I. DISEASES OF CEREAL CROPS

WHEAT

HEAD DISCOLORATION (Alternaria, etc.). Although 1940 was not a root-rot year in Sask., head troubles were conspicuous. Fairly soon after the wheat crop headed, many samples of bleached or partially bleached heads were received. In the partially affected heads, sometimes the upper half, and sometimes the lower was injured. These troubles were attributed, in some cases with supporting field evidence, to drought or hot dry winds, frost, or slight hail injury. These were followed, until the grain was cut, by specimens showing head discolorations, involving the glumes and usually the rachis. The discolorations were referable to kernel smudge (Helminthosporium, Fusarium, Alternaria), black chaff, and glume blotch (Septoria). (T. C. Vanterpool).

Head discoloration was widespread in Sask. on Apex and was severe on heavy and late crops of this variety. It was also noted in Red Bobs at the University, Saskatoon. Discoloured kernels from affected heads yielded mostly Alternaria, but also a few Helminthosporium spores, when they were placed on moist sterile filter paper in a Petri dish. Head discoloration was almost completely absent in Que., N.B., N.S., and P.E.I.; traces were recorded at Ste. Anne de la Pocatiere, Que., and at Truro and Nappan, N.S.; 5% of the heads were discoloured at Boudreau, N.B.

ERGOT (Claviceps purpurea). A trace to slight infection was found in 6 fields out of 164 examined in Alta., and also in the plots at Edmonton and Lacombe. An examination of about 35 fields in the Alameda-Northgate area, Sask., revealed ergot in every field of durum wheat, and in some, 0.5 to 1.0% of the heads were infected; no ergot was found in common wheat. A trace was recorded in wheat at Hartland and Boudreau, N.B.

ROOT ROT (Cryptoascus sp.) was abundant on Huron in one section of a field at Charlottetown, P.E.I.

POWDERY MILDEW (Erysiphe graminis) moderately infected Sun winter wheat in May in the plots at Sidney, B.C. It was general in plots at Edmonton, infection ranging from a trace to moderate; infection was moderate on late-maturing varieties at Lethbridge. A plot of Thatcher at Aylsham, Sask., was severely infected. Powdery mildew was common to abundant in Que. It was severe on Little Club and Thatcher in the Uniform Rust Nursery, Fredericton, N.B.

HEAD BLIGHT (chiefly Fusarium spp.). Slight to moderate infections were observed at Vegreville and in the plots at Lethbridge, Alta. Blighted heads of the Fusarium type were fairly common in fields at Melfort, Tisdale, and Pontrillas, Sask. and scabby kernels were present in threshed grain from Indian Head. Material showing blight due to Helminthosporium sativum was received from Gronlid and Scott. In Man., 2% of the heads were affected at Roblin, as well as a trace at Binscarth (Fusarium Scirpi var. acuminatum and Helminthosporium sativum isolated)

and at Winnipeg (F. Poae, F. Scirpi and F. Scirpi var. acuminatum). About 10% of the heads were said to be affected in winter wheat in western Ontario; isolations were made from two samples, one from Ailsa Craig (F. graminearum) and one whose location was not stated (F. graminearum and H. sativum). Diseased specimens were collected at Ottawa (F. graminearum and F. Poae). Head blight was virtually absent in Que., N.B., N.S., and P.E.I.; 3% of the heads were affected at Gillespie, N.B. (F. graminearum); a trace occurred in Garnet at Truro, N.S., and a trace was present at Charlottetown, P.E.I. (F. graminearum and F. Poae). The fungi reported within the brackets were isolated and determined by W. L. Gordon.

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.). No survey was made in the southern part of Alta. owing to dry conditions prevailing there; the disease was about as prevalent as usual in the central and northern sections. Infection in 85 out of the 164 fields examined was a trace in 44 fields, slight in 25, moderate in 12, and severe in 4.

All three major root rots of cereals were less common than usual in Sask. Common root rot was observed in 173 out of 188 fields examined. The average infection was moderate and did not vary greatly over the province, except in a few fields or districts. In three districts, Grenfell, Saltcoats and Alameda, wheat was patchy and common root rot was conspicuous at harvest time on the remaining plants. Data from several rotations at Illustration Stations indicated that infection was less severe than in 1938 or 1939. T. C. Vanterpool reports that when wheat plants were collected at harvest time from browning root rot (Pythium spp.) areas and from normal areas respectively, from six fields under observation, and readings were made for common root rot, the latter was no more severe on plants attacked by Pythium than those which came from the healthy areas.

