

LEAF RUST OF WHEAT IN CANADA IN 1969¹

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Disease development and crop losses in Western Canada

Leaf rust was first found in Manitoba on July 9, which is about 2 weeks later than usual. The presence of resistant varieties further delayed rust development and none of the crop was damaged in western Manitoba and Saskatchewan. Late fields in central and eastern Manitoba probably suffered some yield loss but this would not exceed 2 to 3 bushels/acre.

Leaf rust in the rust nurseries

Ratings of leaf rust intensity on 15 wheat varieties grown at nurseries across Canada are shown in Table 1. Leaf rust was widely distributed in Canada but infections were severe only in Manitoba and at a few locations in Ontario. A trace of leaf rust was recorded on 'Frontana' in Manitoba but the infections were of a resistant or moderately resistant type.

Physiologic specialization

In 1969, eight single gene backcross lines were used to study physiologic specialization in leaf rust. These lines contain most of the genes present in earlier sets of differential varieties. In addition, these lines contain all the important genes for seedling resistance in commercial varieties grown in the Prairie Provinces. The distribution of virulence on the individual single gene lines is shown in Table 2. A majority of the isolates were virulent on gene Lr3. Compared to 1968, there was a marked drop in the number of isolates virulent on genes Lr10 and Lr16.

Fifteen virulence combinations were obtained in 1969 (Table 3). The majority of isolates were virulent on only gene Lr3 or on genes Lr3 and Lr10.

The commercial variety 'Manitou' is susceptible to leaf rust in the seeding stage but adult plants are resistant in the field. This adult plant resistance is conditioned by gene Lr13 which was derived from 'Frontana'. The resistance is poorly expressed in the greenhouse, and variable results are obtained when tests are carried out at different times of the year. Twenty-eight cultures obtained from Manitoba in 1968 were tested on adult plants of 'Manitou' during the winter and spring of 1968-69, and two cultures were virulent on adult plants in each test. This is the first indication of virulence in the North American leaf rust population to adult plant resistance derived from 'Frontana'. However, this resistance is probably still reasonably effective under field conditions.

Composite collections of leaf rust were used to inoculate the highly resistant varieties 'Agatha', 'Transfer', 'Klein Lucero', 'Aniversario', 'Wanken', 'Maria Escobar', 'Rio Negro', 'El Gaucho', 'Terenzio', 'Preska', 'Timpaw', and 'Norteno 67'. Susceptible-type pustules were obtained on 'Maria Escobar', 'Rio Negro', 'Terenzio' and 'Norteno 67'. A comparison of the pattern of rust reactions on 'Norteno 67' and the single-gene lines indicated that 'Norteno 67' possesses genes Lr1 and Lr2.

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Table 1. Percentage infection by *Puccinia recondita* on 15 wheat varieties in uniform rust nurseries at 27 locations in Canada in 1969

