LEAF RUST OF WHEAT IN CANADA IN 1972[1]

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Disease development and crop losses in Western Canada

Wheat leaf rust caused by Puccinia recondita Rob. ex Desm. was unusually widespread in 1972 extending into the Peace River area of Alberta. However, appreciable damage was limited to Manitoba and southeastern Saskatchewan. Leaf rust was first observed in the Red River Valley of Manitoba on June 5. It developed slowly but by August 8 moderately heavy infections were present in the most advanced fields and by the end of August severe infections were general. Early sown fields escaped with little damage, but late sown fields suffered losses estimated at up to 10%. The average loss in Manitoba and southeastern Saskatchewan was estimated at less than 5% of the potential yield.

Leaf rust in the rust nurseries

Ratings of leaf rust intensity on 18 wheat (Triticum aestivum L.) varieties grown at nurseries across Canada are shown in Table 1. The severe infections observed at Lacombe and Edmonton are most unusual and indicate the widespread occurrence of leaf rust in Western Canada in 1972.

Physiologic specialization

In 1972, as in previous years, field collections of leaf rust were established on 'Little Club' wheat in the greenhouse and one single-pustule isolate was taken from each collection. Most of the collections in Manitoba and Saskatchewan were obtained from commercial fields of 'Manitou' or 'Neepawa'. These varieties do not possess any seedling genes for leaf rust resistance.

Eight single-gene backcross lines were used to study physiologic specialization in leaf rust. The distribution of virulence on the individual single-gene lines (Table 2) is

Table 1. Percentage infection by *Puccinia* recondita on 18 wheat varieties in uniform rust nurseries at 21 locations in Canada in 1972

Location	Lee	Pitic 62	Selkirk	Red Bobs	Manitou	Neepawa	Kenya Farmer	C.T. 432	Hercules	Mindum	Stewart 63	D.T. 316	Wascana	Exchange	Frontana	Tc^6 x Transfer	R.L. 4255	Glenlea
Creston, B.C.	0	0	5	70	tr*	tr	0	0	40	tr	0	20	10	0	0	0	0	0
Edmonton, Alta.	40	45	40	85	65	65	40	70	20	5	10	30	20	0	tr	0	0	0
Lacombe, Alta.	60	60	60	80	65	60	50	50	15	5	10	40	10	0	5	0	0	0
Lethbridge, Alta.	0	5	tr	20	tr	5	tr	5	tr	0	0	tr	0	0	0	0	0	0
Indian Head, Sask.	20	5	10	60	25	30	25	40	tr	0	0	tr	5	0	tr	0	0	0
Scott, Sask.	tr	0	tr	15	15	15	3	3	tr	0	0	0	0	0	0	0	0	0
Melfort, Sask.	5	5	10	25	15	10	10	5	0	0	0	5	0	0	0	0	0	0
Brandon, Man.	50	25	45	90	65	65	25	60	10	0	0	15	5	0	0	0	0	0
Durban, Man.	50	40	30	90	50	50	20	40	40	tr	tr	5	40	0	0	0	0	0
Morden, Man.	60	50	50	90	60	60	40	50	20	3	tr	40	25	0	0	0	0	0
Glenlea, Man.	30	20	20	40	30	20	5	20	5	tr	tr	3	1	tr	tr	0	tr	tr
New Liskeard, Ont.	10	25	25	80	65	65	50	70	35	tr	tr	40	35	0	0	0	0	tr
Kemptville, Ont.	0	tr	0	80	0	0	tr	0	0	0	0	0	0	0	0	0	0	0
Thunder Bay, Ont.	0	tr	5	30	10	10	0	25	0	0	0	0	0	0	0	0	0	0
Guelph, Ont.	50	25	0	85	15	15	40	tr	tr	2	5	25	25	0	0	0	0	tr
Ottawa, Ont.	5	5	5	50	15	15	20	25	25	tr	tr	25	25	0	0	0	0	tr
Appleton, Ont.	0	0	0	50	tr	5	tr	5	tr	0	0	tr	0	0	0	0	0	0
Vineland, Ont.	tr	tr	tr	80	0	tr	10	5	0	0	0	5	0	0	0	0	0	0
Macdonald College, Que.	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kentville, N.S.	40	20	20	75	15	30	35	40	15	0	0	10	0	0	0	0	0	tr
Fredericton, N.B.	5	tr	15	80	0	0	tr	tr	0	0	0	0	0	0	0	0	0	0

