I. DISEASES OF CEREAL CROPS

WHEAT

HEAD DISCOLORATION (Alternaria, etc.) was recorded from Man. eastward. A. tenuis was isolated from one collection at Winnipeg and Helminthosporium sativum from another (W.A.F. Hagborg). Traces were present on some rust resistant varieties at Ste. Anne de la Pocatiere, Que. (A. Payette), while discoloration was heavy on 2 varieties in the same test at Fredericton, N.B., as well as on some soft wheats (S.F. Clarkson). About 1% of the heads showed discoloration in the plots at Charlottetown, P.E.I., and it was also observed in 12 fields in Queens Co. (R.R. Hurst).

ERGOT (Claviceps purpurea) was recorded as follows: trace in one field out of 89 in Alta.; in Red Bobs in the plots at Edmonton and Lacombe (M.W.C.); in 5 fields out of 210 in Sask., a trace except one, where 15% of the heads bore ergots along one edge of the field adjoining severely infected brome grass (H.W.M.); recorded in Queens Co., P.E.I. (R.R. Hurst).

POWDERY MILDEW (Erysiphe graminis) was first observed on winter wheat at the Sidney Station, B.C., on April 24 and was present on all winter varieties on May 22; mildew was not seen at the Agassiz Station on May 26 (W. Jones). A slight infection was observed in 2 fields in Alta.; it was slight to severe in the variety plots at Lacombe and slight to moderate at Edmonton (M.W.C.). Powdery mildew was severe on winter wheat about Guelph, Ont. (J.D. MacLachlan). It was severe in the rust nursery (q.v.) at Saanichton, B.C., and moderate at several points in Alta. and Ont. Of the commercial varieties in the test, Thatcher was the most susceptible, followed by Marquis and Apex; Renown and Regent were almost free from infection (T. Johnson).

HEAD BLIGHT (chiefly Fusarium spp.) infected 5% of the heads in a field of Renown near Nipawin, Sask. (H.W.M.). In fields of winter wheat affected by take all (q.v.) in the Guelph and Waterloo districts, Ont., the disease was prevalent on heads of lodged stems (J.D. MacLachlan). Traces to light infection occurred at Ste. Anne de la Pocatiere, Que., particularly in the wheat plots on sandy soil (A. Payette). Traces were present in the plots at Fredericton, N.B. (S.F. Clarkson) and in Prince and Queens Co., P.E.I. (R.R. Hurst). In the rust nurseries (q.v.), the disease was most prevalent in Que. (T. Johnson).

A number of collections of head blight of wheat and barley from the 1944 crop was cultured to determine the organisms associated with them. The collections from outside Man. were obtained from diseased heads of plants sent to the Laboratory from the rust nurseries (q.v.). On wheat: Winnipeg, Man., Fusarium culmorum, 1 collection, F. Equiseti, 1, F. Scirpi var. acuminatum, 1; St. Germain, F. Poae, 1; Agassiz, B.C., F. avenaceum, 1; Macdonald College, Que., F. avenaceum, 3, F. culmorum, 1, F. Poae, 1; Lennoxville, F. avenaceum, 5, F. culmorum, 7, Colletotrichum graminicola, 1.

Isolations were made from one collection of barley from each of the following places in Man., the most common isolate being mentioned first: Morden, Helminthosporium sativum, F. Poae, Alternaria sp.; Nesbit, A. sp., H. sativum, F. Poae; Treherne, H. sativum, A. sp.; Neepawa, F. Poae. Head blight of barley was more common this year than usual in Man. (W.L. Gordon).

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.). Out of 89 fields examined in Alta., common root rot caused a trace of damage in 41 fields, slight in 33 and moderate in 1. The disease was found in the plots at Beaverlodge and Lacombe, and at Olds, where it was most prevalent in the manured plots. It caused more damage than usual in the Drumheller area, especially in volunteer stands in fields hailed out last year (M.W.C.).

Common root rot was present in every one of the 194 fields of wheat examined in Sask. after July 25. The mean disease rating was 8.5 and its standard deviation 3.63. The difference between the mean for 1944 and that of 9.4 for 1943 (P.D.S. 23:2) is significant at the 5% point. If the province is considered as a whole, the crops were somewhat better than in 1943, but worse than those of 1942 when the mean disease rating was very low, 6.0. Thus there is evidence of a negative correlation between yield of grain and disease rating. When the data are considered by crop districts for a single year, in crop districts 4 and 7 in the western part of the province the yields were low due to low rainfall and the disease ratings were about 11.0, while in crop districts 1 and 5, on the eastern side, the yields were relatively high and the disease ratings were 6.7 and 7.3 respectively (B.J. Sallans).

A phase of common root rot, known as pre-maturity blight, characterized by premature ripening with lodging of affected plants, caused a trace to 3% damage in 15 fields. It was severe in the durum varieties in the dry land plots and in many lines of common wheat in an irrigation plot at the University, Saskatoon. It was also severe at the Swift Current Station (H.W.M.). Isolations made from basal parts of the affected wheat plants at Saskatoon yielded mostly Helminthosporium sativum and less frequently, Fusarium culmorum. The discoloration of basal parts was usually not at all conspicuous in the affected plants with their empty heads (T.C. Vanterpool).

Many wheat fields in the Willowbunch district in southern Sask. were reported to be yielding below expectations. An examination of some fields revealed large areas usually on slopes or low spots where heads of the plants were poorly filled and the bases of the majority of such plants were attacked by common root rot. The situation in this part of the province in 1944 appears to be similar to that reported in 1942 by Sallans and Ledingham (P.D.S. 22:2). It was concluded that common root rot can be much more serious than has been generally realized. For the first time, as pointed out by Sallans and Ledingham, large areas in the fields appeared to be attacked intensively by this disease. The disease was also conspicuous at Carlyle, Lac Vert, Porcupine Plain, and Achydal, Sask. (T.C. Vanterpool).

Common root rot was much more severe in Man. in 1944 than in 1943. The disease was present in most fields of wheat and barley examined, and it was more severe in the lighter soil zones in the province. Severe pre-maturity blighting of wheat, oats, and barley occurred throughout the province. In some fields of durum wheat in northwestern Man., as many as 10% of the plants were blighted. In general, such plants produced little, if any, grain. At Winnipeg, many varieties of oats were severely affected with a form of pre-maturity blight (F.J. Greaney).

