

PHYSIOLOGIC RACES OF CEREAL RUSTS IN CANADA IN 1954

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In Report 9 issued by the Plant Pathology Laboratory, Winnipeg, Man., January 1955, an account is given of cereal rust development in Western Canada in 1954 and the distribution in Canada is recorded of the physiologic races of the rusts: wheat stem rust (*Puccinia graminis* var. *tritici*), wheat leaf rust (*P. triticina*), oat stem rust (*P. graminis* var. *avenae*) and oat crown rust (*P. coronata*). Isolations from collections of aecia from barberry and buckthorn are also recorded.

Cereal rust development in Western Canada has already been covered in Report 8, on the Rust Nurseries. The other two sections have been summarized below.

Distribution of Physiologic Races

*Puccinia graminis* var. *tritici*

The 1954 stem-rust survey included 361 isolates. The following races were isolated (the number of isolates of each race given in brackets): race 10 (1); race 11 (1); race 15 (2); race 15B (283) further distinguished as the biotypes 15B (274), 15B-3 (6), and 15B-4 (3); race 29 (30) in the biotypes 29-1 (21), 29-2 (7), and 29-3 (2); race 37 (1); race 38 (5); race 48A (14); race 56 (15); race 59A (1); race 59C (5); race 87 (2) and race 139 (1).

Race 15B was the predominant race in both Eastern Canada and the Prairie Provinces, accounting for 77% of all Canadian isolates. Most of the isolates of this race were of the type widely prevalent since 1950, designated simply as race 15B. Two other biotypes of this race, distinguishable by means of the accessory varieties Golden Ball, Selkirk, and McMurachy, were found in small amounts. Six isolates of the biotype designated 15B-3 were collected in the Prairie Provinces. This biotype is more virulent than the others to Selkirk and McMurachy. Three isolates of 15B-4 (formerly called 15B-2) were collected in Man. This biotype is distinguishable from the others by its greater virulence on Golden Ball. It is now referred to as 15B-4 because the designations 15B-1 and 15B-2 are in use in the United States for biotypes identified at the University of Minnesota. Other strains of the race 15 complex found in 1954 include race 15 found in N. B., near barberry, and race 87 found in Ont. and Man. Race 87 differs from race 15B-3 chiefly by the production of X type of infection instead of 4 type on Mindum, Spelmar and Kubanka.

After race 15B, race 29, accounting for 8% of all isolates, was the next most prevalent. In this race, three biotypes were distinguished by means of accessory varieties: race 29-1 virulent on Golden Ball, Selkirk and McMurachy; race 29-2 non-virulent on Golden Ball but virulent on Selkirk and McMurachy; and race 29-3 virulent on

Golden Ball but not on Selkirk and McMurachy. The two biotypes virulent to Selkirk, which constitute more than 7% of all isolates, are the most common of the rust strains known to be pathogenic to that variety.

Race 56, the predominant race for many years prior to 1950, was reduced to the low ebb of 4% of the isolates.

The rather wide distribution of race 48 in Eastern Canada is of interest. This race had a wide distribution in the southern United States in 1954 but occurred only to a slight extent in the Prairie Provinces where it had little opportunity to get established because the wheat varieties now grown there are resistant to it. In Eastern Canada it gained a wide distribution and was responsible for severe rusting of McMurachy wheat in several rust nurseries. In these nurseries, Selkirk was virtually free from stem rust. This is the first time that McMurachy has shown any appreciable amount of stem rust in the Uniform Rust Nurseries in Canada. The race 48 encountered this year is pathogenically distinct from isolates found in former years and should therefore be regarded as a strain of race 48. It is here designated as race 48A.

#### Stem Rust on Barley

In 1954, stem rust on barley belonged predominantly to var. tritici. Of 53 isolates from barley 47 belonged to var. tritici and only 6 to var. secalis.

#### Puccinia triticina

The physiologic races of wheat leaf rust were recorded according to the "Unified Numeration" (UN) key adopted in 1948, by American and Canadian investigators of this rust. In this key the races are grouped into 24 classes into which they fall if the differential hosts comprise the varieties Malakof, Webster, Loros, Mediterranean and Democrat. In 1954, race identification was performed by using these hosts with the addition of the varieties Brevit and Renown. By using the latter variety it was possible to isolate "biotypes" of certain races that would otherwise have escaped notice. The varieties Carina and Hussar were used occasionally to test the reaction of the complete set of differential hosts to isolates of certain races. The original race numbers that correspond to the UN groups are also given.

All rust collections were initially increased on the susceptible variety Little Club. Two single-pustule isolates were subsequently established from each collection. These were, after increase, cultured on the differential hosts and the resultant race identifications established. The remainder of the original cultures were used to inoculate "screening" sets composed of the varieties Exchange, Lee, Kenya Farmer and Selkirk. The reaction of the variety Lee indicated the presence of rust strains somewhat pathogenic to it in the seedling stage. In 1953, Lee was resistant to all of the races isolated in Western Canada, but this year this

variety was susceptible to certain isolates of race 126 and its biotype 126a. The reaction of Kenya Farmer paralleled that of Lee.

