LEAF RUST OF WHEAT IN CANADA IN 1968[1]

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Disease development and crop losses in Western Canada

Trace amounts of leaf rust were present throughout southern Manitoba on June 12 which is a normal level of leaf rust infection for this area. However, further development was very slow and infections wrre still light in the middle of August. The cool, wet weathrr delayed maturity of the crop and allowed considerablr development of leaf rust in late fields, where some damage may have resulted. The majority of the wheat crop was not damaged by leaf rust in 1968.

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. Nurseries where no leaf rust occurred or where rust intensity could not be estimated are omitted from this table. The reaction of the varieties is very similar to that observedin former years with little or no leaf rust on 'Manitou', 'Exchange', and 'Frontana'.

Table 1. Prrcentage infection by Puccinia recondita on 17 wheat varieties in uniform rust nurseries at 22 locations in Canada in 1968

Locality	Lee	Thatcher	Selkirk	Red Bobs	Manitou	Marquis	Kenya Farmer	McMurachy	Ramsey	Mindum	Stewart 63	D. T. 184	Thatcher 6x Transfer	Exchange	Frontana	D. T. 191	Noroeste 66
Agassiz, B.C.	5	50	50	50	1	40	2	5	0	0	0	0	0	0	0	0	tr*
Creston, B.C.	20	70	15	70	2	60	*2*	*7*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0
Lacombe, Alta.	0	0	0	tr	0	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*	0	0	0	0
Lethbridge, Alta.	5	20	*3*	20	tr	20	5	2	0	0	0	0	0	0	0	0	0
Indian Head, Sask.	0	tr	*0*	tr	0	tr	0	tr	0	0	0	0	0	0	0	0	0
Melfort, Sask.	15	15	15	25	0	20	1	5	0	0	0	0	0	0	0	0	0
Morden, Man.	40	60	*30*	70	10	40	5	6	0	0	0	0	0	*0*	*0*	*0*	*0*
Winnipeg, Man.	50	80	70	*80*	5	80	*3*	*8*	*0*	*0*	*0*	*0*	*0*	0	0	0	0
Glenlea, Man.	30	80	60	60	10	60	6	7	0	0	0	0	0	*0*	*0*	0	0
Verner, Cnt.	2	60	tr	60	tr	50	2	6	0	0	0	0	0	0	0	0	0
Williamstown, Ont.	15	50	10	60	tr	50	1	6	0	0	0	0	0	0	0	0	tr
Douglas, Ont.	0	3	0	5	0	3	0	2	0	0	0	0	0	0	0	0	0
Alfred, Ont.	3	30	2	30	tr	20	2	3	0	0	0	0	0	0	0	0	0
Fort William, Ont.	10	40	2	40	tr	40	1	4	0	0	0	0	0	0	0	0	0
Ottawa, Ont.	tr	30	tr	30	0	30	tr	3	0	0	0	0	0	0	0	0	0
Appleton, Ont.	15	80	5	80	5	73	1	5	0	0	0	0	0	0	0	0	0
Morewood, Ont.	10	40	3	50	tr	40	1	4	0	0	0	0	0	*0*	*0*	*0*	*0*
St. Catherines, Ont.	5	70	5	70	tr	60	5	7	0	0	0	0	0	0	0	0	0
Macdonald College, Que.	40	60	5	60	tr	70	4	7	0	0	0	0	0	*0*	*0*	*0*	*0*
Lennoxville, Que.	5	30	2	30	0	20	*5*	*2*	0	0	0	*0*	0	0	0	O	tr
L'Assomption, Que.	tr	5	tr	10	0	2	tr	5	0	0	0	0	0	0	0	0	0
Kentville, N. S.	tr	3	tr	10	0	3	tr	5	0	0	0	0	0	*0*	*0*	0	0

* tr = trace.