Common root rot was found in all foundation spring wheat varieties inspected in the Cereal Division plots at Ottawa, Ont. Infection was most severe in a plot of Coronation; all the plants were severely stunted resulting in a marked reduction in yield. A moderate to severe infection also occurred in Garnet, Reward, Regent, Marquis and Thatcher (R.G. Atkinson).

HEAD BLIGHT (Helminthosporium sativum). Specimens were received from Evesham, Sask.; Alternaria and Cladosporium were also present on the straw and glumes (T.C. Vanterpool).

TAKE ALL (Ophiobolus graminis) was observed in 12 out of 89 fields in Alta. About 25% of the plants were severely affected in a field of Red Bobs at Millet and a field of winter wheat was moderately damaged in the Peace River district; in the other fields the damage was severe in 1, moderate in 3, slight in 6 and a trace in 2 (M.W.C.). A trace was present on widely scattered plants in 8 out of 210 fields examined in Sask. (H.W.M.). Take all was not found in Man. in 1944 (F.J. Greaney). The disease was observed in several fields of winter wheat in the Guelph and Waterloo districts, Ont.; it affected localized areas in the field (J.D. MacLachlan). This is the first report of take all to the Survey from Ont. (I.L.C.).

BASAL GLUME ROT (Pseudomonas atrofaciens). A trace was observed in 2 fields in Alta. and a general moderate infection was reported in another at Provost following damage by hail (M.W.C.). A trace occurred in a field near Rosthern, Sask. (H.W.M.).

STRIPE RUST (Puccinia glumarum). A slight infection was recorded on Dawson's Golden Chaff at the Sidney and Agassiz Stations, B.C. (W. Jones).

STEM RUST (Puccinia graminis) was first observed at Edmonton, Alta., when a trace was recorded on Aug. 19. Its development was delayed by cool weather and infection was slight even on late maturing stands in September. Infection was a trace in 9 fields and slight in 3 out of the 89 examined (M.W.C). Stem rust was observed only in the south and southeastern parts of Sask. Infection was in general very light and developed late, but it was severe in some late maturing crops (H.W.M.).

Stem rust was of very minor importance in Man. this year. Most of the commercial acreage was sown to rust resistant varieties and only slight traces of stem rust were observed in any of these stands. Stem rust infections, however, were general on Hordeum jubatum and in stands of Marquis in the experimental plots at Winnipeg, Morden, and Brandon. The rust infection on Marquis in these plots averaged 50%. Infections ranging from 5 to 50% were present on H. jubatum in many localities in southern Man. in late August. A very light sprinkling of stem rust was general on barley. However, in only a small fraction of the fields did this infection exceed 5% (B. Peturson). It may be noted that a goodly number of the collections of stem rust on Hordeum jubatum and barley in Man. proved, upon culture, to be the Secalis variety. Before the advent of rust resistant varieties, these hosts were almost always affected by the Tritici variety (M. Newton).

Stem rust slightly infected winter wheat in the Guelph district, Ont. (J.D. MacLachlan). Stem rust was not observed on wheat in the plots at Ste. Anne de la Pocatiere, Que. (C. Perrault). It was virtually absent from the plots at Fredericton, N.B., except for a trace on Dicklow (S.F. Clarkson). Traces were observed at several points in P.E.I. in August, while infections varying from 5 to 25% were recorded in September (R.R. Hurst).

In the rust nurseries (q.v.) stem rust was heavy on susceptible varieties at Brandon and Winnipeg, Man., moderate at Morden and near Ottawa, Ont., and slight to absent elsewhere (T. Johnson).

LEAF RUST (Puccinia triticina) appeared late in the season in Alta., being first observed on Aug. 15 at Edmonton. Only a trace was recorded in 6 fields and in the plots at Lacombe and Olds; a slight infection was present at Edmonton (M.W.C.). Leaf rust was more prevalent in 1944 than in the previous year in Sask. Infection was a trace in 34 fields, slight in 20, moderate in 13 and severe in 3. In four fields in the Weyburn district, infection was moderate to severe and the grain in the heads was definitely shrivelled, apparently by the rust (H.W.M.).

Leaf rust inoculum was very scarce in the air over Man. during the early part of the growing season of 1944, and although both temperature and moisture conditions were quite favourable for the establishment and development of this rust, it was not until June 20, a full week later than normal, that scattered traces of leaf rust were found in southern Man. Owing to the scarcity of initial infections rust spread rather slowly at first. However, by mid-July a light infection of leaf rust was general on susceptible wheat varieties throughout the southern part of Man. At that time wheat generally was well past the flowering stage. From then on leaf rust developed very rapidly and in early August, shortly before harvest, infections ranging from 60 to 80% in intensity were quite general in the southeastern part of the province. Infections were much lighter in the northern agricultural areas. Although leaf rust infection was quite severe, its adverse effect on the yield of early sown wheat, as judged by the comparative yields of susceptible and moderately resistant varieties in test plots located in the more heavily leaf rusted areas, was not very great. However, in late sown field plots it caused substantial yield reductions (B. Peturson).

Leaf rust was not as severe in winter wheat in the Guelph district, Ont., as in 1943 (J.D. MacLachlan). Leaf rust was severe on Marquis, Reward, and Thatcher and moderate on Triticum turgidum var. megapolitanicum in a small plot in the Montreal Botanical Garden, Que. No signs of rust were seen on T. aegilopoides, T. compactum var. creticum, T. dicoccum, T. durum, T. durum var. africanum, T. monococcum, T. polonicum var. elongatum, T. polonicum var. martinarii, T. spelta and T. turgidum var. speciosum (J.E. Jacques). Trace to slight infection was recorded on the varieties on clay at Ste. Anne de la Pocatiere, Que. (C. Perrault). A few varieties showed slight infection in the plots at Fredericton, N.B. (S.F. Clarkson). Traces were observed at two points in N.S. (J.F. Hockey), while infection was usually about 40% at several places in P.E.I. (R.R. Hurst). In the rust nurseries (q.v.) the highest infection was at Brandon, Man. and Lennoxville, Que., with high percentages at many other points. Of the commercial varieties in the test, Regent and Carleton were the most resistant (T. Johnson).

