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Is there appearance of new broomrape race in Serbia?

Stevan Maširević., Sladjana Medić-Pap, Dragan Škorić

University of Novi Sad, Faculty of Agriculture

Trg Dositeja Obradovića 8, Novi Sad

email: stevanm@polj.uns.ac.rs

ABSTRACT

- Broomrape in sunflower fields in Serbia has been appearing with varying intensity almost every year. Yield losses depend on intensity of attack and they can range from 5 to 100 %. According to previous investigations of broomrape population in Serbia, race E is dominant. During 2011 in several regions in Vojvodina (North part of Serbia) broomrape appearance on some sunflower hybrids which have resistance to races A-E was noticed. This phenomenon indicates the possibility of changes in broomrape population in our country.
- In order to determinate changes in races, broomrape seeds were collected from the points (fields) where the attack in hybrids resistant to races A-E was noticed. Seed samples were kept in the fridge on +4°C due to break dormancy. The reaction of some differential lines to the collected broomrape population was investigated in the green-house. Seed of differential lines were sown in plastic tubes in mixture of sand and perlite. Before sowing of sunflower seeds, broomrape seeds were put in tubes together with roots of susceptible sunflower genotype. The susceptibility or resistance of these lines to collected broomrape population was evaluated on the basis of presence of tubercles on sunflower roots.
- Presence of broomrape on hybrids resistant to race E was noticed primarily at points where for many years the sunflower hybrids resistance to races A-E has been tested. On those experimental fields sunflower has been cultivated every second year and that frequency of cultivation leads to inoculum increasing and higher selection pressure of broomrape to cultivated plant. Results obtained from the experiments in the green-house also indicate that there are some changes in broomrape population.
- It should be pointed out that on resistant hybrids, intensity of broomrape attack was low and could not significantly influence the yield. On the other hand in scientific and professional meaning this is very important because the first appearance of broomrape plants with changed racial composition could be possibly an introduction into new period of its expansion and increasing of damages caused by this parasitic plant.
- These findings and observations are very important because of high practical importance of this parasitic plant and the fact that grown hybrids have low resistance level to new races. Another question is opened: Is this possibly new broomrape race present in Serbia identical to the new races present in Romania, Turkey or Spain or in some other regions in the world where this parasitic plant exists? The main problem is that other races except A-E are not determined strictly. The next step is establishment of differential lines for separation of races 6, 7 etc., and on that way the results of scientist from different countries could be comparable.

Key words: new race, Orobanche, Serbia, sunflower

INTRODUCTION

Broomrape in Serbia for the first time was described in 1951. Since that period it has been appearing with varying intensity almost every year but since the 1990s broomrape has been causing significant damage in susceptible hybrids (Gulya et al., 1997, Maširević 2002). Yield losses depend on intensity of attack and they can range from 5 to 100 %. In addition to this pest's huge infectious potential and long viability of seed in the soil, another great problem is caused by the heterogeneity of its population i.e. by the existence of multiple physiological races, each specific to a particular sunflower region. The appearance of new broomrape races have been reported in recent years in other countries: Spain, Turkey, Romania, Bulgaria, Russia (Melero-Vara et al., 2000; Kaya et al., 2004; Molinero-Ruiz and Melero-Vara, 2005; Fernandez Escobar et al., 2008; Schindrova, 2006, Păcureanu-Joita et al., 2008, Antonova et al., 2009, Škorić et al., 2010). According to previous investigations of broomrape population in Serbia, race E is dominant (Maširević and Medić-Pap, 2009). During 2011 in several regions in Vojvodina (North part of Serbia) broomrape appearance on some sunflower hybrids which have resistance to races A-E was noticed. This phenomenon indicates the possibility of changes in broomrape population in our country. The aim of this paper is to test the racial composition of collected broomrape population.

The question also is: Where are the new race(s) coming from?

MATERIAL AND METHODS

Broomrape seeds were collected from the points (fields) where the attack in hybrids resistant to races A-E was noticed. The first sample originates from locality Sombor and the second one from the locality Sivac (Northwestern part of the Serbia). These localities are known to be one of the main foci of broomrape distribution. After collection from the mature plants, seed samples were kept in the fridge on +4°C due to break dormancy.

In the experiment followed differential lines and hybrids were used: PRA 71, PRG 45, LG-5588, KRUGLIK, FAVORIT, DANIEL, RECORD, LC-1093, RO-B-5A, BAČVANIN, VELJA, and DL 1002A. The reaction of some differential lines to the collected broomrape population was investigated in the climate chamber at continuous light and on 26°C.