Physiologic specialization

Physiologic specialization in leaf rust has been studied in the past with the standard differentials, supplementary differentials, single gene lines, or combinations of these sets of differentials. In 1968,

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eight single-gene back-cross lines were used. These lines contain most of the genes present in the earlier sets of differential varieties (1,2,3). The distribution of virulence on the individual single gene lines is shown in Table 2. A majority of the isolates were virulent on genes Lr3 and Lr10. All isolates virulent on gene Lr16 were also virulent on Lr10; the commercial variety 'Selkirk', which possesses both of these genes for resistance, was attacked by 11.4% of the isolates. The genes for virulence corresponding to the eight genes for resistance all appear to be independently inherited, and 256 virulence combinations are possible in this system. Too few isolates were studied in 1968 to detect all virulence combinations, and none of the isolates were capable of attacking more than five genes for resistance (Table 3).

Infection types produced on back-cross lines with genes Lr10 and Lr16 were compared with infection types produced on varieties possessing known genes for resistance to leaf rust (Table 4). Interaction between gene Lr10 and an avirulent culture of leaf rust results in a 0; reaction on 'Lee',

Table 2. Virulence of isolates of Puccinia recondita on back-cross lines containing single genes for resistance to leaf rust in Canada in 1968

Resistance genes	Number of isolates from: Ont. & Que.	Man.	Sask.	B.C. & Alta	Total no. of virulent isolates	% total isolates
Lr1	2	2	1	0	5	4.4
Lr2a	1	1	0	0	2	1.7
Lr2c	19	2	1	11	33	29.0
Lr3	25	41	28	16	110	96.5
Lr10	22	23	25	15	85	74.4
Lr16	1	3	4	5	13	11.4
Lr17	0	0	2	10	12	10.5
Lr18	18	16	4	1	39	34.2

Table 3. Percentage of isolates virulent on one or more genes for resistance (% of total isolates in each area)

Geographic area	Number of genes for resistance attacked: 1	2	3	4	5	6	7	8
Que. & Ont.	6.9	38.0	20.7	31.0	3.4	0	0	0
Man.	28.8	48.9	17.0	4.9	2.4	0	0	0
Sask.	7.1	67.9	21.4	3.6	0	0	0	0
Alta. & B.C.	6.3	18.7	12.5	43.8	18.7	0	0	0

Table 4. Infection types produced on selected wheat varieties by isolates of leaf rust in 1968

Culture number of leaf rust isolates	Host variety and known genotype: T^6X Exchange (Lr10)	T^6X Exchange (Lr16)	Lee (Lr10)	Selkirk (Lr10, Lr16)	Exchange (Lr10, Lr16)	Renown*
10-68	1	2	0;	0;	0;	4
11-68	4	2	4	2	2	4
45-68	4	2	2	2	0;	4
77-68	4	2	4	;1	2	X
44-68	4	4	4	4	4	4

* The gene for resistance conditioning an X reaction is probably Lr14.

'Selkirk', and 'Exchange' and a type 1 reaction on the back-cross line containing Lr10. Obviously, genetic background influences the expression of infection type. Culture 77-68, mesothetic on 'Renown'. produces an atypical infection type on 'Selkirk'. Since 'Selkirk' possesses the resistance gene present in 'Renown', the atypical infection type results from the interaction with two genes for resistance, one conditioning a type 2 and the other an x reaction type. The infection types produced by culture 45-68 suggest that 'Lee' and 'Exchange' possess an additional gene or genes for resistance other than Lr10 and Lr16.

Coinposite collections of leaf rust were used to inoculate the highly resistant varieties 'Agrus', 'Transfer', 'Klein Lucero', 'Klein Titan', 'Maria Escobar', 'Rio Negro', 'Aniversario', 'Wanken', 'Anex', 'Lani', 'Lafron', 'Frex', 'Lex', 'Anfron', 'Preska', and 'Timpaw'. Susceptible-type pustules were obtained on 'Klein Titan', 'Maria Escobar', and 'Rio Negro', andanumber of cultures were established. 'Maria Escobar' and 'Rio Negro' showed a similar but not identical pattern of rust reactions to these cultures. 'Klein Titan' was usually moderately resistant to cultures virulent on 'Maria Escobar' and 'Rio Negro', and the latter two varieties were generally resistant to cultures virulent on 'Klein Titan'.

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