LEAF BLOTCH (Pyrenophora Tritici-repentis (Helminthosporium Tritici-repentis) was severe over a whole field near Rosetown, Sask., on June 20, and probably slightly arrested the growth of the seedlings. Perithecia were present on the stubble. No Pythium was present on the roots (T.C. Vanterpool).

BROWNING ROOT ROT (Pythium spp.) caused a trace of damage in 4 fields and slightly affected 2 others out of about 30 examined in east central Alta. in early July. Several hundred acres on fallow were affected near Winterburn, west of Edmonton. A field of Red Bobs at the University showed a 70% infection in June, but it recovered to yield about 60 bu. per acre (M.W.C.).

In the central and northern wheat growing areas of Sask. the browning root rot situation was normal; that is, in localities where the disease is commonly conspicuous the majority of summer-fallow wheat fields were highly to moderately infected, with an occasional one showing severe symptoms. There was also a normal or above normal infestation on the Regina plains (see report of the Dom. Lab. of Plant Pathology for this year), but on the same clay soil type in the Rosetown area, no fields showing heavier than slight infestations were recorded. So-called 'recovery' from the disease was observed in many districts owing to the moist and relatively cool conditions prevailing till well on into the summer. This actually means that the plants in diseased areas were not stunted, but the early damage caused by reduced tillering was still reflected in lower yields. An oat field following fallow at Saskatoon showed a moderate infestation with accompanying root-tip necrosis. This brings out the fact, not sufficiently recognized, that oats and barley when grown on fallowed land may be as heavily attacked as wheat under the same conditions. Many farmers who, during the drought and depression years, had reduced the applications of phosphatic fertilizer or had ceased using it entirely, are again increasing their purchases of phosphate. Obviously then, in estimating the severity of the disease in a district for any given year, a careful survey would have to be made of the number of fertilized and unfertilized fields, since adequate applications of phosphate will ordinarily eliminate the 'browning' symptoms. The Agricultural Committee of the Regina Board of Trade have improved the situation for 1945 in procuring from the Wartime Prices and Trades Board increased quotas on phosphatic fertilizers and fertilizer machinery attachments for the province (T.C. Vanterpool).

In a limited survey made June 13-17 between Saskatoon and Indian Head, particularly in the Regina area, browning root rot was found to be present in epidemic form on heavy land, south and east of Regina. On June 2, leaf symptoms were evident from the highway near Indian Head (H.W.M.).

A survey made in late June revealed little browning root rot, although many fields in the Red River Valley and the Portage Plains of Man. suffered considerably from water damage. A trace of the disease was found in a field at Forrest. There was almost no loss from the disease in Man. in 1944 (F.J. Greaney).

GLUME BLOTCH (Septoria nodorum). Infection was a trace in 8 fields, slight in 3 and moderate in 2 out of 89 examined in Alta.; a moderate infection was present on several varieties at Edmonton and a trace at Olds (M.W.C.). Diseased specimens were received Aug. 24 from Bresaylor, Sask. (T.C. Vanterpool). A slight to moderate infection was found in 12 out of 21 fields examined in P.E.I. (R.R. Hurst). Septoria nodorum was moderate in the rust nurseries (q.v.) at

Brandon, Winnipeg, Morden, Man.; Kapuskasing, Ont.; Macdonald College, Lennoxville, Ste. Anne de la Pocatiere, Que., and Fredericton, N.B., with lesser amounts at several other places (T. Johnson).

SPECKLED LEAF BLOTCH (Septoria spp.). A slight infection by S. Tritici was present on Rideau and Ridit in May at Agassiz, B.C. (W. Jones). Speckled leaf blotch was unusually prevalent and severe in central Alta. in 1944; infection was a trace in 6 fields, slight in 12, moderate in 13 and severe in 19. Infection was severe on some late-maturing varieties at Edmonton and ranged from a trace to slight in the plots at Lacombe and Olds. Both S. nodorum and S. Tritici were found in specimens examined (M.W.C.). Septoria Tritici was observed in rust nursery (q.v.) material from Edmonton and Lacombe only (T. Johnson). Leaf spots of various kinds were recorded in 33 out of 210 fields examined in Sask. In 5 in the northeastern part of the province, where the pathogen was identified as S. nodorum, the damage was moderate to severe (H.W.M.).

Light to moderate infections by certain species of Septoria occurred on cereals in Man. in 1944. Trace or light infection of Septoria nodorum was found on wheat in four localities (Winnipeg, Macdonald, McCreary, Gilbert Plains) and moderate infection in one (Melita).

A strain of Septoria of the general type of S. nodorum, but with longer spores that conform in size with Septoria Avenae, was found rather commonly throughout the province in the late summer on wheat and occasionally on barley. Infections were mostly trace or light, but in the latter part of August heavy infections were noted on wheat at Gimli and Kenville, and on both wheat and barley at Winnipeg. Infection, unlike that of S. nodorum, was largely confined to the leaves and was followed, at Winnipeg and Gimli, by abundant development of perithecia of Leptosphaeria in early September.

Septoria Passerinii was found at three points, Morden, Brandon, and Neepawa, infection varying from light to moderately heavy. Septoria Avenae was observed at Winnipeg, only trace infection being present (T. Johnson).

BUNT (Tilletia caries and T. foetida). A summary of car inspections for the first quarter of the grain year 1944-45 was prepared by W. Popp from the records of the Western Inspection Division. The results are presented in Table 1.

Table 1. Wheat Bunt in Western Canada

Summary of Inspections from August 1 to October 31, 1944

Class of Wheat	Cars Inspected	Cars Graded Smutty	Percentage Graded Smutty
Hard Red Spring	61,865	214	0.34
Amber Durum	1,300	33	2.54
White Spring	14	0	0.00
Alberta Red Winter	121	1	0.82
Garnet	262	2	0.76
Mixed Wheat	35	0	0.00
All Classes	63,597	250	0.39

There appears to be a distinct increase in the amount of bunt in the 1944 crop over the previous year, if the percentage of cars graded smutty in the first quarter of the 1944-45 grain year is any indication. Although the figure is still small, it is the highest of the war years.