* 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 1972

Resistance genes	No. of virulent isolates from:						Total no. of virulent isolates	% total isolates
	Maritimes	Que. & Ont.	Man.	Sask.	Alta.	B.C.		
Lr 1	5	5	0	1	0	0	11	6.5
Lr 2A	1	2	0	1	0	0	4	2.4
Lr 2D	1	9	0	1	1	7	19	11.2
Lr 3	5	10	69	55	17	7	163	96.4
Lr 10	5	9	28	25	5	7	79	46.7
Lr 16	0	0	3	4	1	0	8	4.7
Lr 17	1	1	1	0	0	7	10	5.9
Lr 18	0	7	19	12	1	0	39	23.1

Table 3. Virulence combinations of Puccinia recondita isolates on backcross lines containing single genes for resistance to leaf rust in Canada in 1972

Avirulence/virulence formula	No. of isolates from:						Total no. of isolates
	Maritimes	Que. & Ont.	Man.	Sask.	Alta.	B.C.	
1,2A,2D,10,16,17,18/3	1	4	26	26	11	0	68
1,2A,2D,16,17,18/3,10	0	0	20	14	3	0	37
1,2A,2D,10,16,18/3,17	0	0	1	0	0	0	1
1,2A,2D,10,16,17/3,18	0	0	14	3	1	0	18
2A,2D,16,17,18/1,3,10	4	2	0	0	0	0	6
1,2A,16,17,18/2D,3,10	0	0	0	0	1	0	1
1,2A,10,16,17/2D,3,18	0	1	0	0	0	0	1
1,2A,3,16,17/2D,10,18	0	5	0	0	0	0	5
1,2A,2D,17,18/3,10,16	0	0	3	3	1	0	7
1,2A,2D,16,17/3,10,18	0	0	4	8	0	0	12
1,2A,2D,10,16/3,17,18	0	0	1	0	0	0	1
10,16,17,18/1,2A,2D,3	0	1	0	0	0	0	1
1,2A,16,18/2D,3,10,17	0	0	0	0	0	7	7
3,16,18/1,2A,2D,10,17	1	0	0	0	0	0	1
10,16,17/1,2A,2D,3,18	0	0	0	1	0	0	1
2A,16,17/1,2D,3,10,18	0	1	0	0	0	0	1
16,18/1,2A,2D,3,10,17	0	1	0	0	0	0	1

similar to the distribution obtained in 1970 and 1971 (1). Most of the isolates were virulent on gene Lr3.

Seventeen virulence combinations were obtained in 1972 (Table 3). The majority of isolates were virulent on only gene Lr3 or on genes Lr3 and Lr10. Only 12 isolates were virulent on more than three of the single-gene lines.

Composite collections of leaf rust were used to inoculate a number of highly resistant varieties. A number of virulent isolates were obtained and further testing indicated that 'Agent', 'Wanken' and 'Preska' all possessed one identical gene for resistance, presumably derived from Agropyron elongatum. This gene is also present in 'Timpaw' which has an additional gene or genes conditioning a moderate level of

resistance to leaf rust. Other studies showed that the variety 'Glenlea' possesses only gene Lr1 conditioning seedling resistance to leaf rust. However, field reactions indicate that this variety must also have genes for adult plant resistance. The variety 'Waldron' has several genes for seedling resistance, probably including genes Lr2A and Lr10.

The identification of genes in these varieties is based on patterns of rust reactions on the varieties and on the single-gene lines. Positive identification would require conventional genetic studies.

Acknowledgments

I am grateful for assistance given by cooperators in the care of the rust nurseries and the collection of rust specimens. Mr. W. Ostapyk performed the technical work of the program.

Literature cited

1. Samborski, D. J. 1972. Leaf rust of wheat in Canada in 1971. Can. Plant Dis. Surv. 52:8-10.