

RESPONSE OF SOME SUNFLOWER CULTIVARS TO BROOMRAPE ATTACK IN ROMANIA

Jinga, V.^{1*}, Iliescu, H.¹, Stefan, S.¹, Manole, D.²

¹ Research-Development Institute for Plant Protection, Bucharest, Romania

² SC Sport Agra srl, Amzacea- Dobrogea, Romania

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SUMMARY

Broomrape (*Orobancha spp*) is one of the most dangerous plant parasites in Romania. of weedy of *Orobancha cumana* Wallr. broomrape populations have been identified in sunflower fields. The parasite is significantly disseminated, especially in the south and south-eastern parts of the country. The reaction of some sunflower cultivars to *O. cumana* was studied under inoculation and natural contamination conditions. Under the inoculation conditions created at Research Development Institute for Plant Protection in Bucharest, the hybrids HS 1900, Turbo, Justin and Favorit showed absolute resistance. Under natural contamination conditions, at SC Sport Agra srl, Amzacea-Dobrogea, best result were shown by Rigasol, Flores, Albani Florena, Sunay, Favorit, Festiv and Turbo. The herbicides Treflan 48 EC and Assert 250 EC were most efficient (>80 %) in controlling *Orabanche cumana* infestation, compared with other herbicides whose efficiency did not exceed 50%.

Key words: broomrape, sunflower, hybrids, behavior

INTRODUCTION

In Romania, sunflower crops in areas heavily infested with the broomrape, especially those in the south and southeast of the country, such as Dobrogea, suffer yield losses from 30 to 80% (Iliescu *et al.*, 1991).

Factors which enhance the occurrence and evolution of broomrape in sunflower crop are of pedoclimatic nature. Sandy soils with a high content of calcium carbonate and a slightly acid to neutral pH offer best conditions for broomrape development. Trials with different levels of fertilization have shown the existence of a positive correlation between soil high levels of phosphorus and potassium in the soil, at the expense of nitrogen, and the high frequency and intensity of *Orobancha* attack.

* Corresponding author: e-mail: vasilejinga@zappmobile.ro;
secretariat_stiintific@icdpp.r

The strongly infested soil had higher contents of phosphorus pentoxide and soluble aluminum than the soil with low infestation. According to literature sources, stems of broomrape plants contain 2 times more nitrogen, 3 times more potassium and 22 times more phosphorus than the host plant. These high demands for phosphorus and potassium are due to a short growth period of the parasite (Horvath, 1994).

A low annual precipitation, less than 500 mm per year, also favors the attack of *Orobanch* species on different host crops.

There is no unique method for controlling broomrape. Reducing the degree of infestation in crops with this dangerous parasite to a tolerable level can be achieved though the development and sustained implementation of integrated control technology. It is a modern approach to broomrape control, which involves combination of technological, biological, physical and chemical means of parasite control.

MATERIALS AND METHODS

The behavior of broomrape races was studied on inoculated soil at R.D.I.P.P. Bucharest-Romania.

Artificial soil infection was performed with broomrape seeds taken from parasite plants from sunflower fields in the districts of Constanta, Calarasi and Ialomit. The inoculum (consisting of broomrape seeds and sand in the ratio 1/15 (v/v)) was added to the soil at sowing, together with the sunflower seeds.

After sunflower flowering, the following observations were made: total number of plants per variant, total number of damaged plants per variant and the number of parasitic plants per sunflower plant.

These data were used to calculate the attack frequency (F%), intensity (I%) and extent (AE%). Most severe attacks were taken in consideration when grading virulence of the studied races (Vrânceanu *et al.*, 1981). The hybrid Festiv was used in herbicide experiments.

RESULTS AND DISCUSSION

From Table 1, which presents the response of Romanian sunflower hybrids to *Orobanch cumana* attack, it can be seen that HS 1900, TURBO, JUSTIN and FAVORIT exhibited absolute resistance. The others were affected to a variable degree, namely: 5 hybrids (VENUS, SATURN, HS 2326, HS 2411 and HS 2192) showed a low attack (0.1%), 10 a medium attack, 7 a high attack and 7 a very severe attack.

In the experiment conducted under natural inoculation in the location of Amza-cea, Constanta district, absolute resistance was displayed only by 8 hybrids (Table 2).

In the period 2005-2007, several experiments were carried out to determine the effectiveness of herbicides in controlling the parasite *Orobanche cumana*.