Bunt affected about 35% of the heads in a field at Lousana, Alta., 2% in 1 and a trace in 3 (M.W.C.). Infection was 35% in one field, 12% in 1, 1-2% in 3 and traces in 5, all located in the southwestern to western part of Sask. An examination, by the Associated Laboratory Service, of over 2,000 samples of 1943 seed to be sown on Sask. farms in 1944 revealed 79.6% of the samples free from bunt spores, while the spore load was a trace in 16.9%, slight in 2%, moderate in 1.3% and heavy in 0.2% (R.C. Russell).

LOOSE SMUT (Ustilago Tritici) affected 5-10% of the heads in a field of Red Bobs at Fort Saskatchewan, Alta.; a trace occurred in 8 other fields (M.W.C.). Infection was a trace to moderate in winter wheat about Guelph, Ont. (J.D. MacLachlan). Loose smut was observed in one field in P.E.I. (R.R. Hurst).

BLACK CHAFF (Xanthomonas translucens). A trace was found in 1 field in Alta. (W.C. Broadfoot). Black chaff was recorded in Man. as follows: X. translucens f. sp. cerealis, severe on leaves of several varieties at Morden and slight at Winnipeg; X. translucens f. sp. undulosa slight at Headingly, Ste. Rose du Lac and Winnipeg; f. sp. undetermined, slight, at Brandon (W.A.F. Hagborg).

A head blight, due to bacteria, was severe at least at Erinferry and Paddockwood, Sask., on Thatcher. The lower parts of the fields were the more seriously affected. It is thought that wet, cool conditions favoured the disease, which killed the heads. Saprophytic fungi then developed on the standing grain, resulting in large blackened areas in the fields. There are indications that in some years the new rust resistant varieties may suffer heavily from bacterial diseases in northern Sask.; cf. P.D.S. 22:7 sub Head Discoloration (T.C. Vanterpool).

OATS

ERGOT (Claviceps purpurea). A trace was found in the plots at Edmonton, Alta. (L.E. Tyner).

ANTHRACNOSE (Colletotrichum graminicola). The fungus was isolated from the roots of a slightly affected sample sent from Beaverlodge, Alta. (G.B. Sanford). Anthracnose caused severe damage in an area 25 yards square in the corner of a field at Zelma, Sask. Affected plants were definitely shorter than the normal and had a bleached appearance; no grain was present in the panicles and the basal parts were markedly darkened by the fungus. The disease has not been observed by me on oats since 1928 (T.C. Vanterpool). The pathogen was found on the mesocotyl of 2 samples of oats examined during the root rot survey (H.W.M.)

POWDERY MILDEW (Erysiphe graminis) moderately affected the leaves of Hermit, a winter oat, at the Sidney Station, B.C., on May 4. It was also recorded at the Agassiz Farm and at the University, Vancouver (W. Jones). It was moderate in the rust nursery at Saanichton (T. Johnson).

COMMON ROOT ROT (Fusarium spp.). Damage was a trace in 4 fields and slight in 3 out of 40 examined in Alta. (M.W.C.). Infection was slight in 3 fields and moderate in 31 out of 41 fields examined in Sask. (B.J. Sallans). Pre-maturity blight was fairly common and this year was often associated with severe blast (H.W.M.).

HEAD BLIGHT (Fusarium spp.). A trace was observed in one field near Montague, P.E.I. (R.R. Hurst).

LEAF BLOTCH (Helminthosporium Avenae). Infection was a trace in 8 fields, slight in 16 and moderate in 1 out of 40 examined in Alta. Infection ranged from slight to moderate on the varieties at Edmonton and a trace to slight at Lethbridge (M.W.C.). The disease was common on the lower leaves of oats in early July in the O.A.C. plots and in the fields in the Guelph and Waterloo districts, Ont. (J.D. MacLachlan). Traces were recorded in plots on clay soil at Ste. Anne de la Pocatiere, Que. (A. Payette). Leaf blotch varied from a trace to 40% averaging about 10% in the plots at Fredericton, N.B. (S.F. Clarkson). Infection was slight at South River, Mabou, Waterville and South Alton and moderate at Somerset out of 11 fields examined in N.S. (J.F. Hockey). Traces were observed in late sowings in P.E.I. (R.R. Hurst).

HETEROSPORIUM LEAF SPOT (H. ?maculatum Klotzsch) was slight to moderate on 2806-123 in the Cereal Division plots, Ottawa, Ont., on July 10. Spots were nearly white with a narrow orange-yellow margin, irregularly oval to rectangular, 4-37 x1.5-6 mm. Spores finely echinulate, olive brown, mostly 2-celled, 9.3-16.3 x 4.6-6.5 microns; a few, 4-celled, 17-24.8 x 6.2 microns; conidiophores 55.8-96.1 x 3.1-4.6 microns (R.G. Atkinson).

HALO BLIGHT (Pseudomonas coronafaciens). Infection was a trace in 2 fields and slight in 3 in Alta.; infection was a trace to severe on the varieties at Lacombe (M.W.C.). Halo blight was fairly common in the earlier cool part of the summer in Sask., but it did not spread later when the weather was hot and dry; it was observed in 7 out of 41 fields examined (H.W.M.). In the University plots located at Star City, the reactions of the varieties were recorded giving 0 = susceptible, and 10 = fully resistant. By this scale, Gopher = 9, Vanguard = 9, Valor = 6, and a numbered line = 3. Most of the common varieties showed some resistance (J.B. Harrington). Halo blight infection was slight at Binscarth and Winnipeg, Man., and moderate at Woodside. The organism was isolated from each collection by W.A.F. Hagborg and found to be pathogenic in every case (W.L.G.). A heavy infection was observed in one field in Queens Co., P.E.I. on July 17 (R.R. Hurst).