Location	Lee	Pitic 62	Selkirk	Red Bobs	Manitou	D. T. 316	Kenya Farmer	R. L. 5404	R. L. 5406	Mindum	Stewart 63	Tc6 x Transfer Exchange	Frontana	D. T. 191
Agassiz, B. C.	0	0	0	tr*	0	0	0	0	0	0	0	0	0	0
Creston, B. C.	10	20	40	90	0	40	10	40	50	1	15	0	0	30
Edmonton, Alta.	0	0	tr	tr	0	0	0	0	0	0	0	0	0	0
Lacombe, Alta.	3	0	3	10	0	0	3	0	0	0	0	0	0	0
Lethbridge, Alta.	2	tr	0	5	0	0	tr	tr	tr	0	0	0	0	0
Indian Head, Sask.	tr	tr	tr	3	0	0	tr	0	0	0	0	0	0	0
Scott, Sask.	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Melfort, Sask.	tr	tr	tr	5	0	0	tr	0	0	0	0	0	0	0
Brandon, Man.	60	50	35	90	5	45	60	30	10	0	0	0	tr	tr
Morden, Man.	70	60	40	100	15	60	60	40	10	0	0	0	tr	2
Glenlea, Man.	50	30	30	90	7	10	50	3	1	tr	tr	0	0	tr
Williamstown, Ont.	15	15	0	50	0	0	20	tr	0	0	0	0	0	tr
Douglas, Ont.	tr	0	0	40	0	0	0	tr	0	0	0	0	0	0
Alfred, Ont.	10	0	10	25	tr	10	15	tr	0	0	tr	0	0	10
Kapuskasing	30	15	40	65	5	tr	35	0	0	0	0	0	0	tr
Fort William, Ont.	2	tr	tr	40	0	0	tr	0	2	5	tr	0	0	0
Ottawa, Ont.	tr	0	0	10	0	tr	tr	0	0	0	0	0	0	0
Appleton, Ont.	tr	tr	tr	10	tr	tr	tr	tr	tr	0	0	0	0	0
Morewood, Ont.	10	tr	tr	40	tr	tr	10	0	0	0	0	0	0	0
Vineland, Ont.	30	20	10	80	10	20	20	5	5	0	0	0	0	2
La Pocaticre, Que.	1	0	tr	25	0	tr	3	0	0	0	0	0	0	0
Macdonald College, Que.	0	0	tr	35	0	tr	tr	0	0	0	0	0	0	tr
Lennoxville, Que.	0	0	0	5	0	tr	0	0	0	0	0	0	0	0
L'Assomption, Que.	0	0	0	tr	0	0	0	0	0	0	0	0	0	0
Normandin, Que.	tr	0	0	10	0	tr	0	tr	0	0	0	0	0	0
Kentville, N. S.	0	0	0	tr	0	0	0	0	0	0	0	0	0	0
Truro, N.S.	0	0	0	20	0	0	tr	0	0	0	0	0	0	0

* tr = trace

Table 2. Virulence of isolates of *Puccinia recondita* on back-cross lines containing single genes for resistance to leaf rust in Canada in 1969

Resistance genes	No. of isolates from:				Total no. of virulent isolates	% total isolates
	Ont. & Que.	Man.	Sask.	B. C. & Alta.		
<u>Lr1</u>	0	2	0	0	2	1.4
<u>Lr2</u>	0	1	0	0	1	0.7
<u>Lr2D</u>	10	3	5	8	26	18.3
<u>Lr3</u>	14	81	32	6	133	93.3
<u>Lr10</u>	14	24	20	8	66	46.4
<u>Lr16</u>	0	3	1	0	4	2.8
<u>Lr17</u>	0	2	2	2	6	4.2
<u>Lr18</u>	6	20	3	0	29	20.4

Table 3. Virulence combinations of *Puccinia recondita* isolates on back-cross lines containing single genes for resistance to leaf rust in Canada in 1969

Virulence formula (effective/ineffective host genes)	No. of isolates from:				Total no. of isolates
	Que. & Ont.	Man.	Sask.	Alta. & B. C.	
1, 2, 2D, 10, 16, 17, 18/3	1	46	13	0	60
1, 2, 2D, 16, 17, 18/3, 10	6	13	14	0	33
1, 2, 2D, 10, 16, 17/3, 18	1	9	1	0	11
1, 2, 3, 10, 16, 17, 18/2D	1	0	0	0	1
1, 2, 3, 16, 17, 18/2D, 10	1	1	1	1	4
1, 2, 10, 16, 17, 18/2D, 3	1	0	0	0	1
1, 2, 2D, 16, 17/3, 10, 18	0	8	1	0	9
1, 2, 2D, 17, 18/3, 10, 16	0	2	0	0	2
1, 2, 16, 17, 18/2D, 3, 10	2	0	1	0	3
1, 2, 3, 16, 17/2D, 10, 18	2	0	1	1	4
1, 2, 16, 18/2D, 3, 10, 17	0	0	2	6	8
1, 2, 16, 17/2D, 3, 10, 18	3	0	0	0	3
1, 2, 2D, 17/3, 10, 16, 18	0	1	0	0	1
2, 10, 16/1, 2D, 3, 17, 18	0	1	0	0	1
10, 16/1, 2, 2D, 3, 17, 18	0	1	0	0	1