Table 1: Response of some Romanian sunflower cultivars to *Orobanche cumana* Wallr. attack
R.D.I.P.P. - Bucharest- artificial infection

Hybrid	F (%)	I (%)	AE (%)
HS 961	61.4	15.8	9.7
HS 1900	0	0	0
HS 1901	34.3	9.0	3.0
HS 2116	29.4	1.0	0.2
HS 2118	43.7	1.0	0.4
HS 2156	85.0	2.5	2.1
HS 2158	75.0	2.4	1.8
HS 2187	30.7	16.7	5.1
HS 2192	11.7	0.2	0.1
HS 2228	38.8	1.8	0.6
HS 2231	41.1	1.7	0.6
HS 2239	50.0	1.7	0.8
HS 2259	22.2	1.0	0.2
HS 2289	41.1	1.1	0.4
HS 2290	50.2	1.0	0.5
HS 2322	41.1	1.4	0.5
HS 2325	50.0	1.2	0.6
HS 2326	15.3	1.0	0.1
HS 2408	57.1	4.6	2.6
HS 2409	35.2	2.8	0.9
HS 2410	35.0	5.0	1.7
HS 2411	11.6	1.3	0.1
HS 2412	64.2	7.8	5.6
FLOROM 214	22.5	1.6	0.3
FLOROM 312	12.5	3.0	0.3
SELECT	50.0	1.1	0.5
VENUS	11.6	1.0	0.1
SATURN	11.2	1.0	0.1
CORIL	16.2	4.3	0.6
SANTIAGO	20.0	1.2	0.2
TURBO	0	0	0
JUSTIN	0	0	0
FAVORIT	0	0	0

The herbicide Treflan 48 EC (Table 3) reduced the attack frequency to 13.3% compared with 56.0% in the untreated variant, attack intensity of 1.0% compared with 2.1% and attack extent of 0.13% compared with 1.17%, with an efficacy of 88.8%.

In the first and second year of experimentation (Table 4), the herbicide Assert 250 EC lowered the degree of attack to 0.04% compared with the untreated which had 1.17%, showing the efficacy of 96.5%, and reduced the degree of attack to 0.09% compared with 1.98% in the untreated control, with the efficacy of 95.4%, respectively.

Table 2: Response of sunflower cultivars to *Orobanche cumana* Wallr. attack in Amzacea, Constanta, under natural contamination

Hybrid	<i>Orobanche cumana</i>		
	F (%)	I (%)	AE (%)
RIGASOL	0	0	0
FLORA	12	3.3	0.4
FLORES	0	0	0
FLEURET	3	4.2	0.13
ALBANI	0	0	0
FLORENA	0	0	0
FLORALIE	10	2	0.2
SANAY	0	0	0
JAZZY	14	1	0.14
PIXEL	6	0.4	0.02
ARENA	7	1	0.07
TEKNY	5	2.1	0.10
MELODY	11	1.6	0.18
TORERO	12	0.8	0.1
SAMBRO	15	2	0.3
SELECT	8	3.1	0.25
RAPID	2.0	1.0	0.02
PERFORMER	2	1.2	0.02
SUPER	6	1	0.06
FAVORIT	0	0	0
FESTIV	0	0	0
TURBO	0	0	0
CORIL	6.2	2	0.12

Table 3: Efficacy of the herbicide Treflan 48 EC in controlling the attack of *Orobanche cumana* on sunflower under conditions of artificial infection R.D.I.P.P., Bucharest, 2005

Herbicide	Active ingredient	Dose l/ha	Frequency (%)	Intensity (%)	Extent (%)	Effectiveness (%)
Treflan 48 EC (ppi)	trifluralin 480 g/l	2.5	13.3	1.0	0.13	88.8
Untrated	-	-	56.0	2.1	1.17	-

Table 4: Efficacy of the herbicide Assert SC 250 in controlling the attack of *Orobanche cumana* on sunflower

Herbicide	Active ingredient	Dose l/ha	Frequency (%)	Intensity (%)	Extent (%)	Effectiveness (%)
2006 - Artificial infection - RDIPP Bucharest						
Assert 250 SC (20 days from sowing)	Imazametabenz 250 g/l	1.0	4.4	1.0	0.04	96.5
Untreated	-	-	56.0	2.1	1.17	-
2007 - Artificial infection - RDIPP Bucharest						
Assert 250 SC (20 days from sowing)	Imazametabenz 250 g/l	1.0	11.4	0.8	0.09	95.4
Untreated	-	-	60.2	3.3	1.98	-
2006 - Natural contamination – Amzacea, Constanta						
Assert 250 SC (20 days from sowing)	Imazametabenz 250 g/l	1.0	92.7	3.8	3.52	50.4
Unterwald	-	-	100.0	7.1	7.1	-

Under conditions of natural contamination, Assert SC 250 reduced the degree of attack to 3.52% compared with 7.10% in the untreated control, showing the efficacy of 50.4%. This lower efficacy is probably due to a high degree of soil infestation with broomrape and the timing of herbicide application - 30 days after sowing, when the ratio between sunflowers and the parasite was partially determined.

