LEAF RUST OF WHEAT IN CANADA IN 1965[1]

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Disease development in Western Canada

Leaf rust was severe in much of the wheat growing area of Western Canada. Wheat leaf rust appeared early in Manitoba (June 7), but developed slowly because the predominant varieties, 'Selkirk' and 'Pembina', are moderately resistant in early stages of growth. It developed rapidly after mid-July and severe infections were common throughout the province before harvest. Data from a yield trial at Winnipeg, in which plots of wheat were protected from rust with a fungicide, indicate that late fields of 'Selkirk' suffered a 20% reduction in yield as a result of leaf rust infection in 1965.

Leaf rust appeared later in Saskatchewan but developed rapidly after mid-July. Infections were very heavy on 'Thatcher' and 'Canthatch' but developed a little late to cause maximum losses. It is estimated that losses averaging 20% occurred with 'Thatcher' and 'Canthatch' in south-central Saskatchewan. Severe leaf rust infections occurred in some parts of Alberta but no estimate of yield **loss** is available.

Table 1. Percent infection of leaf rust of wheat (Puccinia recondita) in 1965 on 15 wheat varieties in uniform rust nurseries at 28a locations in Canada.

Locality								McMurachy	Ramsey	Mindum	Stewart 63	D. T. 184	Thatcher[6] Transfer	Exchange	Frontana
Creston, B. C.	tr	80	20	80	tr	70	tr	80	O	tr	O	0	0	O	tr
Edmonton, Alta.	60	80	60	80	5	70	40	8	0	0	0	0	0	0	0
Lacombe, Alta.	0	2	0	3	0	2	0	2	0	0	0	0	0	0	0
Lethbridge, Alta.	7	25	5	25	2	20	10	2	0	0	0	0	0	0	0
Indian Head, Sask.	25	50	25	50	10	50	20	65	0	tr	0	0	0	0	0
Scott, Sask.	35	70	40	80	15	65	**30**	70	0	O	tr	0	0	10	0
Melfort, Sask.	70	90	60	90	5	80	60	9	0	0	0	0	0	0	0
Brandon, Man.	80	90	60	80	1	-	30	100	tr	0	tr	tr	0	tr	tr
The Pas, Man.	60	80	90	80	10	80	1	90	tr	0	tr	0	0	0	0
Morden, Man.	40	90	70	60	2	80	5	90	tr	0	0	tr	0	0	0
Winnipeg, Man.	40	80	50	80	10	80	30	8	0	0	0	0	0	0	0
Glenlea, Man.	50	80	50	80	5	70	60	8	0	0	0	0	0	O	tr	O
Verner, Ont.	30	80	20	80	3	80	30	8	0	0	5	0	1	0	0
Williamstown, Ont.	3	40	3	40	tr	40	3	4	0	0	3	0	0	0	0
Alfred, Ont.	3	50	3	50	0	50	3	5	0	0	2	0	0	0	0
Kapuskasing, Ont.	1	20	1	20	0	20	1	2	0	0	0	0	0	0	0
Kemptville, Ont.	15	60	15	70	5	70	10	60	O	tr	0	0	0	0	0
Fort William, Ont.	30	60	35	65	15	55	30	6	5	tr	0	O	tr	0	0	0
Guelph, Ont.	30	85	20	80	15	80	30	75	tr	tr	tr	0	0	tr	0
Ottawa, Ont.	60	80	30	85	3	70	60	8	0	0	3	0	0	0	1	0
Appleton, Ont.	50	80	40	80	tr	70	40	80	0	1	0	0	0	0	0	0
Merrickville, Ont.	tr	50	tr	50	tr	40	tr	50	0	tr	0	0	0	0	0
St. Catharines, Ont.	tr	20	tr		tr	25	tr	2	5	0	0	0	0	0	0	0
La Pocatikre, Que.	20	50	25	60	5	55	25	50	5	5	5	tr	0	0	0
Québec, Que.	10	45	5	45	10	45	10	6	0	0	5	0	0	0	0	0
Macdonald College, Que.	15	40	15	60	tr	45	15	40	O	tr	0	0	0	0	0
Lennoxville, Que.	30	65	25	65	15	65	35	70	tr	0	0	0	0	0	0
Normandin, Que.	40	80	10	40	5	70	40	8	0	3	5	5	5	0	0	0

[a] Wheat leaf rust was not found on nurseries from Saanichton, B.C., Agassiz, B.C., Beaverlodge, Alta., L'Assomption, Que., Nappan, N. S., Kentville, N.S., Fredericton, N.B., Charlottetown, P.E.I., Doyles, Nfld.