The effect of common root rot on the yield of wheat was studied again in Man., the same procedure being followed as in 1939 (see P.D.S. 19:6-7). Samples were collected from 60 fields in 6 soil zones. For each field, the plants were classified according to the severity of root rot and the number of plants and weight of grain in each class were determined. The average loss due to root rot in the 60 fields was 16.6% as compared to 7.4% in 1939. The number of tillers per plant and the yield of grain per head were both reduced in proportion to the extent of root rot injury. Due to better growing conditions in 1940, however, more plants per row reached maturity and the yield per unit area was greater. (J. E. Machacek)

Common root rot caused slight damage to Kharkov winter wheat at the Experimental Station, Ste. Anne de la Pocatiere, Que.

KERNEL SMUDGE (Helminthosporium etc.) was far more prevalent this year than usual in the Prairie Provinces, partioularly on common wheat, according to a survey of car-inspection records from Aug. 31 to Oct. 1, 1940

at Winnipeg. The records of 1,000 cars of common wheat from as many different points in Manitoba showed that 7.6% of these were degraded on account of smudge. Infection in western Man. was much more abundant than in 1938, a previous severe smudge year. In Sask. the percentage degraded in 1,000 cars was but 2.4%; while out of 5,000 cars from Alta. only 2 cars were recorded as having smudged seed in them. Alternaria spp. were by far the most common fungi associated with infected seed.

Examination of seed samples from the co-operative wheat variety tests conducted in all three Prairie Provinces revealed that the varieties in the test showed considerable differences in susceptibility to kernel smudge. These differences are set forth below:-

Variety	Man.	Sask.	Alta.
Apex Selection	6.9%	4.0%	0.8%
Thatcher Selection	4.3	2.0	0.9
Thatcher	3.9	1.9	0.7
Marquis	3.6	0.4	0.3
Regent	1.9	0.7	0.1
Renown Selection	1.0	0.2	0.5
Regent Selection	0.6	0.2	0.1
Garnet	0.0	0.0	0.0

SPOT BLOTCH (Helminthosporium sativum) slightly damaged the leaves and heads of Marquis from Saskatoon, Sask. Infection was a trace at Homewood and slight at Crystal City, Sperling, and Winnipeg, Man., on durum wheat.

YELLOW BLOTCH (Helminthosporium Tritici-repentis). A trace was found on durum wheat at Lyleton, Man. (J. E. Machacek)

Nigrospora sphaerica (Sacc.) Mason has been found on samples of seed from several points in Sask. It was also obtained from oat seed. (R. C. Russell)

TAKE ALL (Ophiobolus graminis) caused slight damage in a field of winter wheat at Duncan, B.C., and moderate damage in the University plots, Point Grey.

Take all caused relatively little damage this year in Alta. even in areas, where it has often proved very destructive. It was observed in 23 fields out of 164 examined; the damage was estimated to be a trace in 13 fields, slight to moderate in 9 and severe (30%) in one, which was at Waskateneau.

Take all was found in single fields at 3 scattered points in Sask., viz. Grenfell, Guernsey and White Fox. At the latter place in a 4-year rotation, the disease was on single plants as well as in patches up to 6 feet across. A trace was also present at the Illustration Station at Pelly.

BASAL GLUME ROT (Phytomonas atrofacions). A trace of infection was found in 3 fields in Alta. and in 3 in central Sask. A sample from Lloydminster showed some shrivelling of tho kernels. Besides, it was common in foundation and elite stock throughout the province.

At Miniota, Man., about 25% of the heads were half destroyed by basal glume rot; hail damage was also present. (W. A. F. Hagborg).

BLACK CHAFF (Phytomonas translucens f. sp. cerealis) slightly infected a field at Austin, out of 65 examined in Man. The organism was isolated. (W. A. F. Hagborg)

STRIPE RUST (Puccinia glumarum) was severe on Pride of Alexandria, but no infection was found on Sun, Ballards, and Red Rock in the rod-row plots at Sidney, B.C., in May.

STEM RUST (Puccinia graminis) was first observed at Edmonton, Alta. on July 30, as a fairly severe local infection on Red Bobs. On Aug. 15, there was a trace to slight infection on most stands in central Alta., and some late-maturing fields, along the eastern side of the province, were moderately infected. Little or no damage was caused, since rust development was retarded by the hot, dry weather, which prevailed during most of August. Infection of the leaves by stem rust was unusually common.

Stem rust was first found at Indian Head, Sask., on July 6. Since rust resistant varieties are grown almost exclusively in south-eastern Sask., rust infection was very light. In south-central Sask., the same was true except in a few areas, as for example about Big Beaver, where damage was severe in the later crops of Ceres and Marquis, which represented 30% of the acreage. Thatcher was also lightly infected. Stem rust was found on July 13 at Saskatoon, and later, traces were present in most fields of Marquis and Reward throughout the central and northern parts of the province.

