

Identification of broomrape (*Orobanche Cumana Wallr.*) biotypes in sunflower main growing areas of China

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Introduction

- In 1959, the sunflower broomrape was first discovered in Zhaozhou County, Heilongjiang Province in China.
- The planted acreage of sunflower in the main sunflower production area is about 1.3 million acres in 2017.
- More broomrape race progressed from A to G in recent years.



- The infected sunflower plants are seriously deprived of nutrition resulting in weaker plants with smaller head diameters and up to an 80% yield loss.



Main sunflower production areas in China of broomrape collection



- In the largest and most concentrated area of sunflower cultivation, Bayannaouer of Inner Mongolia, broomrape has infected up to 33,250 acres out of 417,000 acres with a parasitic rate as high as 90% resulting in yield losses of 30 to 45%.



- Monitoring the broomrape race composition in each area using bulk samples to identify the highest race(s) present will not only provide information about race dynamics and competition, but will also serve as guidelines for breeding resistant sunflower hybrids.

Materials and Methods

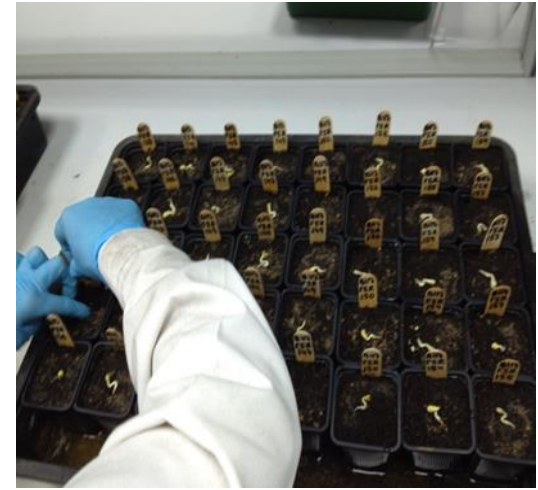
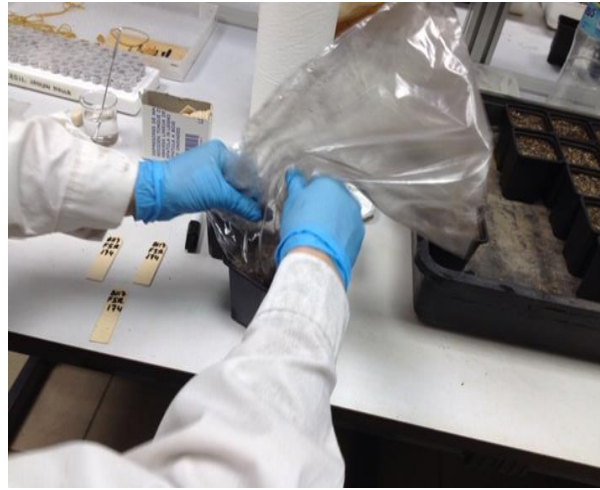
➤ Broomrape seed sampling

- a. Bulk samples from 55 and 44 fields were collected in 2014 and 2016 in Inner Mongolia, Xinjiang, Gansu and Heilongjiang.
- b. 60 single plant samples were collected in every representative field in 2017 in Inner Mongolia, Gansu, and Xinjiang. Samples from three fields were evaluated in 2018.

➤ **Differential lines resistant to specific broomrape races**

71NCA101(**A**), J8281(**B**), 1532(**C**), S1358(**D**), NR5(**E**), P96(**F**)
and B117 (**universal susceptible line**).





Results

Table 1. The highest broomrape races in major Chinese sunflower growing areas in 2014 and 2016.

Region	Year	Broomrape Races						
		Race A	Race B	Race C	Race D	Race E	Race F	Race G
Inner Mongolia	2014	0	0	0	1	2	16	0
	2016	0	0	0	0	0	26	3
Xinjiang	2014	0	2	5	8	11	5	0
	2016	0	0	0	1	3	6	0
Gansu	2014	0	0	0	0	0	2	0
	2016	0	0	0	0	3	0	0
Heilongjiang	2014	0	0	0	0	0	3	0
	2016	0	0	0	0	0	2	0
Total		0	2	5	10	19	60	3

Table 2. Proportion of broomrape races in major Chinese sunflower growing areas in 2014 and 2016.

Region	Year	Broomrape Race (%)						
		Race A	Race B	Race C	Race D	Race E	Race F	Race G
Inner Mongolia	2014	0	0	0	5	10	85	0
	2016	0	0	0	0	0	90	10
Xinjiang	2014	0	6	16	26	36	16	0
	2016	0	0	0	10	30	60	0
Gansu	2014	0	0	0	0	0	100	0
	2016	0	0	0	0	100	0	0
Heilongjiang	2014	0	0	0	0	0	100	0
	2016	0	0	0	0	0	100	0
Total		0	0.75	2	5	22	69	1.25

Table 3. The number of broomrape samples from Inner Mongolia, Gansu, and Xinjiang infecting the differential lines resistant to specific broomrape races in 2017.

Location	Broomrape Races							Total sample
	Race A	Race B	Race C	Race D	Race E	Race F	Race G	
Inner Mongolia	0	0	0	1	4	11	0	16
Gansu	0	0	0	3	12	1	0	16
Xinjiang	0	0	2	5	4	4	0	15
Total	0	0	2	9	20	16	0	47

Discussion

- The presence and increase of more virulent broomrape in major sunflower production areas could be caused by seeds contaminated with higher level races and the continuous cropping of the same fields.
- Differential lines resistance to Race G.

- Comparing the results of 2014 and 2016, without any obvious selection pressure from resistant hybrids, a general trend moving toward higher levels of broomrape races was obvious.
- We expect a greater increase of Race G or higher races in China as Races E and F resistant hybrids are developed and widely used in production.
- Continue collecting and monitoring of race shift in China, and the race composition of individual fields.

- Need strict quarantine procedure to prevent foreign new virulent broomrape races from entering China.
- Evaluate wild *Helianthus* species for new resistance sources.
- Focus on the development of hybrids resistant to race G and higher utilising wild *Helianthus* species.
- Efficient utilization of wild germplasms critical for future success of sunflower battling this most damaging parasitic weed.

Acknowledgments

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