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leaf rust in the rust nurseries

Severe infections of leaf rust occurred in nurseries from Quebec to British Columbia, (Table 1). No leaf rust was observed in nurseries in the Maritime Provinces. A considerable amount of leaf rust was recorded on 'Selkirk' wheat: this was partly due to the increased prevalence of virulent strains of leaf rust. 'Manitou', anewly released variety, showed good resistance and the rust infections observed on this variety were of the resistant or the moderately resistant type. The durum varieties 'Ramsey', 'Mindum', 'Stewart 63' and 'D. T. 184', and the common wheats 'Thatcher^{6}' x 'Transfer', 'Exchange', and 'Frontana', were resistant at all locations. The reading of 10% on 'Exchange' at the Scott nursery probably resulted from a breakdown of resistance to leaf rust which may occur in this variety at an advanced stage of maturation.

Table 2. Distribution by geographic areas of physiologic races of Puccinia recondita isolated in Canada in 1965.

Race	Geographic Area						Total Isolates	Percent of Total Isolates
	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia		
1						1	1	0. 3
5	2	3	10	10	3		28	6. 9
9			1		3		4	0.9
15	12	45	85	111	46	3	302	75. 3
35	9	3					12	3.0
58	23	10		1			34	8. 5
126		1					1	0.3
140				1			1	0.3
161		6			1	11	18	4.5
	46	68	96	123	53	15	401	100.0

Table 3. Distribution by geographic areas of NA65 races of Puccinia recondita isolated in Canada in 1965.

Race	Geographic Area						Total Isolates
	Que.	Ont.	Man.	Sask.	Alta.	B. C.	
1			1		3	2	6
3	13	25	1	16	7	9	71
7	9	3					12
9	13	23	65	74	42	1	218
10		12	29	32	1	3	77
13				1			1
19	11	5					16

Table 5. Reaction of 'Selkirk' wheat to race 15 of Puccinia recondita.

Geographic Area	Number of isolates producing indicated reaction types				
	0;	1	2	2^{+}-2^{++}	3-4
Que.	1	5	4	1	1
Ont.	13	3	9	9	11
Man.	1	3	29	27	25
Sask.	14	6	38	23	30
Alta.	6	18	15	6	1
B. C.	0	0	0	0	3
Total Isolates	35	35	95	66	71

Table 4. Percent of isolates of Puccinia recondita studied in Canada in 1965 virulent on each of the NA65 differential wheat varieties.

Geographic Area	Percent of isolates virulent on:				
	Dular	Waban	Lee	Sinvalocho	Exchange
Quebec	23.9	19.5	28.3	71.7	0.0
Ontario	7.4	4.4	51.5	48.5	12.0
Manitoba	0	0	97.9	2.1	30.2
Saskatchewan	0	0	87.0	13.0	26.1
Alberta	0	0	81.0	13.2	1.9
British Columbia	0	0	26.7	60.0	20.0

Distribution of physiologic races

Nine races of wheat leaf rust were isolated in the 1965 race survey (Table 2). Race 15 constituted 75% of the isolates in Canada and 90% of the isolates in the three Prairie Provinces. In addition, 8% of the isolates from the prairies were race 5 which is very similar to race 15 differing only by virtue of additional virulence on 'Malakof' wheat.

A somewhat greater level of variability in the rust population can be demonstrated by the use of supplementary differential wheat varieties (Table 3). However, most of the isolates from the prairies again fall into one or two races, distinguished largely by virulence or avirulence on 'Exchange' (Table 4).

It appears that the leaf rust population in the spring wheat area is remarkably homogeneous. The commercial variety, 'Selkirk', which derives its leaf rust resistance from 'Exchange' has been the main rust resistant variety in the past ten years and evolutionary changes in leaf rust have been limited to the origin and spread of strains virulent on 'Selkirk'. The present status is shown in Table 5. The 0; and type 2 reactions are conditioned by two independent resistance genes in association with avirulent isolates of race 15. The isolates producing 2^{+} to 2^{++} reactions are probably heterozygous for virulence with respect to the gene conditioning the type 2 reaction. It is not known whether the type 1 reaction results from a separate gene for resistance or is a modified reaction of one of the other two 'genes.