PPO – SPECIAL REPORT NO 16 – 2014, 237-238

Efficacy of various sources of resistance in protection of potato foliage and tubers against *Phytophthora infestans*

J. PLICH, B. TATAROWSKA, B. FLIS

Plant Breeding and Acclimatization Institute - National Research Institute, Młochów Research Centre

Efficacy of various sources of resistance in protection of potato foliage and tubers against *Phytophthora infestans*

J. Plich, B. Tatarowska, B. Flis
Plant Breeding and Acclimatization Institute - National Research Institute, Młochów Research Centre

***Phytophthora infestans* (Mont.) de Bary, the causal agent of potato late blight, can infect both foliar and tuber tissue. Although economic value of potato resides in its tubers, comparatively less effort is made in breeding for potato late blight resistance in tuber than in foliage. It is considered, that cultivars with a high level of foliage blight resistance show a good level of tuber blight resistance, however foliage resistance does not guarantee tuber resistance. Despite the abundance of major resistance genes introduced into potato cultivars, little is known about effectiveness of these genes in potato tubers. In many cases R genes which provide effective protection of potato foliage fail to function in the tubers.**

To compare effectiveness of various resistance sources in foliage and tubers protection cv. Sarpo Mira and two potato clones; Balck's differential R9 and 04-IX-4 were chosen. Resistance of cv. Sarpo Mira and clone R9 is based on presence of multiple R genes (respectively: *R3a, R3b, R4, Rpi-Smira1, Rpi-Smira2* (Rietman et al. 2012) and *R1, R2, R3a, R3b, R4, R8, R9* (Kim et al. 2012)). The resistance of clone 04-IX-4 is provided by single broad spectrum resistance gene (*Rpi-phu1*). This potato cultivar and clones proved to be highly resistant to *P. infestans* in field conditions (Fig. 1)

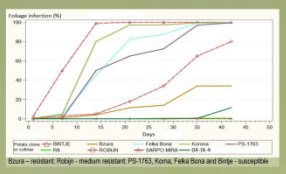


Fig. 1 Disease Progress Curve for cv. Sarpo Mira, clones R9, 04-IX-4 and standard potato cultivars/clones. Curves were ploted based on results of field trials from 2009.

Pic. 1
Sarpo Mira in field trial.

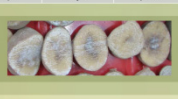
Clones R9, 04-IX-4 and cv. Sarpo Mira, as a donors of resistance, was crossed with susceptible potato cultivars. Among individuals from each progenies, five potato clones (outstanding in foliage resistance and in agronomic traits) were chosen for further evaluations. In 2011 and 2012 foliage and tuber resistance of donors and their selected progeny clones was assessed in detached leaflets and tuber slices tests (5 leaflets/slices in 2 replication, two times in each year). In both tests *P. infestans* isolate MP324 (race 1,2,3,4,5,6,7,10,11) was used for inoculation. The foliage resistance was also assessed in field trials in 2012.

	Leaflets test	Slices test	rAUDPC
Sarpo Mira	**8,7**	**6,0**	**0,013**
Purple × Sarpo Mira			
11-VIII-35	8,6	**3,8**	0,160
11-VIII-39	8,5	**4,5**	0,131
11-VIII-45	8,5	**6,0**	0,016
11-VIII-47	8,8	**3,5**	0,088
11-VIII-49	8,6	**4,2**	0,127

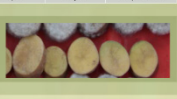
	Leaflets test	Slices test	rAUDPC
04-IX-4	**8,9**	**8,8**	**0,003**
Salad Blue × 04-IX-4			
11-VIII-52	9,0	**8,8**	0,006
11-VIII-56	8,8	**8,6**	0,044
11-VIII-58	8,9	**8,6**	0,043
11-VIII-59	9,0	**9,0**	0,013
11-VIII-62	8,8	**8,8**	0,024

	Leaflets test	Slices test	rAUDPC
R9	**9,0**	**6,4**	**0,000**
R9 × Felka Bona			
Bio-10	9,0	**4,1**	0,055
Bio-29	9,0	**1,6**	0,012
Bio-31	9,0	**2,4**	0,044
Bio-33	9,0	**3,5**	0,013
Bio-34	9,0	**5,8**	0,004

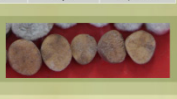
Pic. 2
Tuber slices test
cv Sarpo Mira



Pic. 3
Tuber slices test
clone 04-IX-4



Pic. 4
Tuber slices test
clone R9



All tested clones show high level of foliage resistance in filed and laboratory tests (Tab.1, 2, 3). Response of these clones for tuber inoculation was much more varied; clone R9, Sarpo Mira and their progeny clones show low and medium tuber resistance (scores range: 1,6 – 6,4). Clone 04-IX-4 and its progeny show extremely high tuber resistance; after inoculation with *P. infestans* no symptoms of infection was observed.

Resistance of cv. Sarpo Mira and clone R9 is based on presence of multiple R genes, but non of this genes proved to be effective in complete protection of tuber tissue. Although isolate MP324 was avirulent to *Rpi-Smira1* (and/or *Rpi-Smira2*) and *R9* (and/or *R8*) in detached leaflets test, these genes did not provide complete resistance of tuber tissue. Resistance of clone 04-IX-4 is provided by single resistance gene *Rpi-phu1*, which is effective in both foliar and tuber tissue.

Currently, ‚stacking' of broad spectrum R genes is one of the preferable solution in breeding against *P. infestans*. The use of foliage and tuber effective R genes can enhanced durability of foliage resistance and allows to avoid problems with tuber infections.

Kim et al. 2012. Broad spectrum late blight resistance in potato differential set plants MaR8 and MaR9 is conferred by multiple stacked R genes. TAG. 124(5):923-35.
Rietman et al. 2012. Qualitative and Quantitative Late Blight Resistance in the Potato Cultivar Sarpo Mira Is Determined by the Perception of Five Distinct RXLR Effectors. MPMI Vol. 25, No. 7 pp. 910–919