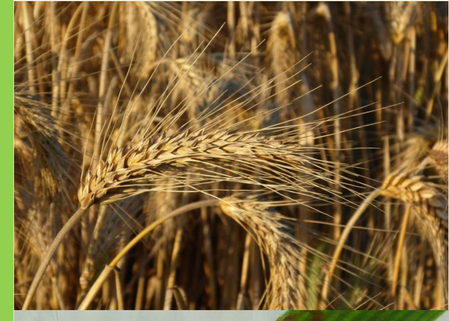
Virulence of *Puccinia triticina* on triticale in Poland



Grzegorz Czajowski* and Paweł Cz. Czembor

Plant Breeding and Acclimatization Institute - National Research Institute, Radzików, 05-870 Błonie, Poland

*** e-mail: *g.czajowski@ihar.edu.pl***

Introduction

Leaf rust, caused by the biotrophic fungus *Puccinia triticina* Eriks. is one of the most important fungal disease affecting triticale worldwide. This disease can cause serious epidemics and yield losses.

Aim of the research

The objective the present study was to characterize virulence of *Puccinia triticina* population from triticale in Poland.

Materials and methods

One hundred sixty isolates of *Puccinia triticina* were collected in the years 2014 – 2015 from susceptible triticale variety Marko in four locations in Poland. These isolates were analyzed for virulence variation on thirty five near isogenic Thatcher NILs with known *Lr* resistance genes. Virulence tests were conducted at seedling stage and infection types were scored according to the 0–4 infection type (IT) scoring system. IT in range 0-2 indicated isolate avirulence, and 3–4 virulence (fig. 1).

Results

Population of the pathogen revealed high virulence frequency, ranged from 80 to 100%, toward the majority of *L*r genes: *Lr2c, Lr10, Lr11, Lr14a, Lr14b, Lr18, Lr30, Lr33* and *Lr44* (tab. 1). The frequencies of virulence for lines with genes *Lr1, Lr2a, Lr3, Lr3bg, Lr15, Lr16, Lr17, Lr20, Lr23, Lr26, Lr28, Lr32, Lr36, Lr38* and *LrW* were low (1 – 30%). No virulence was found to resistance genes *Lr9, Lr19* and *Lr25*. Pathotypes *P. triticina* were identified with the use of informative 15 NILs possessing resistance genes *Lr1, Lr2a, Lr2b, Lr2c, Lr3, Lr9, Lr11, Lr15, Lr17, Lr19, Lr21, Lr23, Lr24, Lr26* and *Lr28* (Mesterhazy et al., 2000). Fifty seven pathotypes from one hundred sixty isolates *P. triticina* were distinguished. Only eight pathotypes were observed few times in the population (tab. 2)

0 1 0; 2 3 4

Figure 1. Infection types of *Puccinia triticina*

Table 1. Virulence frequency of *P. triticina* isolates collected from triticale

N.o.	Gene	Pedigree	Year	
			2014	2015
1	*Lr1*	Tc*6/Centenario	5,0	10,0
2	*Lr2a*	Tc*6/Webster	3,8	8,8
3	*Lr2b*	Tc*6/Carina	43,8	47,5
4	*Lr2c*	Tc*6/Loros	81,3	80,0
5	*Lr3*	Tc*6/Democrat	8,8	11,3
6	*Lr3bg*		8,8	10,0
7	*Lr3ka*		51,3	61,3
8	*Lr9*	Transfer/Tc*6 *Aegilops.umbellulata*	0,0	0,0
9	*Lr10*	Tc*6/Exchange	92,5	91,3
10	*Lr11*	Tc*2/Hussar	92,5	100,0
11	*Lr13*	Tc*6/Frontana	62,5	72,5
12	*Lr14a*	Selkirk/Tc*6	80,0	65,0
13	*Lr14b*	Tc*6/Mario Escobar	93,8	88,8
14	*Lr15*	Tc*6/W1483	28,8	22,5
15	*Lr16*	Tc*6/Exchange	16,3	16,3
16	*Lr17*	Klein Lucero/Tc*6	6,3	12,5
17	*Lr18*	Tc*7/Afrika 43	95,0	100,0
18	*Lr19*	Tc*7 Transloc.4-*Agropyron elongatum*	0,0	0,0
19	*Lr20*	Tc*6/Jimmer	28,8	17,5
20	*Lr21*	Tc*6RL5406 Ae. squarrosa v.mayeri	60,0	60,0
21	*Lr23*	Lee 310/Tc*6	1,3	2,5
22	*Lr24*	Tc*6/Agent *Agropyron elongatum*	48,8	66,3
23	*Lr25*	Tc*6/Transec *Secale cereale*	0,0	0,0
24	*Lr26*	Tc*6/St-1-25	5,0	8,8
25	*Lr27+31*		38,8	22,5
26	*Lr28*	Tc*6/C-77-1 *Aegilops speltoides*	0,0	15,0
27	*Lr29*	Tc*6/CS7D-Ag + 11 *A.elongatum*	61,3	38,8
28	*Lr30*	Tc*6/Terenzio	82,5	83,8
29	*Lr32*	Tc*6/3/ *Aegilops squarrosa*	28,8	23,8
30	*Lr33*	Tc*6/PI 58548-1	91,3	100,0
31	*Lr36*		8,8	21,3
32	*Lr38*	Tc*6/TMR-514-12-24	11,3	27,5
33	*Lr44*	Tc*6/*Triticum spelta*	90,0	71,3
34	*LrB*	Tc*6/PI 268316	36,3	16,3
35	*LrW*	Tc*6/V336	12,5	2,5
36	Thatcher	Susceptible control	100,0	100,0
Number of isolates			80	80

Table 2. Prevalent *P. triticina* pathotypes identified among isolates collected from triticale in the years 2014-2015 [%].

Pathotype	Virulence	Year	
		2014	2015
01100	*Lr2c, Lr11*	5	5
01101	*Lr2c, Lr11, Lr24*	3,8	7,5
01120	*Lr2c, Lr11. Lr21*	8,8	5
01121	*Lr2c, Lr11. Lr21, Lr24*	8,8	5
41101	*Lr2b, Lr2c, Lr11, Lr24*	6,3	5
41121	*Lr2b, Lr2c, Lr11. Lr21, Lr24*	6,3	13,8
41125	*Lr2b, Lr2c, Lr11. Lr21, Lr24, Lr28*	0	6,3
41321	*Lr2b, Lr2c, Lr11, Lr15, Lr21, Lr24*	6,3	6,3

References

Mesterhazy A., Bartos P., Goyeau H., Niks E.R., Csosz M., Andersen O., Casulli F., Ittu M., Jones E., Manisterski J., Manninger K., Pasquini M., Rubiales D., Schachermayr G., Strzembicka A., Szunics I., Todorova M., Unger O., Vanco B., Vida G., Walther U. 2000. European virulence survey for leaf rust in wheat. Agronomie 20: 793 — 804.

Acknowledgements

Authors would like to acknowledge the financial support of The Long-term Research Program 2015-2020 (Polish Ministry of Agriculture and Rural Development): Basic Research for Biological Progress and Preservation of Plant Genetic Resources as a Source of Innovation and Support for Sustainable Agriculture and National Food Security; task 3.2: Monitoring changes in pathogenicity of the cereal biotrophic pathogens.