Abundant precipitation occurred throughout Manitoba during June, 1940. A lush heavy crop developed and moisture conditions generally were very favourable for the germination of rust spores. Rust development, however, was not favoured by the prevailing temperatures which averaged from 2 to 4°F. below normal for this month. Northerly winds prevailed during June over the prairie region of the United States and Canada and consequently the northward drift of rust spores was retarded by these unfavourable winds. Both temperature and moisture conditions during July were quite favourable for rust development.

Stem rust made its appearance in Manitoba about the same time as in 1939. The first infections were observed at Portage la Prairie and at Winnipeg on July 3, and shortly thereafter infections were observed on susceptible wheat varieties at Morden and Brandon. It was almost impossible to find any stem rust on wheat except at the Experimental Stations where some susceptible varieties were grown. Most of the wheat acreage in

Manitoba was sown to rust resistant varieties and in those fields stem rust made no headway. It is not known definitely what percentage of the acreage was sown to susceptible wheat varieties, but it must have been exceedingly small for it was almost impossible to find any farmers' fields of susceptible wheat. Of several hundred fields examined this year, only a few fields were known to be sown to susceptible varieties. One of these fields was located about 60 miles north of Winnipeg, and was sown to Reward wheat. On July 20, the severity of infection in this field amounted to about 5%. Although this field was sown fairly early, the severity of infection averaged about 75% when the infection had reached its maximum. The grain from this field weighed 57.5 pounds per bushel, whereas grain of rust resistant varieties from surrounding fields weighed from 62 to 64 pounds per bushel. The damage caused in this instance amounted to 25% or more and it is not at all unlikely that this figure fairly well represents the damage that would have resulted generally in this area had susceptible varieties been grown. In the Winnipeg area, plots of Marquis wheat that were protected from rust with sulphur dust yielded about 18% more than comparable plots of the same variety which were exposed to natural infections of stem rust. At Morden and Brandon, the rust resistant varieties out-yielded the old standard susceptible varieties by about 30 and 12% respectively. This reduction in yield was no doubt due to stem rust which averaged about 70% at Morden and 50% at Brandon on the susceptible varieties. Stem rust was much less prevalent in the northern half of the agricultural area of Manitoba. Although it was present throughout this region, it arrived too late and did not develop in sufficient intensity to affect the yields of susceptible varieties. In the northern areas of the province, the susceptible varieties yielded as much as the rust resistant varieties in experimental plots.

Generally, stem rust of wheat caused only very slight damage in southern Manitoba chiefly on account of the absence of susceptible varieties in any quantity. In the northern half of the province, stem rust probably caused no damage. Had the wheat acreage in Manitoba been sown to susceptible varieties as in former years, it is probable that stem rust would have caused appreciable damage in southern Manitoba this year, but in the northern sections of the province the damage would have been only slight.

Durum wheat varieties were not damaged by stem rust to any appreciable extent. Only traces of stem rust were present in most fields; in a few very late fields the infection averaged as high as 20%. (B. Peturson)

Stem rust was common to abundant in fields examined in Que. (I. H. Crowell) In general, stem rust was very light in N.B.; a 5% infection was recorded at Kedgewick and a trace in two out of 28 fields examined. In the plots, most susceptible varieties showed only a trace or light infection; however 65% was noted on Garnet at Fredericton (S. F. Clarkson). Traces to low percentages of stem rust were recorded in the plots in N.S.,

the highest infection being 40% on Garnet at Lower South River (J. F. Hockey). Stem rust was also surprisingly scarce in P.E.I. this year; a 15% infection was recorded at Palmer Road (G. W. Ayers). Rust resistant varieties, particularly Coronation, are rapidly replacing the older varieties in P.E.I., such as White Fife and Huron. Although the 1940 season was very favourable for wheat, and stem rust was very slight, Coronation yielded as well as these older varieties, when it was grown on reasonably good land.

LEAF RUST (Puccinia triticina) slightly infected wheat in the plots at Sidney, B.C. Leaf rust was relatively scarce in Alta. However, an exceptionally severe local infection occurred in the winter wheat plots at Lacombe in late July and a trace to slight infection developed later in the adjacent plots of spring wheat.

Leaf rust infection was very light in Sask. and was virtually absent in the western part. However, it was fairly common on Thatcher and was heavy on some late crops in the north-eastern section. A 5% infection was recorded on durum wheat at Bengough.

