Leaf rust of wheat in Canada in 1975[1]

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Conditions were favorable for a leaf rust *[Puccinia recondita]* epidemic on the Prairies in the spring of 1975 since most of the acreage was planted to moderately susceptible varieties and leaf rust was widespread in the United States. However, very hot, dry weather during July delayed rust development and there was little damage from leaf rust in Canada in 1975. The leaf rust race survey showed that virulence on the *Lr2* locus for resistance was prevalent in the rust population. Three cultures virulent on Transfer (gene *Lr9*) were isolated from collections made in Manitoba and Saskatchewan.

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Au printemps 1975, les conditions etaient favorables a une épidémie de la rouille des feuilles *[Puccinia recondita]* dans les Prairies, puisque la plupart des superficies etaient ensemencees de varietes moderement sensibles et que la rouille était largement répandue aux Etats-Unis. Toutefois, le temps sec et tres chaud qui a sevi au mois de juillet a retarde le developpement de la rouille et a permis de reduire les dégâts. L'etude des races de la rouille des feuilles a montre que la population de rouille a ete virulente sur les varietes possedant le gene de resistance (*Lr2*). Trois cultures virulentes sur Transfer (gene *Lr9*) ont ete isolees de prélèvements effectues au Manitoba et en Saskatchewan.

Disease development and crop losses in western Canada

Most of the wheat acreage in the traditional rust area of Manitoba and Saskatchewan was planted to moderately susceptible varieties in 1975. Leaf rust [*Puccinia* recondita] was widespread in the United States in the spring and there was abundant inoculum to initiate an epidemic in western Canada. However, very hot, dry weather during July delayed rust development and there was little damage from leaf rust in 1975.

Leaf rust in the rust nurseries

Ratings of leaf rust intensity on 20 wheat varieties grown at nurseries across Canada are shown in Table 1. A number of varieties were essentially free of leaf rust but virulence has been found on all these bread wheat varieties but Agatha, which has gene *Lr19*.

Table 1. Percentage infection by *Puccinia recondita* on *20* wheat varieties in uniform rust nurseries at 12 locations in Canada in 1975

Location	Red Bobs	Lee	Pitic 62	Neepawa	Napayo	Sinton	Kenya Farmer	C.I.8154 X Frocor[2]	Glenlea	Norquay	Exchange	Frontana	Thatcher[6] X Transfer	R.L.4255	Agatha	Hercules	Mindum	Wascana	Macoun	Wakooma
Creston, B.C.	70	10	10	5	5	0	5	3	0	0	0	0	0	0	0	5	0	5	5	5
Lethbridge, Alta.	5	3	1	1	1	0	3	1	0	0	0	0	0	0	0	tr*	0	tr	tr	tr
Melfort, Sask.	70	50	20	40	40	tr	30	2	0	0	0	0	0	0	0	3	0	3	3	5
Indian Head, Sask.	5	1	tr	3	3	tr	tr	tr	0	0	0	0	0	0	0	tr	0	tr	tr	tr
Brandon, Man.	90	70	50	20	20	10	40	5	tr	tr	tr	5	tr	0	0	5	tr	5	5	5
Morden, Man.	10	3	tr	3	5	tr	tr	1	0	0	0	0	0	0	0	tr	0	tr	tr	tr
Glenlea, Man.	5	5	tr	3	5	tr, 3	3	tr	0	tr	tr	tr	0	0	0	1	0	1	1	1
Thunder Bay, Ont.	30	5	5	5	5	0	5	3	0	0	0	0	0	0	0	3	0	3	3	3
Vineland, Ont.	20	1	tr	tr	tr	0	1	3	0	0	0	0	0	0	0	3	0	3	3	3
Sunbury, Ont.	10	1	1	tr	tr	0	tr	2	0	0	0	0	0	0	0	tr	0	tr	tr	tr
Québec, Qué.	80	5	40	3	5	tr	5	3	0	0	tr	0	0	0	0	2 0	0	2 0	2 0	2 0
Truro, N.S.	50	1	tr	3	3	0	1	1	0	0	0	0	0	0	0	tr	0	tr	tr	tr

* tr = trace

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Table 2. Virulence of isolates of *Puccinia recondita* on backcross lines containing single genes for resistance to leaf rust in Canada in 1975

Resistance genes	No. of virulent isolates from: N.S.	Que. & Ont.	Man.	Sask.	Alta.	B.C.	Total no. of virulent isolates	% total isolates
Lr1	2	0	4	2	1	0	9	2.8
Lr2a	0	0	18	11	18	0	47	14.4
Lr2c	6	3	19	11	18	4	61	18.7
Lr3	5	3	155	94	62	3	322	98.5
Lr3ka	5	0	1	0	0	0	6	1.8
Lr10	4	1	111	70	59	4	249	76.1
Lr16	0	0	1	0	0	0	1	*0.3*
Lr17	2	*0*	1	0	0	3	6	1.8
Lr18	4	3	17	5	1	1	31	9.5

