Leaf rust of wheat in Canada in 1976'

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Hot dry weather on the Prairies in July and August limited rust development and there was little damage in this area from leaf rust [*Puccinia recondita]* in 1976. The leaf rust race survey was carried out with 18 single gene backcross lines for resistance as differential varieties. Genes *Lr11, Lr19* and *Lr21* were resistant to all isolates in 1976 and only a few isolates were virulent on *Lr9, Lr16* and *Lr17*.

Can. Plant Dis. Surv. 56: 123- 125. 1976

Le temps chaud et sec qu'ont connu les Prairies en juillet et en août a restreient le développement de la rouille des feuilles *(fuccinia recondita),* limitant les dégâts causes par la maladie dans cette region en 1976. Un relevé des races de rouille a été effectue utilisant 18 lignées de blé issues de rétrocroisements a gene unique de resistance comme variétés différentielles. Les genes *Lr11, Lr19* et *Lr21* se sont montrés réristants a tous les isolats en 1976, et seuls quelques isolats ont manifeste de la virulence sur les genes *Lr9, Lr16* et *Lr17*.

Disease development and crop losses in western Canada

Leaf rust of wheat ***[Puccinia recondita]*** was first found in Manitoba on June **18.** It was widespread by early July in Manitoba and eastern Saskatchewan and moderate infections developed on the bread wheat varieties Neepawa, Napayo, and Manitou. However, hot dry weather in July and August limited rust development and there was little damage from leaf rust in **1976.** The new commercial variety Sinton was resistant in the field, and Glenlea was highly resistant.

Physiologic specialization

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

A total of **264** cultures were established in **1976.** Most of the collections in Manitoba, Saskatchewan, and Alberta were obtained from commercial fields of wheat varieties that do not possess any genes for seedling resistance to leaf rust.

The single-gene backcross lines listed in Table 1 have been described previously (1, **2,** 3). Genes ***Lrl, Lr2a, Lr2b, Lr2c, LrB, Lr3,*** and ***Lrl 1*** were isolated from the eight standard leaf rust differential varieites and appear to be all the genes in these differentials that are detectable with North American isolates of leaf rust. This permits survey data from earlier studies using these differentials to be interpreted in terms of specific gene interactions.

Four exotic genes are shown in Table 1: ***Lr9 (Aegilops umbellulata), Lr19 (Agropyron elongatum), Lr21 (Aegilops squarrosa)*** and ***Lr24 (Agropyron elongatum).*** Genes ***Lr9*** and ***Lr24*** have been used in breeding programs and varieties possessing these genes are in commercial production. Cultures of leaf rust virulent on genes ***Lr9*** and ***Lr24*** have been isolated in North America and virulence on ***Lr24*** is especially prevalent. Gene ***Lr19*** is highly resistant to all isolates of leaf rust. A range of infection types were obtained on ***Lr21*** with different isolates of leaf rust although no compatible interactions have been observed.

All cultures of leaf rust virulent on ***Lr9*** isolated in Canada have the same avirulence/virulence formula **(1,2a,2b,16,17,24/2c,B,3,3ka,9,10,18).** This pattern is characteristic of the leaf rust population in eastern Canada. Virulence on ***Lr24*** occurred in cultures that were virulent on only ***Lr3*** of the resistance genes from the standard differential varieties (Table **2).** This type of culture, previously identified as race **15,** has long been characteristic of the leaf rust population in the Great Plains of North America. Most of the cultures virulent on ***Lr24*** were avirulent on ***Lr10*** but this is probably because there is at present little selection pressure in this area for virulence on ***Lr*** 10.

Twenty-two virulence combinations on twelve genes for resistance were obtained in **1976.** These virulence patterns again show three leaf rust populations in North America that are quite distinct, although some mixing does occur. In Canada, these rust populations occur in: 1) British Columbia and southern Alberta; **2)** Manitoba, Saskatchewan, and northern Alberta; **3)** eastern Canada including Ontario, Quebec, and the Maritime Provinces.

Composite collections of leaf rust were used to inoculate a number of highly resistant varieties of wheat. A number of single-pustule isolates were studied but all were similar to cultures already described (Table 2).