Leaf rust appeared in Manitoba in 1940, on July 3, fully two weeks later than normal. Although present throughout the province, it caused no appreciable damage. The heaviest infections occurred in the extreme south-eastern part of the agricultural area of the province, where infections averaged as high as 30%; elsewhere in the province only traces occurred. Even in the fields where the heaviest infections occurred, no appreciable damage was caused owing to the late arrival and slow development of the rust. The crop had almost reached maturity before rust infections became heavy. (B. Peturson)

Leaf rust was common to abundant in fields examined in Que. (I. H. Crowell). An occasional high infection was observed in the fields examined in N.B.; in the Uniform Rust Nursery at Fredericton, 90% was recorded on Thatcher (S. F. Clarkson). Leaf rust infection was light in N.S.; but on susceptible varieties at Nappan, 40% of rust was recorded (J. F. Hockey). Leaf rust was fairly heavy late in the season in P.E.I. on susceptible varieties such as Huron. (R. B. McLaren)

BROWNING ROOT ROT (Pythium spp.) on summer fallow was moderate both in severity and distribution during 1940 in Sask. Meteorological data did not reveal any deviation from the normal in rainfall, temperature, sunshine or evaporation sufficiently great to account for this decrease in the disease compared with the last two or three years. The explanation may be the complete absence of high temperature extremes accompanied by dry winds such as often occur during June or the last few days of May. In previous years, conspicuous browning root-rot symptoms have frequently appeared on the fallow crop following two or three days of hot, dry winds. Their appearance has been considered to be due to the increased demand in the absorption of water made upon the root system, and the inability of the impaired roots to meet this demand. At the critical time in June

of 1940, it is possible that over wide areas where browning is usual, the affected root systems could at all times supply the demands made on them for water by the leaves above. Where this demand could not be met, above-ground symptoms showed up.

In the central area around Saskatoon for long distances, an infected field was found only here and there. Further north, infestation was more general, but only moderate in severity when compared with a so-called bad browning year. Moderate infestations, with an occasionally severely attacked field, were found in the Prudhomme to Totzke area, around Naicam, Tisdale to Birch Hills, St. Louis to Cudworth, and Duck Lake to Rosthern. An authoritative report of the disease in the Paynton to Maidstone area was also received.

In some localities where browning has been common before, phosphate fertilizers were being used and probably helped to explain the absence or only slight infestations of the disease this year. In other districts, notably around Watson, slight browning root rot was scattered, but most of the leaf discoloration was caused by early drought.

From observations in two fields, it seemed that plants in browning areas are more susceptible to late spring frosts than plants in normal areas.

In six fields kept under observation, the diseased areas were definitely later in maturing than the normal areas. The differences followed the rough outline map made in June demarking diseased and healthy areas. At the same time the diseased plants were as tall as or in two instances taller than healthy plants, though they had not tillered as well. This suggests that the water supply is the limiting factor.

In the majority of diseased fields when cutting is done by the binder, the grain of the diseased areas is usually immature when cut and thus both yield and grade are reduced; however, harvesting by the combine may aid in reducing losses by allowing the grain in diseased plants to ripen thoroughly before being cut.

It is interesting to note that in the Dakotas, R. Sprague (Pl. Dis. Reporter 24:344-345. 1940) isolated Pythium arrhenomanes from early-sown wheat. He also obtained the fungus from oats, sorghums, corn, pigeon grass (very common) and a number of other grasses. He states that "with fresh material it is suspected that Pythium would be found in greater amounts than the few isolations that were possible with advanced specimens received."

The following species in order of frequency were isolated from field material collected in June in Sask.: Pythium arrhenomanes, P. tardicrescens and P. aristosporum. The last named fungus was isolated

from the roots of wheat seedlings grown in four separate samples of soil obtained from the Swift Current station. No browning root rot has hitherto been reported from the extreme south-west of the province, but this confirms the view that all arable soils of Saskatchewan contain species of Pythium parasitic to wheat. (T. C. Vanterpool)

The Dominion Laboratory survey in southern Sask. embraced the districts of Indian Head, Grenfell, Balcarres and Qu'Appelle. Out of 16 fields, 6 were free from disease, 6 showed a trace, and 4 were slightly infected. Moisture was good at seeding time, but the area received no rain after June 15. The usual field symptoms were absent or were obscured by drought injury. In the central and east-central parts of the province including the Saskatoon, Dundurn, Lanigan, Humboldt, Spalding, Valparaiso, and Melfort districts, 25 fields were healthy, 4 showed a trace, 5 slight, 17 moderate and 2 severe infection. In a field of Regent at Valparaiso, field symptoms were typical and lesioning was pronounced, while in a field of Thatcher on the same farm there were no conspicuous field symptoms but root lesions were present. The field was broken 3 years previously and the preceding crop was crested wheat grass. The disease was less severe than in 1939. Infection was probably as widespread as usual, but the areas of severe infection were smaller and more scattered.

