

DETERMINING NEW AGGRESSIVE BROOMRAPE INFESTATION IN MEDITERRANEAN REGION OF TURKEY

Yücel KILIÇ¹, Yalçın KAYA², Mehmet SEZGİN³

¹*Limagrain Seed Co, TURKEY*

²*Trakya University Engineering Faculty, Genetic and Bioengineering Department, TURKEY*

³*Variety Registration and Seed Certification Center, TURKEY*

ABSTRACT

Orobanche L. is a large genus mainly distributed throughout subtropical and temperate regions of the northern hemisphere. The Mediterranean region is one of the most important centers of diversity. The genus *Orobanche* has been represented by 39 species due to this new record in Turkey. (Zare et al., 2009) Sunflower cultivation has gradually increased in the eastern Mediterranean region since 2004.). In 2011, sunflower broomrape began to appear in cultivated area in Adana and increased rapidly until today. Based on this research results and natural condition observations show that infested new broomrape races areas are increasing seriously year by year in the mediterranean region. As a result it will be required of new sources genetic resistance to the most virulent races or herbicide resistant hybrids for this region.

INTRODUCTION

Orobanche L. is a large genus mainly distributed throughout subtropical and temperate regions of the northern hemisphere. The Mediterranean region is one of the most important centers of diversity. The genus *Orobanche* has been represented by 39 species due to this new record in Turkey. (Zare et al., 2009)

Sunflower broomrape (*Orobanche cumana* Wallr.) is a parasitic angiosperm, totally devoid of chlorophyll, that infects the roots of sunflower (*Helianthus annuus* L.) plants, drawing water and nutrients from them. This parasitic plant is regarded as one of the most important constraints on sunflower production in areas of eastern and southern Europe, the Middle East, Russia, Ukraine and China (Parker,1994). According to Kaya *et al.* (2004), about 80% of sunflower areas in Turkey (Thrace region) are infested with the seeds of the parasite. According to these authors, epiphytotic occurrence of broomrape is registered in this region each 20 years. Furthermore, the parasite forms new, more virulent races which overcome the resistance of the varieties and hybrids commonly used in production (Kaya *et al.*, 2004; Pacureanu-Joita *et al.*, 1998; Alonso, 1996; Fernandez-Martinez *et al.*, 2000). This impedes effective control of broomrape.

Sunflower cultivation has gradually increased in the eastern Mediterranean region since 2004. In 2005, sunflower acreage and production in the region were tripled compared with 2004. There has not been any record on broomrapes in sunflower fields in eastern Mediterranean region yet, but broomrapes are considered a possible threat for sunflower fields in this area. *Orobanche cernua* Loef. causes considerable damage in sunflower fields in other regions of Turkey where sunflower has been sown for years and it may spread from those regions to the eastern Mediterranean region (Bülbül et al. (2009). In 2011, sunflower broomrape began to appear in cultivated area in Adana and increased rapidly until today (Figure 1, 3) .

MATERIALS AND METOD

Sunflower hybrids in the official registration trials which commercial sunflower hybrids belong private companies were tested against to new broomrape races in natural conditions between 2013-2014.

Broomrape observations were evaluated as Frequency (F) Intensity (I) and Attacking Rate (AR) based on Pustovoit method. The plants were accepted as resistant having % 0-10 Frequency and 0-1 AR values and (Vranceanu *et al.*, 1980). The plants had % 10-20 frequency as accepted tolerant .

$F = \% \text{ The number of plant with orobanche (The plant number infested orobanche / Total plants in the row x 100)}$

$I = \text{The number of orobanche in one infested plant (Total orobanche / Total plants infested orobanche in the row).}$

$AR = F \times I / 100 = \text{The number of orobanche in one plant in the row.}$



Figure 1. Broomraper in Adana Region in Turkey

RESULTS

High percentages of broomrape attack were registered in southeastern regions of Turkey during 2013 and 2014 growing seasons. According to 2013 observations, only sensitive varieties showed infection of broomrape (Table 1). In 2014 all plants in the set which contain official checks were susceptible or highly influenced and then We concluded that they could be new races (Table 2, Figure 2).

Table1. Broomrape observations in natural conditions				
No	Varieties	2013		
		Adana (Ceyhan)		
		F	I	SD
		%	(piece)	(piece)
1	Candidate 1	0.3	3.0	0.01
2	Candidate 2	7.9	3.42	0.27
3	Candidate 3	9.4	2.08	0.2
4	Candidate 4	9.4	2.43	0.23
5	Candidate 5	10.1	4.98	0.5
6	Candidate 6	11.1	3.66	0.41
7	Candidate 7	14.6	4.55	0.66
8	Candidate 8	15.8	2.94	0.46
9	Candidate 9	16.1	3.43	0.55
10	Candidate 10	17.1	2.3	0.39
11	Candidate 11	19.8	2.27	0.45
12	Candidate 12	21.2	3.17	0.67
13	Candidate 13	25.8	2.47	0.64
14	Candidate 14	29.2	7.47	2.18
15	Candidate 15	29.6	3.02	0.89
16	Candidate 16	30.8	4.53	1.4
17	Candidate 17	45.5	2.46	1.12
18	Candidate 18	57.9	3.1	1.79
19	Candidate 19	100	8.91	8.91
20	Candidate 20	100	10.23	10.23
21	Candidate 21	100	6.66	6.66
22	Candidate 22	100	8.45	8.45
23	Check1	1.5	3.33	0.05
24	Check2	1.8	1.86	0.03
25	Check3	2.8	3.73	0.1
26	Check4	11.0	2.0	0.22
27	Check5	24.8	2.4	0.6
28	Check6	35.4	3.64	1.29

