

Towards *Orobanche* resistance in sunflower - Screening of wild *Helianthus* for novel resistance sources

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Introduction

Broomrape (*Orobanche cumana* Wallr.) is the most serious constrain for sunflower (*Helianthus annuus* L.) production in Southern and Eastern Europe. It causes considerable yield losses and reduces sunflower seed quality. Genetic resistance had proved to be the most efficient method for suppressing severe broomrape attacks in the field, however selection pressure resulted in occurrence of new, and more aggressive races of the parasite. Broomrape is absent in the centre of origin of the genus *Helianthus* and in the sunflower crop areas of Latin America. In Argentina, one of the five main producer countries, the parasite is also absent in the exotic accessions of *H. annuus* and *H. petiolaris* naturally developed in the sunflower crop area (Cantamutto et al. 2010). Both natural and broad genetic resistance in Argentina sunflowers could be potentially responsible for broomrape absence in Argentina (Miladinović et al. 2012). In order to check this hypothesis and find potential novel resistance sources we have screened wild *H. annuus* and *H. petiolaris* accessions from Argentina for their resistance to broomrape.

Material and Methods

Plant material tested for broomrape resistance consisted of four *H. annuus* and four *H. petiolaris* accessions from Argentina (Tab. 1). Sunflower plants were grown in nine-litre pots in greenhouse at 25°C - 16:8 h photoperiod during six weeks as described by Terzić et al. (2010) (Fig. 1). After six weeks plants were taken out of the pots and completely cleaned.

Plants without broomrape attached to its roots were marked as resistant, and plants with emerged or underground broomrape were considered susceptible. Incidence was calculated as the ratio attacked plants: total plants, while severity was calculated as broomrape attachment number per sunflower plant (Fig. 2).

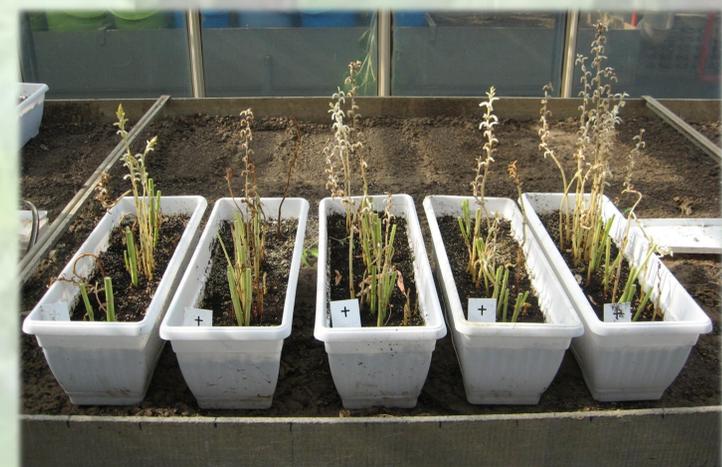


Figure 1. Sunflower resistance testing in greenhouse conditions

Results and Discussion

The ANOVA showed highly significant differences between species. The tested accessions of *H. annuus* were susceptible and had 4.3 ± 3.3 broomrape tassels per plant. Wild *H. annuus* accessions LMA and RIV were completely susceptible, while some plants of the DIA and AAL accessions were resistant (Tab. 1). All the tested accessions of *H. petiolaris* were resistant to broomrape as no broomrape tassels were observed. Similar results were obtained by Terzić et al. (2010) who tested *H. petiolaris* accessions from the USA. As interspecific hybridisation in sunflower is possible, this wild *Helianthus* species could be a valuable source of broomrape resistance genes that could be incorporated into cultivated sunflower by crossing. Especially having in mind that cultivated sunflower and *H. petiolaris* are sexually compatible and that their flowering time overlaps (Gutierrez et al. 2012).

Table 1. Accession identifiers and reaction of wild *H. annuus* and *H. petiolaris* to broomrape

Species	Genotype	Incidence of broomrape	Severity $\pm \sigma$
<i>H. annuus</i>	LMA	100%	5.06 \pm 3.17
<i>H. annuus</i>	RIV	100%	3.82 \pm 2.21
<i>H. annuus</i>	DIA	90%	5.75 \pm 3.80
<i>H. annuus</i>	AAL	61.1%	2.17 \pm 2.43
<i>H. petiolaris</i>	1509	0%	0
<i>H. petiolaris</i>	2610	0%	0
<i>H. petiolaris</i>	2910	0%	0
<i>H. petiolaris</i>	3210	0%	0

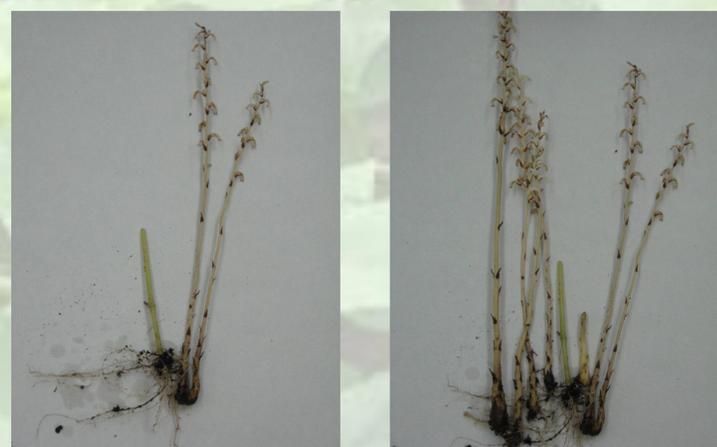


Figure 2. Broomrape attached to wild *H. annuus* root system

Conclusions

- LMA and RIV accessions of wild *H. annuus* were completely susceptible to broomrape, while some plants of AAL and DIA accessions were resistant
- All four tested *H. petiolaris* accessions were completely resistant to broomrape
- Newly found resistance in *H. petiolaris* has a great potential for introduction into cultivated sunflower

Acknowledgement

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