Altogether 342 isolates were studied and identified as follows (number of isolates in brackets): UN 1 = races 1 (6) and 1a (5); UN 2 = races 15 (17) and 15a (88); races 3 (1) and 58 (65); UN 5 = races 5 (9) and 5a (87); UN 6 = races 126 (28) and 126a (20); UN 9 = race 9 (5); UN 10 = race 11 (7); UN 11 = race 93 (2); UN 13 = race 35 (2). Races with the suffix "a" are virulent to seedlings of Renown and several derivatives of H44 and Hope.

The race distribution in 1954 was rather similar to that of 1953. Race 58 was predominant in Eastern Canada, especially in Ont. and races 5a and 15a comprised most of the rust in the Prairie Provinces. Race 1 was found only in B. C. and Que. and race 1a in B. C. while race 11 was found in Ont. Sask. and Alta. Races 126 and 126a were more common in the Prairie Provinces than in the preceding year. Race 126 is probably a complex, including race 105 which has never been readily distinguishable from it under Winnipeg greenhouse conditions. This complex is of particular interest because some elements of it show evidence of pathogenicity to the rust-resistant variety Lee. Selkirk and Exchange are only moderately resistant to this race.

In greenhouse tests, it was noted that Rosen rye, in the seedling stage, proved to be a congenial host to races 5, 5a, 11, 15, 15a, 126 and 126a. To these races, however, Prolific rye was resistant. As Rosen is a winter rye its ability to harbor leaf rust of wheat raises the question of whether or not varieties of winter rye could play any part in the overwintering of this rust in areas north of the winter wheat belt.

#### Puccinia graminis var. avenae

In the 1954 oat stem rust survey, 175 isolates were studied. The races isolated (number of isolates of each race in brackets) in order of prevalence were: race 7 (80), race 8 (4), race 10 (19), race 2 (11), race 5 (6), race 11 (5), race 7A (4), race 6 (4), race 13 (4), race 4 (1), and race 12 (1).

The varieties Rodney and Garry were included with the differential hosts Victory, White Russian, Richland, and Sevnothree. Rodney is susceptible only to race 7A and differentiates this race from race 7. Garry is resistant to all races isolated to date in Canada.

Race 7, comprising 45% of the isolates, predominated in 1954 as it has for several years. Race 8 was second in order of prevalence in 1954 as in 1953 but it constituted 23% of the isolates in 1954 as against 14.6% in 1953. This increase in the prevalence of race 8 is important in Western Canada where the predominant varieties such as Ajax, Exeter, Fortune and Vanguard are resistant to race 7 but susceptible to race 8. Four isolates of race 7A were obtained in 1954 as against 2 in 1953. The increased prevalence of this race is significant because it can attack the new variety Rodney. Races 6 and 13, which can attack the varieties White Russian (resistant to race 8) and Richland (resistant

to race 8) and Richland (resistant to race 7) and their derivatives, constituted approximately 5% of the isolates, as they did also in 1953. Races 2, 7, 7A, 8, 10, and 11 were distributed across the country; races 6 and 13 were found only in Ont; races 5 and 12 occurred only in Western Canada and race 4 only in N.B. Race 7A occurred in Eastern and Western Canada as it did in 1953. Races 6 and 13 have occurred in Eastern Canada for several years but have not been found in Western Canada in recent years.

#### Puccinia coronata var. avenae

Uredinial collections of crown rust of oats were obtained, in 1954, from all the Canadian provinces except B. C. and Nfld.

The crown rust races present in these collections were identified on the basis of the rust reactions produced on the ten new differential host varieties, Anthony, Appler, Bond, Bondvic, Saia, Ukraine, Trispernia, Victoria, Santa Fe, and Landhafer. The rust reaction of the two new oat varieties, Garry and Rodney were ascertained also to each of the rust collections.

In all 177 isolates were studied. The number of isolates identified is indicated in brackets after the number of the race. 201 (24), 202 (45), 203 (18), 205 (1), 209 (3), 210 (1), 211 (8), 212 (10), 216 (1), 226 (2), 228 (7), 229 (1), 231 (4), 234 (7), 235 (6), 237 (7), 238 (2) 239 (12) and 240 (12). Two of these races 205 and 216, had not been found previously in Canada but both have been found repeatedly in the United States.

Races 201, 202 and 203 were the most prevalent races in Western Canada, while in Eastern Canada, races 201, 202 and 239 were most prevalent. In Western Canada, races 201, 202, 203, 205, 209, 210, 211 and 216, all of which heavily attack varieties which possess the Bond type of resistance, comprised 80.5% of all isolates, whereas in Eastern Canada, these races comprised 49.5% of all isolates. The varieties Garry and Rodney proved resistant to about 70% of the isolates. The variety Victoria was susceptible to one isolate (race 216) while Trispernia, Santa Fe and Landhafer were resistant to all the isolates.

#### Isolations from Aecia

During June and early July of 1954 collections of aecia on barberry (Berberis vulgaris) and buckthorn (Rhamnus spp.) were forwarded to the Winnipeg Laboratory by cooperators in Eastern Canada. For this assistance we wish to thank the following: K. A. Harrison, Kentville, N. S.; J. L. Howatt, Fredericton, N. B.; H. R. Klinck, Macdonald College, Que.; J. W. MacRae, Kemptville, Ont., W. H. Waddell, Guelph, Ont.; T. C. Vanterpool, Saskatoon, Sask.; D. B. O. Savile, and I. L. Conners, Ottawa, Ont.; and D. W. Creelman, Kentville, N. S.

#### Aecia on Barberry

As in recent years, Little Club wheat, Victory oats, Rosen rye,