

RACES OF *COLLETOTRICHUM LINDEMUTHIANUM* IN RHODOPPI MOUNTAINS, BULGARIA AND LANDRACES RESISTANCE

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Common bean (*Phaseolus vulgaris* L.) and runner bean (*P. coccineus* L.) are the most widespread crops in the Rhodoppi Mountains of Bulgaria. The landraces cultivated in this area are large seeded, with white or mottle seeds, climbing habit type and are usually grown in small-scale farms in mixture with maize and potato. The predominantly cold and humid conditions during the period of vegetation, the lack of crop rotation, and usage of seeds of own production favored the occurrence and development of anthracnose. Seven races of the causal agent of the anthracnose, *C. lindemuthianum* have been reported in Bulgaria since 2000 (Kiryakov, 2000; Kiryakov and Genchev, 2004). However, no information has been reported for race diversity of the bean anthracnose pathogen in Rhodoppi Mountains, except the existence of race 6 in the area of Smolyan (Kiryakov and Genchev, 2004). On the other hand, only local landraces are cultivated in this area and there is not information for their resistance to the pathogen races widespread. Study on the anthracnose race diversity will help to evaluate the resistance of the main landraces cultivated in this area with a view of selecting commercial cultivars. Thus, the objectives of this work were to study anthracnose race diversity in Rhodoppi Mountains and to evaluate the resistance of landraces to them.

MATERIALS AND METHODS

Thirty-four single-spore isolates were isolated from the pods and seeds with the anthracnose symptoms, which were collected during 2006 from 6 locations in Rhodoppi Mountains. The isolates were obtained from primary culture after dilution procedure on PDA and Mathur's medium. Seven-day old seedlings from the 12 standard differential cultivars (Pastor-Corrales, 1991) were inoculated by spraying spore suspension (10^6 spore/ml) from each isolate. The plants were placed in mist chamber for 72h in the greenhouse at 20-22/16-19°C day/night. The temperature was maintained the same after removing the chamber. Fifteen *P. vulgaris* and eight *P. coccineus* landraces were inoculated by an isolate of races determined in this study following the procedure described above. The landraces were collected from the area of Devin (altitude 710 m), Rakitovo (970 m), Smilyan (680 m), Konstantinovo (970 m), and Gella (1400 m) during 2006-2007. The coding of landraces was formed from the name of the location plus a number. The disease reaction of differential cultivars and landraces was scored 10 days after inoculation by a 9-degree scale (Genchev and Kiryakov, 2005). Score 1 to 3 meant a resistant phenotype in race determination.

RESULTS AND DISCUSSION

Four races were determined on the basis of the virulence of 34 single-spore isolates to the differential lines (Table 1). Race 22 were predominantly isolated (16 isolates) followed by race 6 (9 isolates), race 2 (6 isolates) and race 54 (3 isolates). All of the isolates had a virulent phenotype typical for the Andean-specific isolates of *C. lindemuthianum*. Races 22 and 54 were identified for the first time in Bulgaria, whereas race 6 was isolated previously from samples collected from the area of Smolyan. (Rhodoppi Mountains) and Radoil (Rila Mountain) in 2003 (Kiryakov and Genchev, 2004). Race 2 was isolated from the plant samples collected in 2000 from some locations in Pirin Mountain (Kiryakov, 2000).

The results obtained showed a lower diversity of the pathogen despite the higher diversity of the bean genotypes cultivated in each of the studied location. Only two pathotypes were obtained in the area of Devin (races 22 and 54), Grohotno (races 6 and 22) and Sedlarovtzi (races 22 and 6), and one pathotype in Rakitovo, Dospat (race 2) and Smilyan (race 6). Probably, regardless of higher phenotype diversity, the landraces cultivated in the Rhodoppi Mountains had the same or similar resistant spectrum.

Three out of 15 *P.vulgaris* landraces were highly resistant to races 2, 6, 22 and 54 – ‘Devin 11’, ‘Rakitovo 11’ and ‘Smilyan 27’. These landraces had white seeded coat color, type IVa stem habits and 1000 seed weight in the range of 300-500 g. All of the eight *P. coccineus* landraces, with the exception of two were highly resistant to the investigated races. The resistant landraces had white to motley seeds, climbing habit type (IVa) and 1000 seed weight 1050 to 1600 g. All of the highly resistant landraces from the two *Phaseolus* species were included in the DAI Bean Breeding Program for developing of commercial cultivars appropriate for cropping in the mountain areas in Bulgaria.

Table 1. Races identified on a differential set of 12 bean cultivars, among 34 isolates of *C. lindemuthianum* collected in six locations in Rhodoppi Mountains

Cultivar	Gene Pool	Resistance gene	Binary code	Race 54	Race 22	Race 6	Race 2
Michelite	MA	<i>Co -11</i>	1	R*	R	R	R
MDRK**	A	<i>Co -1</i>	2	S	S	S	S
Perry Marrow	A	<i>Co -1³</i>	4	S	S	S	R
Cornell 49-242	MA	<i>Co -2</i>	8	R	R	R	R
Widusa	A	<i>Co -1⁵</i>	16	S	S	R	R
Kaboon	A	<i>Co -1²</i>	32	S	R	R	R
Mexico 222	MA	<i>Co -3</i>	64	R	R	R	R
PI 207 262	MA	<i>Co -4³;Co-9</i>	128	R	R	R	R
TO	MA	<i>Co -4</i>	256	R	R	R	R
TU	MA	<i>Co -5</i>	512	R	R	R	R
AB 136	MA	<i>Co -6;co-8</i>	1024	R	R	R	R
G 2333	MA	<i>Co -4²;Co-5²;Co-7</i>	2048	R	R	R	R
Number of isolates				3	16	9	6

*R-resistant; S-susceptible; **Michigan Dark Red Kidney.

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