CROWN RUST (Puccinia coronata) caused some damage in eastern and southeastern Sask.; a trace was present in a plot at Saskatoon (H.W.M.). Heavy infections of crown rust developed on oats throughout the whole of the southern half of the agricultural area of Man. and light infections of this rust were general in the northern areas. In the heavily rusted areas the intensity of infection in many fields ranged up to 80% (B. Peturson). In contrast to 1943, resistant varieties were not materially affected about Guelph, Ont. On susceptible varieties, infection was moderate to severe particularly on late sowings (J.D. MacLachlan). Crown rust slightly affected Cartier, Tartarian and A. brevis, while infection was moderate on Vanguard and

severe on hull-less at the Botanical Garden, Montreal, Que. (J.E. Jacques). Crown rust was absent in the plots at Ste. Anne de la Pocatiere, Que. (A. Payette), and at Fredericton, N.B. (S.F. Clarkson). Traces of crown rust were found in 3 out of 10 fields examined at widely separated points in N.S.; one field at St. Croix was about 200 yards from a buckthorn hedge (J.F. Hockey). The intensity of infection ranged from traces to 40% in fields examined in September in all 3 counties of P.E.I. (R.R. Hurst). In the rust nurseries (q.v.) infection was severe in Man. and moderate at Geulph, Ont., and Fredericton, N.B. Of the commercial varieties in the test, Erban was the least susceptible (T. Johnson).

STEM RUST (Puccinia graminis) was general on volunteer plants in one field near Victoria, B.C. (W. Jones). Infection was a trace in 12 fields and slight in 9 out of 40 examined in Alta. It was first observed at Edmonton on Aug. 24. Telia were present in the unusually severe local infections in the plots in September (M.W.C.). Stem rust was very light in Sask.; infection was a trace in 4 fields, slight in 1 and moderate in 1 out of 41 examined (H.W.M.).

Stem rust infections began to appear on wild oats (Avena fatua), and on susceptible oat varieties, in southern Man., during the 2nd week in July. Scattered trace infections also appeared in many stands of the new rust resistant oat varieties. The infections on wild oats and on susceptible varieties increased considerably and by mid-August ranged from 40 to 80%. The infections on resistant varieties, however, increased very slowly and in most fields ranged from scattered chance pustules to very light infections averaging less than 1% at time of harvest. Greenhouse investigations showed that the infections on the rust resistant varieties were caused by physiologic races 8, 10, and 11 of Puccinia graminis Avenae all of which are capable of infecting these varieties. These three races were, however, less prevalent than last year and comprised only a small percentage of the rust collected on susceptible hosts. As stated a year ago, no prediction can be made at this time regarding the prevalence of these races in the future, but it is encouraging to note that apparently a slight decrease in their prevalence occurred this year (B. Peturson).

Stem rust developed but little on resistant varieties, in contrast to 1943, about Guelph, Ont., while it was moderate to severe in susceptible varieties (J.D. MacLachlan). A new variety, named Beaver, a cross between Vanguard and Erban, has been licensed and is being distributed to members of the Canadian Seed Growers' Association for propogation. "In tests conducted to date it appears to mark an improvement over both parents both in yield and quality quite apart from its ability to resist both rusts." (L.H. Newman). A slight infection was observed on Erban and Avena strigosa at the Botanical Garden, Montreal, Que. (J.E. Jacques). Stem rust was not observed in the plots at Ste. Anne de la Pocatiere, Que. (A. Payette). Infection was zero or a trace in variety plots at Fredericton, N.B. However, in a separate trial, 10 varieties of oats, 5 of wheat and 2 of rye were sown in a plot adjacent to the alternate hosts, Berberis vulgaris and Rhamnus catharica on June 6. The seed was kindly supplied from Winnipeg and Ottawa. Aecia were mature on the barberry on June 22, and on the buckthorn on June 23. A moderate to severe infection developed on the oat varieties as shown below:

Variety	Crown Rust	Stem Rust
Ajax	55%	0
Roxton	trace	trace
Bond	15	65
Erban	70	55
Vanguard 7	60	trace
Victory	75	15
Mabel	15	3
2806-123	65	25
2797-69	2	3
R.L. 1272	0	0

Stem rust was not observed on the wheats, although Garnet and Marquis were two of the varieties. The rye varieties, Prolific and Ottawa Selection, showed 65 and 70% infection respectively. Some of the susceptible oats varieties were sown on May 16 about 400 yards from the alternate hosts. Little, if any rust developed on this sowing, whereas these same varieties sown adjacent to the alternate hosts were severely infected. It would appear that the early sown varieties escaped infection because of their more advanced stage of growth before the rust reached them. The same experiment was conducted in 1943, except the sowing was limited to a few oat varieties. The results in 1944 agree closely with those obtained in 1943 (P.D.S. 23:9 and 10). Mature aecia of P. graminis were also observed in Victoria Co. on June 29, in Westmorland Co. on July 3 and in Charlotte Co. on July 7 (S.F. Clarkson). A slight infection was observed in 3 fields and a trace in one examined on Aug. 18 in N.S. Old aecia were observed on barberry in Guysboro Co., on Aug. 1 (J.F. Hockey). Stem rust infections varying from 10 to 65% were observed in all three counties in P.E.I. in September (R.R. Hurst). In the rust nurseries (q.v.) stem rust was severe in Man.; Guelph, eastern Ont.; and Fredericton, N.B. In a nursery near Ottawa, Vanguard was moderately affected (T. Johnson).

BROWNING ROOT ROT (Pythium spp.) was found on oats on summer fallow at Nampa and Winterburn, Alta. (A.W. Henry). The disease was observed on Exeter on a summer fallow plot at Saskatoon, Sask.; root-tip necrosis, which is ordinarily less noticeable in oats than in wheat, was conspicuous. See also p. 5 of this MS. (T.C. Vanterpool).

SPECKLED LEAF BLOTCH (Septoria Avenae) was slight on Exeter at the Agassiz Farm, B.C. (W. Jones). The disease was observed in 3 fields - trace, slight, and moderate in Alta. (M.W.C.). A heavy infection was observed on the lower leaves of 2806-123 at Ottawa, Ont. (R.G. Atkinson). Infection was moderate in the oat plots on clay with lesser amounts in the plots on sandy soil at Ste. Anne de la Pocatiere, Que. (A. Payette). Infection ranged from trace to 25% and averaged nearly 7.5%, at the Station, Fredericton, N.B., being slightly less prevalent than leaf blotch (S.F. Clarkson).