Efficacy of post-emergence herbicides (Table 5) in controlling the attack of *Orobanche cumana* varied from 8.1% in Furore Super 75 EW to 52.9% in Modown, the other two herbicides, Agil 100 EC and Gallant Super, having the efficacy of 14.6% and 34.6%, respectively.

Table 5: Efficacy of post-emergence herbicides in controlling the attack of *Orobanche cumana* on sunflowers under natural infestation Amzacea, Constanta, 2006

Herbicide	Active ingredient	Dose l/ha	Frequency (%)	Intensity (%)	Extent (%)	Effectiveness (%)
Agil 100 EC	propaquizafop 100 g/l	1.0	77.8	7.8	6.06	14.6
Furore Super 75 EW	Fenoxapropetil 75 g/l	2.5	98.9	6.6	6.52	8.1
Gallant Super	haloxyfop R-metil 100 g/l	1.0	96.8	4.8	4.64	34.6
Untrated	-	-	100	7.10	7.10	-

CONCLUSIONS

The Romanian sunflower cultivars taken under investigation showed different responses to the attack of the parasite *Orobanche cumana*. It should be noted that HS 1900, Turbo, Justin and Favorit had an absolute resistance, while Venus, Saturn, HS 2326, HS 2411 and HS 2192 suffered a low attack of the parasite. The remaining material suffered medium, high, or very severe attacks.

Under conditions of natural infection in the location of Amzacea, absolute resistance was shown by Rigasol, Florena, Albani, Sanay, Favorit Festiv and Turbo.

The analysis of herbicide efficacy showed that the herbicides Treflan 48 EC and Assert 250 EC had the highest efficacy (>80%) in controlling the attack of *Orobanche cumana* compared with the other herbicides whose efficacy was >50%.

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COMPORTAMIENTO DE ALGUNOS CULTIVARES DE GIRASOL EN LA BROOMRAPE ATAQUE EN RUMANIA

RESUMEN

Uno de los parásitos más peligrosos en las plantas hay Broomrape (*Orobancha* spp) en Rumania. El girasol se identificaron los campos de la población de malas hierbas broomrapes de *Orobancha cumana* Wallr. Se demostró una importante difusión, especialmente en el sur y sur-oriental del país. El comportamiento de algunos cultivares de girasol contra *O. cumana* se estudiaron bajo la inoculación artificial de las condiciones naturales y la contaminación. En condiciones de inoculación artificial, la experiencia en el desarrollo de la investigación efectuada por el Instituto de Protección Fitosanitaria Bucarest, híbridos SA 1900, Turbo, Justin Favorit y han mostrado una resistencia absoluta. Naturales en la contaminación en el SC Sport Agra SRL Amzacea-Dobrogea, mejor resultado han mostrado: Rigasol, Flores, Albani Florena, Sunay, Favorit, Festiv y Turbo. El herbicida Treflan 48 CE y Assert 250 CE, tiene la más alta eficacia (>80%) en el control de ataque *Orobancha cumana*, en comparación con otros herbicidas que no >50%.

COMPORTEMENT DE CULTIVARS DE TOURNESOL SUITE À L'ATTAQUE d'*Orobancha* EN ROUMANIE

RESUME

Un des parasites les plus dangereux pour les végétaux en Roumanie est l'*Orobancha* (*Orobancha* spp). Dans les champs de tournesol, une population sauvage d'*Orobancha cumana* Wallr. a été identifiée.

Une dissémination significative a été démontrée, particulièrement dans le sud et le sud-est du pays. Le comportement de quelques cultivars de tournesol contre *Orobancha cumana* a été étudié dans des conditions d'inoculation artificielle et de contamination naturelle.

Pour les inoculations artificielles, une expérience menée à l'Institut de Développement et de Recherche pour la Protection des Plantes de Bucarest. Les hybrides HS 1900, Turbo, Justin et Favorit ont montré une résistance totale.

Lors de la contamination naturelle à SC Sport Agra srl, Amzacea - Dobrogea, les meilleurs résultats ont été obtenus pour : Rigasol, Flores, Albani Florena, Sunay, Favorit, Festiv et Turbo.

Les herbicides Treflan 48 EC et Assert 250 EC ont eu l'efficacité la plus élevée (> à 80%) dans le contrôle des attaques d'*Orobancha cumana*, comparée à d'autres herbicides où aucun n'a donné de résultat supérieur à 50%.