Seed of differential lines were sown in plastic tubes in mixture of sand, soil and perlite. Broomrape seeds were placed in tubes together with roots of susceptible sunflower genotype and distributed in the upper third of the tube (Figure 1 and 2). This method showed up as efficient in previous investigations (Masirević et al., 2011). Two sunflower seeds were sown in each pot in 4 replicates for locality Sombor and in 3 replicates for locality Sivac. The pots were watered when the upper third of the soil mixture became dry. After 75 days, the plants were taken out from the tubes, their roots rinsed with water and the number of developed broomrape tubercles and plants on the roots counted. The susceptibility or resistance of these lines to collected broomrape population was evaluated on the basis of presence of well developed tubercles on sunflower roots. Traces of degenerate and dead broomrape tubercles on sunflower roots were also counted by stereomicroscope.



Fig 1 and 2 Broomrape seeds were placed in tubes together with roots of susceptible sunflower genotype and distributed in the upper third of the tube

RESULTS AND DISSCUSION

Presence of broomrape on hybrids resistant to race E was noticed primarily at points where for many years the sunflower hybrids resistance to races A-E has been tested. On those experimental fields sunflower has been cultivated every second year and that frequency of cultivation leads to inoculum increasing and higher selection pressure of broomrape to cultivated plants. It should be pointed out that on hybrids resistant to race E, intensity of broomrape attack was low and could not significantly influence the yield. However some information we received from other localities coming from different regions about broomrape attacks on sunflower hybrids which should be resistant to dominant race E. These attacks were noticed in production conditions. On the other hand in scientific and professional meaning this is very important because the first appearance of broomrape plants with changed racial composition could be possibly an introduction into new period of its expansion and increasing of damages caused by this parasitic plant. According to our investigation and findings, it can be suspected that the new race was introduced together with infested sunflower seed.

The results obtained from the experiments in the green-house also indicate that there are some changes in broomrape population (Table 1). Some differential lines and genotypes which have resistance to race E, F and G were sensitive to the broomrape population collected in Sombor and Sivac. The sensitive at both localities were, Favorit, RO-B-54A (Or6) and Daniel (A-F). To the broomrape population from Sombor we found sensitive plants in Bacvanin (Or5), PRG 45 and LC 1093A (Or6). Kruglik, Record and Velja were used as sensitive controls and the plants of these genotypes were sensitive to the broomrape population from both localities. Genotypes PRA71 and LG-5588 were resistant to the collected broomrape population.

Table 1 The infestation degree of sunflower differential lines and hybrids by broomrape of two tested populations

Differential line	Resistant to broomrape races	Population of broomrape			
		Sombor		Sivac	
		number of infested plants (%)	infestation degree a number of tubercles per plant infested	number of infested plants (%)	infestation degree a number of tubercles per plant infested
KRUGLIK	Or1	50	3	12.5	1
RECORD	Or3	77.8	2.71	100	3
VELJA	Or4	100	10*	66.7	6
DL 1002 LC	DL za rasu D	20	1.5	0	0
BAČVANIN	Or5	66.7	2*	0	0
PRA 71	Or6+	0	0	0	0
PRG 45	Or6+	22	1	0	0
LG-5588	Or6+	0	0	0	0
FAVORIT	A-F	37.5	2.33	12.5	1
LC-1093A	Or6	10	3	0	0
RO-B-54A	Or6	16.7	1	33.3	1
DANIEL	A-G	66,7	4,5	25.0	2

*developed broomrape plants

According to the obtained results it can be concluded that the change of racial composition of broomrape in Serbia at both localities is present. Appearance of new race of broomrape in Serbia indicates that Or6 gen is not enough for resistance of sunflower hybrids to be grown in infested production areas. In the coming period the hybrids which are resistant to Orobanche race 6 should be created and introduced in wide production. These investigations will be continued and expanded to the other genotypes which poses resistance to race 6 and 7.

These findings and observations are very important because of high practical importance of this parasitic plant and the fact that grown hybrids have low resistance level to new races. Another question is opened: Is this possibly new broomrape race present in Serbia identical to the new races present in Romania, Turkey, Russia or Spain or in some other regions in the world where this parasitic plant exists? The main problem is that other races except A-E are not determined strictly. The next step is

establishment of differential lines for separation of races 6, 7 etc., and on that way the results of scientist from different countries could be comparable.

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