SMUTS (Loose Smut, Ustilago Avenae and Covered Smut, U. Kolleri). Smut infection was a trace in 2 fields, and 2%, 4% and 12% in 1 field each in Alta. (M.W.C.). A trace of loose smut was recorded in 5 fields in Sask. Covered smut infection, on the other hand, was a trace in 11 fields, 1-4% in 8, 5-10% in 4 and 15-30% in 3 out of 41 examined. Associated Laboratory Service

found 27.5% of the samples of 1943 crop clean, with infection a trace in 51.9%, slight in 10.7%, moderate in 7.1% and heavy in 2.8% (H.W.M.); In field tests, naturally inoculated seed showed a moderate amount of smut, with a uniform increase in the number of smut heads with each increase in the spore load. The two sowings, May 4 and May 22, gave about the same amounts of smut (R.C. Russell). Smut was present in 15 out of the 17 fields examined in Man., the average infection being 3.7% and heaviest infection 18% (W.L. Gordon). Loose smut was less severe about Guelph, Ont. than in 1943 (J.D. MacLachlan). In 11 fields examined in N.S., infection mostly due to U. Avenae averaged 3%, the highest being 19% (J.F. Hockey). Heavy infections of loose smut were noted in 10 fields, and traces to 10% in 25 others in P.E.I. (R.R. Hurst).

BLAST (non-parasitic) was recorded as follows: slight in Victory, Eagle, and Alaska in the University plots, Vancouver, B.C. (W. Jones); trace in 10 fields, 5% in 12, 10% in 10 and 15-20% in 8 out of 40 examined in Alta., with 10% in most varieties at Edmonton (M.W.C.); moderate amounts in 23 out of 41 fields examined in Sask. (H.W.M.); trace in a field at Kelwood, Man. (W.A.F. Hagborg); 20-30% in most varieties at Ste. Anne de la Pocatiere, Que. (A. Payette); generally trace to slight, up to 12% in the plots at Fredericton, N.B. (S.F. Clarkson); about 10% of blast in all 8 varieties in the plots at River Denys, Inverness Co., N.S. (J.F. Hockey); a slight amount in all fields examined in P.E.I. (R.R. Hurst).

MAGNESIUM DEFICIENCY was observed in 10 fields in Kings and Queens Co., P.E.I.; the lack of magnesium was confirmed by tissue tests (R.R. Hurst).

GREY SPECK (manganese deficiency). A disease of oats, thought to be grey speck, was observed for several years in experimental plots at Winnipeg, Man. At times it was common enough to render examinations for halo blight difficult as the lesions in advanced stages were not always easy to distinguish from the advanced lesions of halo blight. It was severe in 1933, 1939 and 1941. At Winnipeg the disease occurred in patches and was much more severe on some varieties and strains than on others. What appeared to be the same disease in a more severe form was noted at Gilbert Plains, in July, 1942.

In the fall of 1943, a quantity of soil was taken from a patch in an oat experiment where severe symptoms of this disease were noted. A pot experiment with oats was conducted in which careful precautions were taken against contamination with manganese from extraneous sources. In this soil, grey speck developed abundantly, but it was absent where manganese sulphate was applied either dry to the soil or as a solution sprayed only once on the seedlings.

In 1944 experiments conducted at Gilbert Plains, on the field suspected of manganese deficiency, gave a good response to manganese sulphate, both in control of grey speck and in improved yield. That the response was not due to sulphate application was evident from a pot experiment conducted with soil from the field at Gilbert Plains. In this experiment a series of pots with manganese sulphate or manganese chloride gave control of grey speck, while a similar series of pots with equivalent amounts of sodium sulphate, sodium chloride or with nothing added failed to control grey speck (W.A.F. Hagborg).

PURPLE DISCOLORATION (?phosphate deficiency). Specimens were received from Indian Head, Sask., where the trouble was conspicuous in the field (T.C. Vanterpool).

FUNGICIDE INJURY. Seed oats treated with an overdose of Ceresan were slightly to moderately injured on a farm in P.E.I. (R. R. Hurst).

BARLEY

ERGOT (Claviceps purpurea). A half to 1% of the heads were affected in 3 fields out of 70 examined in Alta.; plants along the edge of some fields at Edmonton were severely affected (M.W.C.). A trace were present in scattered fields in Sask. (H.W.M.) Ergot was observed occasionally at Guelph, Ont. (J.D. MacLachlan). A trace of ergot was present at Pictou and Nappan, N.S. (J.F. Hockey). A trace was recorded in one field of Charlottetown 80 in P.E.I. (R. R. Hurst).

POWDERY MILDEW (Erysiphe graminis). Infection was general but slight in the plots at the Sidney Station, B.C., on May 4; the disease was general on the varieties at the Agassiz Farm on May 26, being severe on fall sown Plush, moderate on Peatland and slight on Olympia and Trebi (W. Jones). Infection was severe on Rex in the University plots, Winnipeg, Man. (W.L.G.). Powdery mildew was severe, especially on early sown varieties at Guelph, Ont.; it is considered the most important disease of barley in this district (J.D. MacLachlan). Trebi and O.A.C. 21, both six-rowed varieties, were heavily infected and many leaves were killed, while the two-rowed barleys, Hannchen and Duckbill, were only slightly affected although they were all growing together in the same plot at the Botanical Garden, Montreal, Que. (J.E. Jacques). Traces were recorded on Charlottetown 80 in 3 fields in Queens Co., P.E.I. (R.R. Hurst). In the rust nurseries (q.v.) powdery mildew was severe at Saanichton and Agassiz, B.C., and moderate at Kemptville, Ont. (T. Johnson).

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.). A trace was recorded in 2 fields and slight damage in 9 out of 70 examined in Alta. (M.W.C.). Infection was slight in 1 field and moderate in 32 in the fields examined in Sask. (B.J. Sallans).