A light infection of browning root rot was reported in the Portage la Prairie district, Man., in June. (J. E. Machacek)

GLUME BLOTCH (Septoria nodorum) was observed in 57 fields out of 164 examined in Alta. Infection was a trace in 35 fields, slight in 21, and moderate in one. In plots at Lacombe, infection was a trace to moderate, while in those at Edmonton, infection was a trace on most varieties, but it was severe on Apex and certain hybrid lines. The disease was recorded on wheat heads from 5 scattered points in Sask. In one collection from Rex, T. C. Vanterpool notes that the spores were unusually long, measuring 43.6 x 3.2 u. A trace of glume blotch was observed on Huron in Queens' Co., P.E.I. (R. R. Hurst)

SPECKLED LEAF BLOTCH (Septoria nodorum and S. Tritici) was unusually prevalent this year in Alta., but severe infections did not develop until late in the season and the damage was probably slight. Infection was a trace in 21 fields, slight in 46, moderate in 14, and severe in 8.

Out of about 25 collections examined microscopically only 2, from Edmonton and Lacombe respectively, were Septoria nodorum and the remainder were S. Tritici. Pycnidia were relatively scarce on the S. nodorum material and it is possible that this species caused some of the leaf spotting in the many fields where no pycnidia were observed. (M. W. Cormack). A slight infection was observed in May on winter wheat at the Experimental Station, Sidney, B.C.; typical Septoria Tritici was present. (W. Jones and I. L. Conners)

Speckled leaf blotch caused slight damage in 3 fields at Tisdale, Melfort, and Young, Sask.; S. nodorum was present.

BUNT (Tilletia caries and T. laevis). A summary of the bunt situation in Western Canada was prepared from the records of the Western Grain Inspection Division and kindly supplied by Wm. Popp.

Table 1. Wheat Bunt in Western Canada

Summary of Inspections from August 1 to October 31, 1940.

Class of Wheat	Cars Inspected	Cars Graded Smutty	Percentage Smutty
Hard Red Spring	39,551	106	0.3
Garnet	735	4	0.5
White Spring	-	-	-
Amber Durum	654	5	0.8
Alberta Red Winter	169	8	4.7
All classes of wheat	41,133	124	0.3

The bunt situation appears to have changed in Western Canada but little over last year. The amount of bunt in winter wheat, however, is the lowest it has been in a decade and may indicate that the seed treatment campaign in the winter wheat districts in Alta. is bringing beneficial results.

About 3% of the heads were affected in a field of Golden Chaff at Soda Creek, B.C.; 2 and 3% of the heads were affected in 2 fields respectively near Maple Creek, Sask. It was also severe in hybrid material of Marquis x Pilot naturally infected in the University plots, Saskatoon.

About 25% of the heads were affected in one field at St. Ignace, Kent Co., out of 28 examined in N.B.

LOOSE SMUT (Ustilago Tritici) infection was 1% of the heads in 3 fields and a trace in 8 others out of 164 examined in Alta. It was reported in 15 fields out of 181 examined in Sask. and seemed less prevalent than in 1938. However, it was present in 11 out of 51 plots of foundation and elite seed throughout the province; 11 plots of Thatcher were free from infection. Traces were reported on Thatcher at Myrtle and McLeod, Man. and on Mindum from Crystal City, Homewood and Sperling.

Loose smut was common everywhere in Que. The average infection was about 0.5% in N.B., the highest being 10% at Oliver Siding; 10% of the heads were affected in a field at Glenkeen, N.S.

DROUGHT DAMAGE was reported as severe from Cromer and Elkhorn, Man.

FROST INJURY. Abortion of several of the lower spikelets was observed on heads of wheat and barley in a field of mixed grain at Shipman, Sask. It was attributed to a frost on July 10.

HAIL INJURY caused moderate damage in Sask. in 1940. The plants left in affected fields showed some of the following symptoms: 1. Lower stem green but with white lesions, neck and head bleached and empty. 2. Lower stem green, neck bleached and head empty. 3. Lower stem green, neck green, upper half of head bleached and empty. 4. Heads shattered and distorted. 5. Empty heads often overgrown by moulds. Hail damage was reported as severe at Elkhorn, Man.

KINK (non-parasitic) caused slight damage in the High River and Okotoks districts, Alta. (L. E. Tyner)

WHITE TIP (non-parasitic). Slight damage was observed in 2 fields in Central Alta.; a trace was also present in the plots at Lacombe.

SEED DISCOLORATION (sap of Salsola Kali var. tenuifolia) was observed in a seed sample from Weyburn, Sask. In the harvesting and threshing operations, fragments of Russian thistle and other weeds are carried along with the grain. The sap of Russian thistle, when exposed to air under moist conditions, turns quite black or purple, presumably due to the presence of oxidizing enzymes. When wheat seed comes in contact with such fragments, blue or usually black blotches appear at the points of contact. Wheat seed has been stained in this manner experimentally. Other weeds may cause staining, but usually the discoloration is some shade of green. (P. M. Simmonds)

OATS

HEAD DISCOLORATIONS (Alternaria spp.) were almost completely absent in Que. (I. H. Crowell). A trace of discoloration was found on Erban oats in York Co., N.B.; the cause appeared to be Alternaria (S. F. Clarkson and T. Johnson).