Table2. Broomrape observations in natural conditions				
No	Varieties	2014		
		Adana (Sarıçam)		
		F	I	SD
		%	(piece)	(piece)
1	Candidate 1	18.0	1.35	0.24
2	Candidate 2	100	6.72	6.72
3	Candidate 3	78.4	1.22	0.96
4	Candidate 4	84.4	1.42	1.2
5	Candidate 5	100	2.11	2.11
6	Candidate 6	80.3	1.99	1.6
7	Candidate 7	100	12.43	12.43
8	Candidate 8	100	11.69	11.69
9	Candidate 9	100	8.11	8.11
10	Candidate 10	86.8	2.57	2.23
11	Candidate 11	100	3.91	3.91
12	Candidate 12	86.8	6.94	6.02
13	Candidate 13	100	6.25	6.25
14	Candidate 14	100	4.12	4.12
15	Candidate 15	100	11.98	11.98
16	Candidate 16	100	15.8	15.8
17	Candidate 17	100	8.08	8.08
18	Candidate 18	90.2	4.38	3.95
19	Candidate 19	100	10.86	10.86
20	Candidate 20	98.5	12.19	12.01
21	Candidate 21	100	11.55	11.55
22	Candidate 22	100	15.33	15.33
23	Check1	49.8	1.39	0.69
24	Check2	100	1.52	1.52
25	Check3	45.1	2.24	1.01
26	Check4	100	10.41	10.41
27	Check5	100	8.0	8.0
28	Check6	100	2.84	2.84

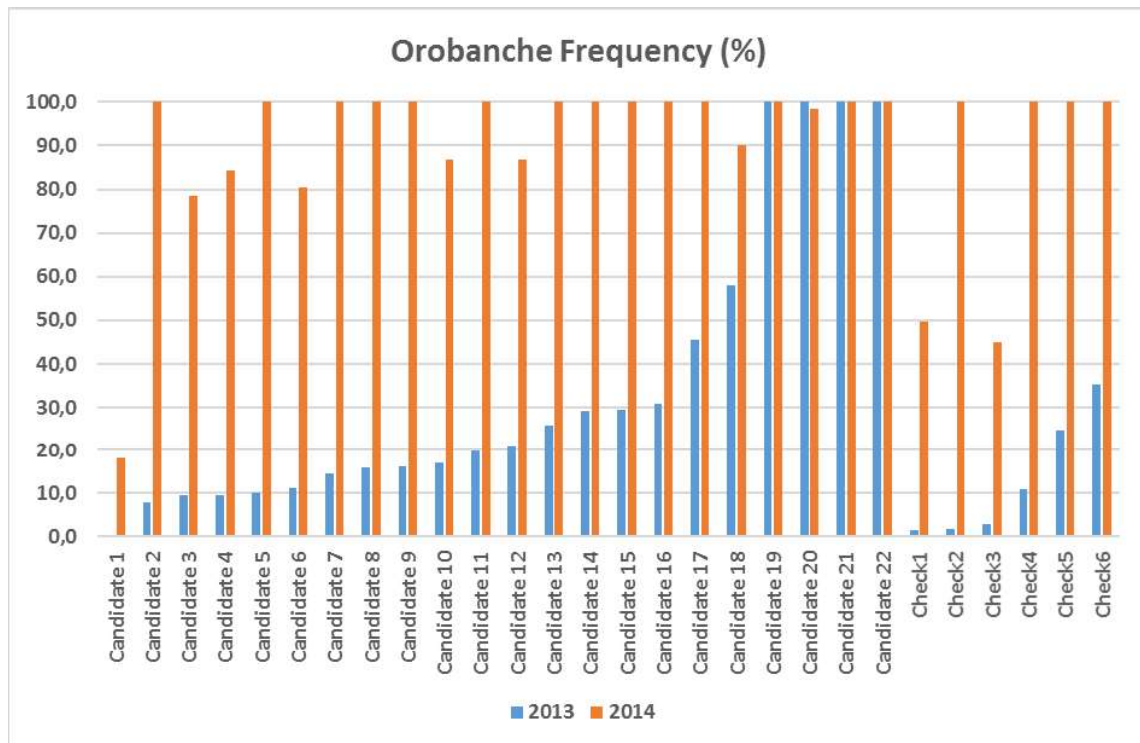


Figure 2: Broomrape density and frequency in trials



Figure 3: Broomrape in the fields.

CONCLUSIONS

In recent years, the parasite *Orobanche sp.* has developed new and virulent populations, in the sunflower crop in Europe, including Turkey.

Based on this research results and natural condition observations show that infested new broomrape races areas are increasing seriously year by year in the mediterranean region.

Control of this parasite remains extremely difficult, as thousands of tiny seeds produced by one single broomrape plant can be easily dispersed by wind, water, animals, humans, machinery or attached to sunflower seeds. Broomrape seeds may remain viable for 15-20 years and will only germinate in the presence of the host plant (Škorić, 1988).

As a result it will be required of new sources genetic resistance to the most virulent races or herbicide resistant hybrids for this region.

LITERATURE

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