NET BLOTCH (Helminthosporium teres). Infection was a trace in 4 fields, slight in 10, and moderate in 1 (H.W.M.). The disease was general and particularly severe in the northern part of Man. (W.L.G.). Infection ranged from a trace to moderate in the plots at Ste. Anne de la Pocatiere, Que. (A. Payette). Infection varied from a trace to 45% and averaged over 12% in the plots at Fredericton, N.B. (S.F. Clarkson). A slight infection was recorded at Pictou, N.S. (J.F. Hockey).

SPOT BLOTCH (Helminthosporium sativum). Infection was a trace in 8 fields and slight in 10 out of 70 examined in Alta.; a slight infection was present on most varieties at Edmonton, Olds, and Lethbridge (M.W.C.). The disease was present on the lower leaves in field plots at O.A.C., Guelph, Ont., in early July (J.D. MacLachlan).

LEAF RUST (Puccinia anomala) was severe on fall sown Trebi and Peatland and moderate on Plush and Olympia at Agassiz, B.C. (W. Jones). Slight traces of leaf rust of barley occurred on barley varieties at Morden, Man. Elsewhere in the province this rust was not observed (B. Peturson). Leaf rust was moderate at Guelph, Ont. (J.D. MacLachlan). A trace was recorded in a field of Charlottetown 80 in Prince Co., P.E.I. (R.R. Hurst).

STEM RUST (Puccinia graminis). A trace was recorded in 2 fields and a slight infection in one in Alta.; at Edmonton stem rust was first observed on barley on Aug. 15 and a slight general infection was present by Sept. 1 (M.W.C.). Stem rust was a trace in 2 fields, slight in 2, moderate in 1 and severe in 1, all located in the southeastern part of Sask. A trace was also noted at Saskatoon (H.W.M.). For Man., see under wheat.

Stem rust infection was moderate at Guelph, Ont. (J.D. MacLachlan). Stem rust was not observed in the plots at Ste. Anne de la Pocatiere, Que. (A. Payette). A trace was present on a few varieties at Fredericton, N.B. (S. F. Clarkson) and on a few plants in a single row in the smut control plots at Kentville, N.S. (J.F. Hockey). In the rust nurseries (q.v.) stem rust was severe at Winnipeg and moderate at Morden, Man., and at Guelph and Ottawa, Ont. (T. Johnson).

BROWNING ROOT ROT (Pythium spp.). A light infection was found on 80% of the plants in one field at Indian Head, Sask. (H.W.M.).

SCALD (Rhynchosporium Secalis) was severe on Trebi x Sol 14 and slight to moderate on the other varieties on May 4 at Sidney, B.C.; a trace was also present on fall sown Trebi and Plush at Agassiz on May 26 (W. Jones). Scald infection was a trace in 7 fields, slight in 13, moderate in 7 and severe in 3 out of 70 examined in Alta.; the disease was severe on most varieties at Beaverlodge and Olds and moderate to severe at Lacombe and Edmonton (M.W.C.).

SPECKLED LEAF BLOTCH (Septoria Passerinii). Infection was a trace in 7 fields, slight in 4 and moderate in 8 in Alta.; it ranged from moderate to severe in the plots at Edmonton and from slight to severe at Lacombe (M.W.C.). In the rust nurseries (q.v.) the disease was moderate at Melfort, Sask., and Brandon, Man.; slight at Edmonton, Alta. and Morden, Man. (see also under wheat) and a trace at Kapuskasing, Ont. (T. Johnson).

COVERED SMUT (Ustilago Hordei). Infection was a trace in 3 fields, slight in 4 and moderate in 2 in Alta. (M.W.C.). Covered smut was more prevalent than in 1943, being recorded in 10 fields out of 30 examined in Sask.; infection was a trace to 4% in 8, 5-10% in 2 (H.W.M.). Infection from naturally inoculated seed was comparatively light in field plot tests, but it increased in intensity with each increase in the spore load. More smut developed in the May 4 sowing than that of May 25, which is the reverse of last year (R.C. Russell).

LOOSE SMUTS (True Loose Smut, Ustilago nuda and False Loose Smut, U. nigra). In a survey conducted by the Line Elevators Farm Service in co-operation with the Dominion Laboratory of Plant Pathology, Winnipeg, Man., it will be seen from Table 2 that

Table 2. Distribution of the loose smuts of barley by provinces.

Smut	Man.	Sask.	Alta.	Total
U. nuda	82	202	129	413
U. nigra	65	98	21	184
Total	147	300	150	597

"U. nigra is relatively much more important in Man. than it is in Alta., while Sask. occupies an intermediate position". U. nigra was present in 44% of the collections in Man., 35% in Sask., and 14% in Alta. It was also shown that both species occur in a wide range of barley varieties. Although U. nigra was found to occur in barley grown from treated seed, "its incidence, relative to U. nuda is much higher in the crop grown from untreated seed". This relation probably accounts for the lower incidence of U. nigra, to U. nuda, in Alta. in contrast to their occurrence in Man. for over 85% of the samples were treated in Alta. against 50% in Man.

Loose smut was present in 33 out of the 70 fields visited in Alta.; infection was trace in 18 fields, slight in 5, 5-10% in 8 and 20-25% in 2. A collection of smut was made from each field; when the spores were germinated, 32 collections proved to be U. nuda and one U. nigra (W.C. Broadfoot). A slight infection was found in Newall at Edmonton, Lacombe and Olds (M.W.C.). Loose smut was observed in 12 fields out of 30 examined (H.W.M.). A sample of Plush of the 1943 crop from Wauchope, Sask., produced a crop in the greenhouse with 2.3% of the heads affected by false loose smut (R.C. Russell). In all 56 samples of loose smut were collected in Que. in 1944 and the spores were germinated using the technique of last year; 75% proved to be U. nuda and 25% U. nigra, a drop of nearly a third over 1943 (R.O. Lachance). A trace of loose smut was recorded in one field in Queens Co., P.E.I. (R.R. Hurst).

BACTERIAL BLIGHT (Xanthomonas translucens). About 25% of the plants were affected in a field near Lacombe, Alta. (A.W. Henry). A slight infection was observed on leaves and heads of barley at Swift Current, Sask. (B.J. Sallans).