ANTHRACNOSE (Colletotrichum graminicola) was abundant on some plants in a field in Que. (I. H. Crowell)

POWDERY MILDEW (Erysiphe graminis) slightly infected R. L. 1114 at Ste. Anne de la Pocatiere, Que.

COMMON ROOT ROT (Fusarium spp. chiefly) caused slight damage in 18 fields out of 23 examined in Sask.; it caused premature ripening of the individual plants, many of which bore sporodochia of Fusarium at their bases.

LEAF BLOTCH (Helminthosporium Avenae) was found in 15 out of 66 fields examined in Alta.; infection was a trace in 9 fields, slight in 4, and moderate in 2. A trace was observed at Ninga and Souris, Man. Leaf blotch was common throughout Que. The average leaf area affected in 186 fields was 3.19%, while in 13 variety tests it was 0.56%; the highest scores recorded were 2.67% at Ste. Anne de Chicoutimi and 2.02% at Peribonca. (I. H. Crowell and D. Leblond)

Leaf blotch was recorded in 75 fields out of 119 examined in N.B.; average infection was estimated at 3% (S. F. Clarkson). The leaf spotting caused by H. Avenae in N.B. was not clearly distinguished from that caused by Septoria Avenae. In 6 field collections, H. Avenae was reported by W. A. F. Hagborg in 5 and S. Avenae in 1, while in 3 collections from the Uniform Rust Nursery at Fredericton, Septoria Avenae only was noted. Leaf blotch was slight to moderate on most varieties at Charlottetown, but was almost absent in plots at other points in P.E.I.

NEMATODES (Heterodera schachtii). The nematode situation in Ont. differed little this year from last. The amount of nematode injury in Waterloo County was about the same as last year although nematodes were worse in some fields than in previous years, while in others the damage was less than it had been previously. Nematode-infected samples were again received from several localities throughout the province, but in no case were any serious outbreaks recorded. (J. E. Howitt)

HALO BLIGHT (Phytomonas coronafaciens). A trace to slight infection was recorded in 33 out of 66 fields in Alta.; a trace was also present on many of the varieties at Lacombe. Halo blight was rarely found in Sask. in 1940 and then only a trace, while last year it was common (T. C. Vanterpool). The disease was found in 32 fields in Man.; infection increased greatly as the season advanced and a maximum of 30% of the leaf area was affected in 4 fields in different districts. (W. A. F. Hagborg)

CROWN RUST (Puccinia coronata) was very scarce in Man. in 1940; traces only were found in 3 fields in southern Man., early in August (B. Peturson). Inspection of 8 varietal tests in Lincoln Co., Ont., showed that stem rust was more prevalent than crown rust in this area (G. C. Chamberlain). Crown rust occurred in small amounts this year in Quebec, but it was quite uniformly distributed including the Lake St. John area. It was estimated that the average leaf area infected was 1.96% in 186 fields and 0.80% in the 13 variety tests. (I. H. Crowell and D. Leblond)

Cereal crops were sown rather late in N.B., especially in Westmoreland Co., on account of a wet, cold, backward spring. At the time of the survey, however, most of the province was suffering from drought, except along the Saint John River Valley, especially above Woodstock, where moisture was plentiful. Leaf rust was somewhat lighter than last year. Out of 120 fields examined no rust was recorded in 91, traces in 15 and 25-65% in 6. A notable fact was that the heavily infected fields were grouped at 4 points, at two of which local infection from buckthorns are known to occur. These points were Springhill, infection 25-60%; St. Andrews, 10-40%; Albert, 5-25%; and Hopewell Cape, 65%. At Springhill, heavy infections have been recorded each year since 1936 and buckthorns were located in the area in 1937. At St. Andrews, heavy outbreaks were observed in 1939; observations in that year and since have

uncovered extensive buckthorn hedges and large escaped trees. Hopewell Cape and Albert were on a route not previously traversed and buckthorns have yet to be located.

