RACES OF PLASMOPARA HALSTEDII IN CENTRAL EUROPE AND THEIR METALAXYL SENSITIVITY

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SUMMARY

Currently eight races of Plasmopara halstedii have been identified in North America and a few of them confirmed also in Europe. In this study, we report the occurrence of new races in Hungary and Yugoslavia coupled with data on their sensitivity to metalaxyl seed treatment.

INTRODUCTION

Plasmopara halstedii (Farl.) Berl. & de Toni (PH), the causal agent of downy mildew of sunflower is a destructive pathogen worldwide. Until recently eight races of PH have been identified in North America (2,5), whereas races 1, 3, 4 and 6 have been confirmed from Europe (5,6,7,9).

Seed treatment with the fungicide APRON (35 % metalaxyl a.i.) is currently used by seed producers to protect sunflower from downy mildew. Although metalaxyl is extremely effective, tolerance to this compound may develop within PH populations (8).

In this study, it was aimed at documenting the racial diversity of PH existing in Hungary and the northern part of Yugoslavia, and to examine the relative sensitivity to metalaxyl of selected PH isolates from this area. Some preliminary results have already been published (6).

MATERIAL AND METHODS

Collection and preservation of PH isolates. Individual infected sunflower plants with sporulation were collected from different locations in Hungary and the Voivodina area of Yugoslavia (Fig. 1) during the last 10 years. Sporangia from each plant were used to inoculate mildew suscepts (cvs. GK-70 or IS-003) to save and increase the isolates separately prior to preservation at low temperature (4,10).

Race identification. Frozen sporangia were allowed to thaw and then increased on a general suscept cultivar to produce fresh inoculum. A series of sunflower differentials were inoculated using the WSI method (1,3,5). Sixty to 100 seedlings of each genotype were inoculated in each test and all tests were repeated at least twice. Susceptibility of a

particular differential was determined by the presence of sporulation on the plants 10-12 days from inoculation.

Metalaxyl sensitivity test. For this, the soil drenching method was used (6). Pre-treated seed of IS-003 was planted in sand/perlite, and the soil drenched with PH inoculum on the third and fourth days after planting. Seedlings were evaluated for mildew infection two weeks later.

RESULTS

Most of the isolates collected in Hungary prior to 1989 and in Yugoslavia prior to 1990 were confirmed as race 1 (Table 1). Two Hungarian isolates dating back to 1982, however, were identified as race 3 and one isolate as race 4. Additionally, three isolates collected in 1989 and 1990 were identified as race 3, and one isolate as race 4. There were two further isolates that appeared to be race 7. One of the isolates from Yugoslavia collected after 1990 was re-confirmed as race 4. In 4 out of 23 locations sampled, more than one race was found coming from the same field, and in a few cases samples appeared to be race mixtures.

No tolerance to metalaxyl could be shown among the mildew isolates tested (Table 2). When treated the seed with very low dosages of APRON, 2 ppm discriminated the metalaxyl sensitivity better than 1 ppm. Furthermore, isolates H-1 and H-22 appeared somewhat metalaxyl tolerant, based on the highest % adjusted infection on 1 and 2 ppm treated seed. There was no apparent relationship between metalaxyl sensitivity and either the origin (time and location) of the isolate or race.

CONCLUSIONS

The relatively low number of PH isolates examined to date (Fig. 1) do not allow us to say what races other than race 1 are also prevalent in either Hungary or Yugoslavia. However, it is apparent that, like in other European countries, local PH populations of this region have been diversified with new races arising indigenously, rather than being imported from elsewhere. In fact, mildew race evolution has been speeded up over the years both in America and Europe (2,5,6,8), the reason of which is not yet clearly understood.

Since the labelled rate of metalaxyl in the practice is significantly higher than the rates used in this study, it is assumed that, while isolates with different levels of metalaxyl sensitivity were detected, none will tolerate the rates at which seeds are commercially treated.

Table 1
Results of race identification tests with Hungarian and Yugoslav Plasmopara halstedii isolates

Isolate	Origin	Race
Hungary		
H-1	1976-80	1
H-13	1982	1
H-18	1982	1
H-19	1982	3
H-20	1982	1
H-22	1982	3
H-27	1982	1
H-29	1982	4
H-30	1982	1
H-31	1983	1
H-33	1983	1
H-34	1984	1
H-36	1984	1
H-42	1985	1
H-44	1985	1
H-46	1987	1
H-47	1988	1
H-49	1988	1
H-50	1989	4
H-61	1989	7
H-65	1989	3
H-78	1990	7
H-79	1990	1
H-80	1990	3
H-81	1990	1
H-82	1990	3
H-83	1990	1
H-84	1990	1
H-85	1990	1
Yugoslavia		
NS-2	1989	1
NS-901	1990	1
NS-902	1990	1
NS-911	1991	1
NS-912	1991	4

Table 2

Relative sensitivity to metalaxyl of Plasmopara halstedii isolates tested in a seed-treatment soil-drenching system

Isolate	% infection relative to non-treated control				
	0 ppm	1 ppm	2 ppm	100 ppm	Average (1+2 ppm)
H-1	100	100	59	0	80
H-19	100	84	32	0	58
H-22	100	79	64	0	72
H-31	100	84	34	0	59
H-49	100	56	29	0	43
H-50	100	65	38	0	52
1/11/19/7	100	68	40	0	54

Figure 1

Plasmopara halstedii sampling sites (1976-1991)

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