

RESEARCH ON THE PRESENCE OF THE *OROBANCHE CUMANA* PARASITIC PLANT IN SUNFLOWER CULTURE

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ABSTRACT

The economic importance of sunflower in Braila County has been the main motivation in the study of the Orobanche cumana attack and the concern to offer a wide range of hybrids to the growers in this area and to provide information on their reaction under similar conditions to those analyzed. The research was carried out in Braila county in the years 2015-2016. Six sunflower hybrids were studied. Observations were made on the frequency, intensity and degree of attack at the end of flowering and before harvesting were determined by counting the parasite on each plant. Formula for

*the degree of attack: $F \times I / 100$ (%), where F = attack frequency (%) I = attack intensity (%). The number of sunflower plants per plot, plant height, calatidian diameter, number of broomrape attack plants, average number of broomrape stems per host plant and plot production at harvest were recorded. The results of the research on the parasitic-host plant system studied under natural infestation conditions depend on the homogeneity of experimental infestation on the field and on the studied genetic material. Infestation with *Orobanche cumana* was lifted during the two years of research.*

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is one of the four major crops grown for most vegetable and industrial oils in the world (Ekin et al., 2005). Sunflower is a plant susceptible to the attack of various pathogens (fungi, bacteria, mycoplasmas, viruses) as well as some parasitic plants, *Orobanche cumana*. Diseases caused by fungi are the most numerous and most prevalent and have the greatest economic impact (Vaidehi et al 2002, Morar et al., 2004, Afzal et al., 2010). *Orobanche cumana* is a parasitic plant, also known as „the lupoiaia”, the pathogen forms unmodified strains attacking many other crop plants (tomatoes, tobacco, etc.), causing significant economic losses worldwide (Shindrova., 2006). It is the main parasite of the sunflower root (Molinero-Ruiz, et al., 2014, Kaya et al., 2004, Eindenberg et al., 2004), causing damage in many

countries such as Turkey, Romania, Ukraine, Bulgaria, China, Black Sea countries and ex-USSR countries (Sackton, 1992, Garcia-Torres et al., 1994; Melero-Vara et al., 2000; Kaya et al., 2004, Masirevic and Malidza, 2006, Schneeweiss, 2009; Fernandez-Escobar et al., 2009). *Orobanche cumana* is a parasitic plant that produces damage that often exceeds 50% of the crop, the negative effect of this plant being also obvious and qualitative, manifesting itself by reducing the percentage of achene oil (Shi, B. X. et. al.2015). *Orobanche cumana* Wallr is present in Russia, Ukraine, Bulgaria, Turkey, Spain, Serbia, Hungary, Moldova, Greece, Tunisia, Israel, Iran, Kazakhstan, China, Mongolia and Australia (Dedic et al 2009, Molinero-Ruiz et al., 2009, Burlov and Burlov., 2011, Maa et al., 2012, Kaya et al., 2012, Antonova et al., 2012, 2013, Cantamutto.,

2012, Miladinović et al., 2012, Eizenberg et al., 2012). The Lupoia (*Orobanche cumana* Wallr.), parasitic pharyngeal, on sunflower (*Helianthus annuus* L.) is frequent in the southeastern part of the country where production losses can exceed 500kg / ha (Brăila, Tulcea, Galati, Ialomita counties) (Iliescu, H., Csep, N., 1982, Păcureanu-Joita et al., 2012). In Romania, over 60% of the area planted with sunflower is infested with *Orobanche cumana*, the most common in the counties of Braila, Constanta and Tulcea. Control of this parasite remains extremely difficult, as thousands of tiny seeds produced by a single broomrape plant

can be easily dispersed by water, wind, animals, humans, machinery or attached to sunflower seeds. In the area infested with broomrape, there has been a progressive development of this parasite in sunflower crops and a rapid appearance of new and more virulent races (Fernandez- Martinez et al., 2008). The purpose of the research was the knowledge of the reaction of various sunflower hybrids cultivated in Braila County, tolerated by the parasitic plot in a classical technology applied in the area. The investigations were conducted under experimental field conditions.

MATERIAL AND METHODS

Researches carried out in field conditions aimed influence attack parasitic plant *Orobanche cumana* studied hybrids, determine the frequency and intensity of the attack, calculating the attack, the efficacy of the parasitic plant *Orobanche cumana*, the production of sunflower compliance technology sunflower growing in the research area. The experimental field was set up in Braila county and the researches were carried out in the agricultural year 2015. The biological material was represented by six sunflower hybrids. Weed control was carried out by applying herbicides (Pulsar 40+ Dash HC) at a dose of Pulsar 1,2/ ha+ Dash HC1,2/ ha post-emergence. The treatment was applied in two phenophases. The first treatment was

applied post-emergence of 4-6 leaves and the second one up to 8 leaves. In the agricultural year 2015, the drought climatic conditions imposed the application of 4 watering (25 June, 10 July, 23 July, 5 August) by spraying with a norm of 700 m³/ ha. Observations on the attack of the *Orobanche cumana* parasitic plant in vegetation consisted of notes on frequency and intensity, values used to calculate the degree of attack. In the case of the attack with the parasitic plant *Orobanche cumana*, the frequency of the attack was noted, considering the 100% intensity, the non-recoverable plant, and therefore the frequency of the attack was equivalent to the degree of attack.