Leaf rust infection in the Springhill area was definitely more limited in 1940 than in 1938, when the area was carefully surveyed. In the latter year, leaf rust was heavy in a mile radius about the buckthorns on the local golf course and across the Saint John River in a strip about a mile wide and four miles long, the infection ranging from 65 to 80%. In 1940 a field on the Springhill side of the river about ½ mile east of the buckthorn bushes showed 65% rust, while in the variety test at the Municipal Home, Nashwaaksis, about 1½ miles across the river, only a trace of leaf rust developed. The aecia of Puccinia coronata were actively discharging spores from the buckthorn bushes on June 20-23, while the prevailing winds were from the east during this period. These facts may explain why heavy rust infection was confined to the Springhill side of the river. A new location for buckthorns was found at Fredericton. (S. F. Clarkson)

Leaf rust was absent or traces only were present in the few fields examined in N.S. The highest infection recorded was 10% in the plots at Glenholme, where in 1939 it was epidemic (J. F. Hockey). Leaf rust was not prevalent this year in P.E.I.; infection ranged from 10-20% on susceptible varieties at Palmer Road, and was still less at Charlottetown.

STEM RUST (Puccinia graminis) was extremely scarce again in Alta.; a trace was found in 2 fields on Aug. 20 in central Alta. Stem rust was observed in Sask. in only one field, viz. at Lipton; infection was very light.

Traces of stem rust were present on oats throughout Manitoba in 1940. Almost no stem rust occurred on rust resistant varieties, such as Vanguard and Anthony, which are now extensively grown in Manitoba. Only traces of rust occurred on early susceptible varieties. However, in southern Manitoba, average infections ranged as high as 30% on very late sown susceptible varieties. These higher infections occurred only in fields which ripened in late August. These late fields were somewhat damaged by rust, but they represent possibly less than 1% of the oat fields. The bulk of the oat crop was not damaged at all by stem rust. (B. Peturson)

Stem rust was almost completely absent in Que., although traces were frequently found even in the Lake St. John area. In 3 fields near Chambly, stem rust was very abundant, although it was not found elsewhere in the vicinity. (I. H. Crowell)

Stem rust was observed in only one field in N.B., located at Milltown, where the infection was 65%; a barberry bush was found 0.3 miles from the field. The importance of the barberry in initiating outbreaks of stem rust is evident from observations at other points. At

Douglastown, stem rust was heavy on oats in nearby fields in 1937, 1938, and 1939, while a large common barberry bush stood on a lawn before a village home. In 1940, the bush had been removed and stem rust was absent on the grain growing 40 paces from the former location of the bush. Near Salisbury, where stem rust was severe in 1937 near barberries, mostly excaped in a pasture, the bushes were destroyed in the early summer of 1938 with a few sprouts surviving and only a light rust infection had developed. In 1940, no sprouts were found in this pasture area and no stem rust was present. At other known barberry sites no grain was growing near the bushes with few exceptions and then the crop was sown so late its immature state had permitted little or no rust development. New locations for barberry in 1940 were Dorchester, Salisbury, Milltown, Fredericton and Rothesay Collegiate Institute, Rothesay. (S. F. Clarkson)

Stem rust was not observed in the few fields examined in N.S., however, in the plots at Glenholme, up to 65% of rust occurred on susceptible varieties, while an occasional pustule was present on Vanguard. Old aecia were abundant on a barberry hedge at Boylestown and on several bushes at Glenholme on Aug. 16. (J. F. Hockey) Stem rust did not appear until late in the season in P.E.I. and most of the infections were light.

SPECKLED LEAF BLOTCH (Septoria Avenae) caused a slight to moderate infection in 5 fields in Alta. and in the Edmonton plots. It affected 0.83% of the leaf area in 186 fields in Que., while 3.99% was affected in the 13 varietal tests (I. H. Crowell and D. Leblond). With leaf blotch (H. Avenae), the situation was just the reverse (see p.12) not only in Que. but apparently also in N.B. It is just possible that the rust resistant varieties are more susceptible to Septoria. Oat leaves from the 1939 crop affected by typical S. Avenae were received from W. Jones, who reported it quite common almost everywhere in B.C. (I. L. Conners)

SMUT (Loose Smut, Ustilago Avenae and Covered Smut, U. Kolleri). Infection ranged from a trace to 5%, average 2%, in the 17 affected fields in Alta.

Covered smut affected 14 out or 23 farmers' fields in Sask.; at Rosetown, where the seed was not treated 25% of the heads were smutty. Loose smut was found in 3 fields. In 37 plots of elite and foundation seed, of which 29 were of Vanguard, 12 were affected by both smuts, 8 by covered smut, and 2 by loose smut. In three plots, where the seed had not been treated 2-5% of covered smut was present. Where the seed had been treated carefully (mostly by hand) with Ceresan, the stands were nearly smut-free.

