	15	3.60
PIXEL	14	18	2.52
FLORA	21	23	4.83
SANY	8	3	0.24

Within the production field, there can be observed a different attack rate of main sunflower pathogens' and *O. cumana* parasite, because of the herbicidation procedure. In first plot, with only one herbicidation, 1,2l/ha it can be observed the weeds attack in 45%, which favors the development of sun flower pathogens, compared to plot 2, where was applied fractioned herbicidation (figure 4).

The agricultural yields, as shown in figure 4, were differentiated taking into account the hybrid's resistance to the attack of *O. cumana* parasite, which led to a production loss of 1775 kg/ha, although there was used the same hybrid and technology, with the exception of a fractionated herbicidation.



Plot 1- Hybrid NK *Neoma*:

Phomopsis helianthi: F= 40 %
Sclerotium bataticola: F= 70 %
Sclerotinia sclerotiorum: F= 9 %
Alternaria helianthi: F= 85 %
Orobanche cumana: F = 90 %
Weeds: Chenopodium 45%
Yield: 2175 kg/ha



Plot 2- Hybrid NK *Neoma*:

Phomopsis helianthi: F= 10 %
Sclerotium bataticola: F= 65 %
Sclerotinia sclerotiorum: F= 3 %
Alternaria helianthi: F= 75 %
Orobanche cumana: F = 3 %
Weeds: below 1%
Yield: 3950 kg/ha

Figure 4. Pathogens' attack frequency (%) (herbicidation with Pulsar 40)

CONCLUSIONS

Sunflower cultivars taken under investigation show a different behavior against the attack of the main pathogens and parasite *Orobanche cumana*.

In natural inoculation on Amzacea location, an absolute resistance was developed only by 7 hybrides: Favorit Festiv, Turbo, Sanay, Rigasol, Alego and Tristan.

The Pulsar 40 herbicide applied in two doses during the high sensibility phases of weeds and *O. cumana* parasite, at the hybrids resistant to imidazolinones, provided increased yield per hectares.

Due to their biological properties, good resistance to broomrape attack, Festiv and Sanay hybrids were cultivated in 2013, at Sun Agro Organic – Carasuhatu, Tulcea county within the Danube Delta Natural Reservation, part of the Natura 2000 Ecosystem.

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REFERENCES

- BYRAREDDY, K., UPPAR, D.S., VYAKARANAHAL, B.S., HIREMATH, S.M., RAVI H., NADAF, H.L. (2008). Effect of integrated nutrient management on sunflower hybrid (KBSH-1) seed production. *Karnataka Journal of Agricultural Science*, 21, 2: 171-175.
- GULYA, T., BERLIN, N., LAMEY, A. (1994). Sunflower diseases. In Berjlund, D.R. (Ed.): *Sunflower Production Ext. Bulletin*. North Dakota Agric. Experiment Station and North Dakota State Univ.: 44-62.
- PRICOP, S.M., CRISTEA, S. (2012). The attack of the *Orobanche cumana* Wallr. and it's influence on a differential sunflower host assortment under Dobrogea conditions. *Research Journal of Agricultural Science* 44, 2:78-84.
- RAMAIAH, K.V. (1987). Control of *Striga* and *Orobanche* species. A review. In: H.C. Weber, and W. Forstreuter (Eds). *Parasitic Flowering Plants*. Philipps-Universitat, Marburg, Germany: 637-664.
- SATISH, I., SHRIVASTAVA, S.K. (2012). Chemical studies of new varieties of sunflower (*Helianthus annuus*) LSF-11 and LSF-8 seeds. *Agricultural Biological Journal of N. America*, 2 (8): 1171-1181.