RYE

ERGOT (Claviceps purpurea) was recorded as follows: A rather heavy infection observed in an orchard in the Okanagan Valley, B.C. (H.R. McLarty); a trace to slight infection found in 2 fields in Alta. and in the plots at Olds (M.W.C.); present in most rye crops in Sask., but the infection generally light to moderate (H.W.M.).

POWDERY MILDEW (Erysiphe graminis). Infection was general but light on Prolific and Storm at Point Grey, B.C., on July 20 (W. Jones). Powdery mildew was severe on Prolific in the Botanical Garden, Montreal, Que., on Aug. 3 (J.E. Jacques).

ROOT ROT (Helminthosporium sativum). A slight infection was found at Airdrie, Alta., in one of the two fields examined (M.W.C.).

LEAF RUST (Puccinia secalina) was general, but damage slight on Prolific at Point Grey, B.C. (W. Jones). A trace to slight infection was seen in 2 fields in Alta. (M.W.C.). Infection was moderate in 2 out of 5 fields examined in Sask. (H.W.M.). A slight infection was present on Rosen winter rye at the Botanical Garden, Montreal, Que. (J.E. Jacques).

SPECKLED LEAF BLOTCH (Septoria Secalis) slightly infected rye in one field in Alta. (M.W.C.).

SURVEY OF RUST NURSERY MATERIAL FOR PLANT DISEASES IN 1944

T. Johnson

In Table 3 are given the results of examinations of material from the 26 uniform rust nurseries across Canada. The examinations were carried out at the Winnipeg Laboratory.

Twelve varieties of wheat, eight of oats and three of barley were grown in the nurseries. The varieties were as follows: Wheat - Apex, R.L. 228 (Marquis x Kanred), McMurchy, Regent, Carleton, Little Club, Marquis, Renown, Spelmar, Thatcher, Vernal, and Norka; oats - Bond, Erban, Trispernia, Ajax, Vanguard, White Russian, S-811, and R.L. 1228 (Victoria x 524); barley - Goldfoil, Heil's Hanna, and Plush. Varieties now or formerly of commercial importance are underlined.

As pointed out last year (P.D.S. 23:16), it is probable that few diseases have an opportunity of reaching their maximum in these nurseries. Readings for each disease were made on all varieties and separate tables were prepared for the intensity of infection of the rusts and powdery mildew and for the physiologic races of the rusts isolated. These detailed tables, however, are omitted and only Table 3, in which the severity of each disease on the more susceptible varieties for each Station is shown, has been included here.

PHYSIOLOGIC RACES OF CEREAL RUSTS IN CANADA IN 1944

Margaret Newton, T. Johnson, B. Peturson and W.J. Cherewick

In 1944, surveys were made of the distribution, in Canada, of physiologic races of the following cereal rusts: Puccinia graminis var. Tritici, P. graminis var. Avenae, P. triticina, P. coronata var. Avenae and P. anomala.

Cultures were also established in spring and early summer from aecia occurring naturally on barberry and buckthorn in certain areas in Eastern Canada. The object of these studies was to determine which varieties of stem rust most commonly infected the barberry and which physiologic races of the crown rust of oats were present in the aecial material.

Table 3 - Pathogenic fungi found present on wheat, oats, and barley grown at 26 localities in Canada in 1944

Locality	Wheat							Oats			Barley			
	P. graminis Tritici	P. triticina	S. nodorum	S. Tritici	Fusarium spp. (Scab)	E. graminis	Melanism (on Apex, Renown, etc.) *	P. graminis Avenae	P. coronata Avenae	E. graminis	P. graminis	P. anomala	E. graminis	S. Passerinii
Saanichton, B.C.	0	1	0	0	0	4	0	1	0	3	0	0	4	0
Smithers, B.C.	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Agassiz, B.C.	0	4	0	0	2	0	2	3	0	0	0	0	4	0
Creston, B.C.	1	4	0	0	0	1	0	0	0	0	1	1	0	0
Beaverlodge, Alta.	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Edmonton, Alta.	0	1	2	2	0	3	0	1	0	0	0	0	0	2
Lacombe, Alta.	0	1	1	2	0	1	1	1	0	0	0	0	1	0
Lethbridge, Alta.	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Scott, Sask.	1	1	0	0	0	0	0	1	0	0	1	0	0	0
Melfort, Sask.	1	2	2	0	0	0	0	1	0	0	0	0	0	3
Indian Head, Sask.	1	2	1	0	0	0	1	1	0	0	1	0	0	0
Brandon, Man.	4	4	3	0	0	0	2	4	4	0	2	0	0	3
Winnipeg, Man.	4	4	3	0	0	0	2	4	4	0	4	1	0	0
Morden, Man.	3	4	3	0	0	0	1	4	4	0	3	1	0	2
Kapuskasing, Ont.	2	4	3	0	0	0	1	2	1	0	1	0	0	1
St. Catharines, Ont.	1	4	1	0	0	0	2	0	1	0	1	1	0	-
Guelph, Ont.	2	4	2	0	1	1	1	4	3	0	3	1	1	-
Kemptville, Ont.	1	4	2	0	0	1	1	4	2	0	2	0	3	0
Blair's, Manotick, Ont.	3	3	2	0	0	3	1	4	2	0	3	0	1	-
Ottawa, Ont.	2	3	2	0	0	3	1	4	2	0	3	1	1	-
Macdonald College, Que.	1	4	3	0	3	1	2	1	1	0	1	0	2	0
Lennoxville, Que.	1	4	3	0	2	1	2	1	1	0	1	0	0	-
Ste. Anne de la Pocatiere, Que.	2	4	3	0	0	0	1	1	1	0	1	0	0	0
Fredericton, N.B.	1	4	3	0	0	0	3	4	3	0	1	0	0	0
Kentville, N.S.	2	1	2	0	0	0	1	0	0	0	0	0	0	0
Charlottetown, P.E.I.	1	1	1	0	0	0	1	1	0	0	0	0	0	0

* Melanism of heads and internodes - confined to derivatives of Hope and H 44 and probably induced by more than one agency.

Explanatory note:

0 = none; 1 = trace; 2 = light; 3 = moderate; 4 = severe; - = plants not examined for presence of organism.