RESULTS AND DISCUSSIONS

The results of the research on the parasitic-host plant system studied under natural infestation conditions depend on the homogeneity of field experimental infestation and the studied genetic material. Analyzing the data in table 1 on the *Orobanche cumana* attack, it was observed that the frequency had higher values, compared to the average intensity of the attack in all studied hybrids. The

highest incidence rate was determined in the Clever hybrid, at which the frequency was 80%. Also, Tristan hybrid recorded a high value compared to the other hybrids tested, respectively, F = 70%. The data in the same table shows that the intensity values were raised at these hybrids. In the case of Tristan hybrid, an intensity value of 8% was calculated, which resulted in an attack rating of 5.6%. In the

MS Oliva hybrid, the attack rate was 0.75%, resulting from the F = 25% incidence and I = 3%. Of the analyzed hybrids, in this hybrid the value of

broomrape attack was the lowest. The *Orobanche cumana* attack on the PR63F73 hybrid was 0.45%.



Figure 1 Attack by *Orobanche cumana* (Clever, 2015)(original)



Figure 2 Attack by *Orobanche cumana* (Tristan, 2015) (original)

The results of *Orobanche cumana* Wallr infestation in 2015, in jud. Braila (original)

Table 1

Hybrid	Tolerant race	F(%)	I(%)	GA(%)
PR63F73	E	30	1,5	0,45
NK Adagio	E	25	6	1,5
Tristan	F	70	8	5,6
MS Oliva	E	25	3	0,75
Clever	E	80	11	0,80
LG 56.31	F	25	3,5	0,87

Influence of the infestation with *Orobanche cumana* Wallr in the year 2015 on sunflower production in jud. Braila (original)

Table 2

Hybrid	<i>Orobanche cumana</i> GA(%)	Production (q/ha)
PR63F73	0,45	40,40
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	0,26	43,1
NK Adagio	1,30	30,30
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	0,57	33,5
Tristan	5,6	24,59
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	3,78	30,15
MS Oliva	0,75	21,75
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	0,4	29,35
Clever	8,80	16,87
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	6,8	19,45
LG 56.31	0,87	22,11
Herbicide Pulsar 40 + Dash HC at the dose of Pulsar 1,2 / ha + Dash HC 1,2 / ha	0,32	29,05

After application of herbicides, Pulsar 40+ Dash HC, at a dose of Pulsar 1,2 / ha+ Dash HC 1,2 / ha in 2015, the level of attack has diminished. At Tristan hybrid, application of herbicides to Pulsar 40+ Dash HC resulted in a decrease in the attack from 5.6% to 3.78%, impacting both the frequency and intensity of the attack. The data in the table shows that in the MS Oliva hybrid the broomrape attack was reduced after the herbicide administration, but in the untreated alternative the hybrid also behaved well to the attack of the parasitic plant (GA = 0.75%, control alternative, GA = 0,4%, treatment alternative). Regarding the reaction of the Clever sunflower hybrid to the application of herbicides from the data presented in the same table, it can be observed that in the treated alternative the level of the broomrape attack

decreased significantly compared to the untreated alternative. The attack was reduced to 6.84% against the control at which GA = 8.80%. The data in table 2 shows that the smallest production value was found in the Clever hybrid with 16.87 q / ha, which was most attacked by *Orobanche cumana* and the lowest level of production. At the PR63F73 hybrid, the highest average yield (40.40 q / ha) was obtained, which can be attributed to the reduced attack of the wolf and its genetic features, which can be considered tolerant to the parasitic plant. After application of the Pulsar 40+ Dash HC products at the 1,2/ ha + Dash HC 1,2/ ha Pulsar dose, the data presented in table 2 shows that the yields increased by 3,3 q/ ha in the hybrid PR63F73 at over 7q / ha in hybrids MS Oliva and LG 56.31.

CONCLUSIONS

The parasite *Orobanche Cumana* Wallr. has evolved in terms of virulence of populations in the last two decades in

southeastern Romania, especially in Braila county. In order to identify the virulence of the *Orobanche* populations, a

differentiated assortment of commercial hybrids on the Romanian market in 2015 was made. The characterization of resistance to *Orobanche* was extracted from published commercial presentations made by producers and from published scientific data. DuPont Pioneer PR63F73-E tolerant race, NK Adagio, Tristan - Syngenta tolerant race E, MS Oliva-BioCrop tolerant race E, Clever- Ragt

tolerant race E, LG 56.31- Limagrain tolerant race F. Applying post-emergence herbicides in the 4-6 leaf sunflower leaf (and up to 8 leaves to control *Orobanche*), accompanied by seed treatment with the Apron XL 350SD product at a dose of 3l / t had a positive effect on production, increases in production.

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