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Table 1. Virulence of isolates of *Puccinia recondita* on backcross lines containing single genes for resistance to leaf rust in Canada in 1976

Resistance genes	No. of virulent isolates from: B.C.	Alta.	Sask.	Man.	Ont. & Que.	Total no. of virulent isolates	% total isolates
Lrl	1	2	0	5	3	11	4.2
Lr2a	0	0	4	1	5	0	19	7.2
Lr2b	0	0	4	1	6	5	25	9.5
Lr2c	4	9	5	16	16	50	18.9
LrB	3	7	0	1	16	27	10.2
Lr3	2	25	86	112	23	248	93.9
Lr9	0	0	0	0	3	3	1.1
Lr10	4	29	59	73	11	176	66.7
Lrll	0	0	0	0	0	0	0
Lr14a	4	23	87	111	12	237	89.8
Lr16	0	0	1	0	0	1	0.4
Lr17	1	2	0	0	0	3	1.1
Lr18	3	7	2	7	16	35	13.3
Lr19	0	0	0	0	0	0	0
Lr21	0	0	0	0	0	0	0
Lr24	1	1	24	39	6	71	26.9
Lr3ka	0	1	0	2	12	15	5.7
LrT	0	0	1	3	8	12	4.6

Table 2. Virulence combinations of *Puccinia recondita* isolates on backcross lines containing single genes for resistance to leaf rust in Canada in 1976

Avirulence/virulence formula	No. of isolates from: B.C.	Alta.	Sask.	Man.	Ont. & Que.	Total no. of isolates
1,2a,2b,2c,B,3ka,10,16,17,18,24/3	0	2	4	5	0	11
1,2a,2b,2c,B,3ka,16,17,18,24/3,10	0	19	52	44	5	120
1,2a,2b,2c,B,3ka,10,16,17,18/3,24	1	1	24	32	3	61
1,2a,2b,2c,B,3ka,16,17,18/3,10,24	0	0	0	6	3	9
1,2a,2b,2c,B,10,16,17,18,24/3,3ka	0	0	0	0	1	1
1,2a,2b,2c,B,16,17,18,24/3,10,3ka	0	1	0	1	0	2
1,2a,2b,2c,B,3ka,17,18,24/3,10,16	0	0	1	0	0	1
1,2a,2b,2c,B,3ka,16,17,24/3,10,18	0	0	1	4	0	5
1,2a,2b,2c,B,3ka,10,16,17/3,18,24	0	0	0	1	0	1
1,2a,2b,B,3,3ka,16,17,24/2c,10,18	0	0	1	0	0	1
2a,2b,2c,B,3ka,16,17,18,24/1,3,10	0	0	0	3	0	3
1,2a,2b,3,3ka,16,17,24/2c,B,10,18	3	5	0	0	0	8
1,2a,2b,B,3ka,16,18,24/2c,3,10,17	0	2	0	0	0	2
1,2a,2b,3,3ka,16,17,24/2c,B,10,18	0	0	0	0	5	5
1,B,3ka,16,17,18,24/2a,2b,2c,3,10	0	0	4	1	4	0	18
2a,2b,3,3ka,16,17,24/1,2c,B,10,18	0	2	0	0	0	2
1,2a,2b,16,17,24/2c,B,3,10,18,3ka	0	0	0	0	3	3
2a,2b,3ka,B,16,18,24/1,2c,3,10,17	1	0	0	0	0	1
2a,2b,10,16,17,24/1,2c,B,3,18,3ka	0	0	0	0	3	3
1,2a,10,16,17,24/2b,2c,B,3,18,3ka	0	0	0	0	5	5
B,10,16,17,24,3ka/1,2a,2b,2c,3,18	0	0	0	1	0	1
2a,16,17,24/1,2b,2c,B,3,10,18,3ka	0	0	0	1	0	1

Acknowledgments

I am grateful for assistance given by co-operators in the care of the rust nurseries and the collection of rust specimens. Mr. W. Ostapyk performed the technical aspects of the program.

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