Table 3. Virulence combinations of *Puccinia recondita* isolates on backcross lines containing single genes for resistance to leaf rust in Canada in 1975

Avirulence/virulence formula	No. of isolates from: N.S.	Que. & Ont.	Man.	Sask.	Alta.	B.C.	Total no. of isolates
1,2a,2c,3ka,10,16,17,18/3	0	2	35	19	2	0	58
1,2a,2c,3ka,16,17,18/3,10	0	1	86	61	42	0	190
1,2a,2c,3ka,10,16,17/3,18	0	0	8	3	0	0	11
1,2a,3,3ka,10,16,17/2c,18	1	3	0	0	0	0	4
2a,2c,3ka,10,16,17,18/1,3	0	0	1	0	0	0	1
1,2a,2c,3ka,16,17/3,10,18	0	0	5	*0*	*0*	***0***	5
1,2a,2c,3ka,17,18/3,10,16	0	0	1	0	0	0	1
1,2a,3,3ka,16,17/2c,10,18	*0*	*0*	*0*	0	0	1	1
3ka,10,16,17,18/1,2a,2c,3	0	0	0	1	0	0	1
1,2a,16,17,18/2c,3,3ka,10	0	0	1	0	0	0	1
1,2a,3ka,16,18/2c,3,10,17	0	0	0	0	0	3	3
1,2a,10,16,17/2c,3,3ka,18	1	0	0	0	0	0	1
1,3ka,16,17,18/2a,2c,3,10	0	0	10	8	17	0	35
1,3ka,16,18/2a,2c,3,10,17	0	0	1	*0*	*0*	0	1
1,3ka,16,17/2a,2c,3,10,18	0	0	4	1	0	0	5
1,2a,16,17/2c,3,3ka,10,18	2	0	0	0	0	0	2
3ka,16,17,18/1,2a,2c,3,10	*0*	0	3	0	0	0	3
3ka,10,16,17/1,2a,2c,3,18	0	0	*0*	1	1	0	2
2a,16,18/1,2c,3,3ka,10,17	2	0	0	0	0	0	2

Physiologic specialization

Field collections of leaf rust were established on ***Triticum aestivum*** L. 'Little Club' wheat in the greenhouse and one single-pustule isolate was taken from each collection. Urediospores from the remaining pustules were collected and were bulked with other collections to give composites that were used to inoculate a group of highly resistant varieties of wheat.

A total of 327 cultures were established in 1975. Most of the collections were obtained from commercial fields of wheat varieties that do not possess any genes for seedling resistance.

The single-gene backcross lines used to study physiologic specialization in leaf rust were as previously decribed (1).

The distribution of virulence on the individual single-gene lines (Table 2) was similar to that obtained in 1974 (2). For the past 30 years, virulence on alleles of the *Lr2* locus has been very scarce in Manitoba and Saskatchewan. The presence of these genes in some wheat varieties presently being grown in the United States has led to increased incidence of virulence on *Lr2a* and *Lr2c*. Only one isolate virulent on *Lr16* was obtained in 1975. This was surprising since Selkirk was grown on 13.4% of the wheat acreage in Manitoba in 1975. This represents nearly 400,000 acres where virulence on Lr16 would give a selective advantage and virulence on Lr16 has been present for a number of years. In 1972, 125,000 acres of Agent wheat (*Lr24*) were grown in Oklahoma. This variety was lightly infected with a new virulent strain of leaf rust and virulence on *Lr24* was readily isolated in Manitoba that fall. This illustrates the profound effect on the Canadian leaf rust population of varieties grown in the south.

Nineteen virulence combinations were obtained in 1975 (Table 3). Only a few collections were obtained from eastern Canada and British Columbia. As a rule, the pattern of virulence in southern Alberta is markedly different from that obtained in Manitoba and Saskatchewan and resembles virulence patterns that occur on the west coast. In 1975, the rust population in southern Alberta was the same as that in Manitoba and Saskatchewan.

Composite collections of leaf rust were used to inoculate a number of highly resistant varieties of wheat. Three cultures virulent on Transfer (*Lr9*) were obtained from collections made in Manitoba and Saskatchewan. These are the first cultures virulent on *Lr9* to be isolated in Canada although virulence on *Lr9* in the Great Plains was first observed in North Dakota in 1973 (3).

Virulence on Agent (*Lr24*) was at a high level in 1975 but all isolates tested had a similar virulence pattern on other resistance genes. A backcross line containing gene *Lr2* 1was resistant to all cultures but there was considerable variation' in rust development on this host. One isolate virulent on El Gaucho was obtained in 1975.

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