Smut was recorded in 24 fields in Man.; infection ranged from a trace to 20% and averaged 5% in these fields. In a field of Swedish Star in Lincoln Co., Ont., smut infection was: Covered smut 25%, loose smut 10%. Smut was common everywhere in Que. Smut was recorded in 80 fields out of 120 examined in N.B., the average infection of covered smut being 3.0% and loose smut 1.0% or 4.0% for the two smuts. The

highest infection observed was 35%; covered smut 15%, loose smut 20%, in a field at Green Point (S. F. Clarkson). The average infection in the few fields of oats examined in N.S. was 6%; both smuts were about equally abundant (J. F. Hockey). Infection ranged from a trace to 3% in fields examined near Charlottetown, P.E.I. Four seed treaters were loaned to farmers this year; marked success was obtained in controlling smut. (R. R. Hurst)

BLAST (non-parasitic) was recorded as follows: Present in all fields in Alta. - trace in 29 fields, 5% in 25, 10% in 9, and 15-25% in 3, trace to 20% in plots at Lacombe; present in every field in Sask., damage ranging from a trace to moderate; varied greatly in intensity being especially prevalent in some localities in Que., absent to slight in others, up to 90% of spikelets blasted in some heads; present in all fields in N.B., 10-25% of blast common; amount of blast varied widely in different test plots in N.S.; slight to moderate amounts recorded in the plots in P.E.I.

BRONZE LEAF (non-parasitic). A bronze or purple leaf discoloration was widespread throughout N.S., particularly in fields seeded early. It was present in the fertilizer plots at Nappan, irrespective of fertilizer applied. The affected plants showed more blast than normal plants. (J. F. Hockey)

GLUME DISCOLORATION (non-parasitic). A trace was present in Victory and 1042-121 in the test plots at Currieburg, N.B.; apparently it is due to an accumulation of anthrocyanin pigment. (S. F. Clarkson and T. Johnson)

GREY SPECK (manganese deficiency) was marked on Erban and Vanguard in the plots at Chambord, Que., on Aug. 19, while the other varieties showed no symptoms. This is the first report of the trouble in the Lake St. John region. A species of Heterosporium was fruiting on the lesions. (I. H. Crowell)

BARLEY

SMUDGE (Alternaria sp.). Discoloured kernels in a 1939 seed sample from the Seed Laboratory, Saskatoon, Sask., yielded Alternaria sp.

ERGOT (Claviceps purpurea). A moderate infection occurred in Peatland and a trace in several other varieties at Lacombe, Alta.; 10% of the heads were affected in a plot at Edmonton. A trace of ergot was seen in the plots at Muenster, Sask.

Several samples of Nobarb barley grown in Ont. and sent for examination contained a high percentage of ergots; this variety appears to be decidedly susceptible to the disease. (J. E. Howitt)

POWDERY MILDEW (Erysiphe graminis) was reported as follows: General on all varieties at Sidney, B.C., while a slight infection was

present in the plots at Agassiz (W. Jones); a slight to moderate infection on a few varieties at Edmonton, Alta.; common and generally distributed in Que.; only traces in the plots at Fredericton, N.B.; a moderate infection in a field in Queens Co., P.E.I.

ROOT ROT (Fusarium sp.) was reported as causing heavy damage at Dunblane, Sask., on Rex barley. This, I believe, is unusual for this variety. (T. C. Vanterpool)

STRIPE (Helminthosporium gramineum) was observed in 18 out of 47 fields in Alta., infection being a trace in 4 fields, slight in 10, moderate in 2 and severe in 3, the latter east of Edmonton. Infection was a trace to moderate in the plots at Edmonton and Lacombe. A trace was found at Regina and Saskatoon, Sask., and slight infection at Beechy. A trace was present in Odessa barley in an experiment on seed longevity at Saskatoon. The seed came from a 1925 sample. It would appear that the fungus persisted in or on the seed for 15 years. The seed germinated 75%. (T. C. Vanterpool)

SPOT BLOTCH (Helminthosporium sativum) was reported as follows: A trace on Sanalta and Olli at Agassiz, B.C.; a trace in 7 fields and slight in 8 in Alta., a trace to moderate infection in plots at Edmonton and Lacombe; a trace to moderate infection in 10 fields in Man.; common and generally distributed in Que.

COMMON ROOT ROT (Helminthosporium sativum and Fusarium spp.) was a trace in 8 fields, slight in 5, and moderate in 4 in Alta. It caused slight damage in 12 fields out of 18 examined in Sask.; basal lesions are common which frequently so completely rotted the base of the stems as to cause the plants to fall over. The disease was severe in patches at Newdale, Man.; and a light scattered infection occurred at Graysville.

NET BLOTCH (Helminthosporium teres) was reported as follows: Much less prevalent than usual in Alta., only traces found in 4 fields; 25% infection at Rapid City and Woodside, Man., slight at Neepawa and a trace at Jordan; common and generally distributed in Que.; slight in N.B. although a 30% infection at Port Elgin; a trace at Rustico, P.E.I. Perithecia (Pyrenophora teres) were collected on May 16 at Macdonald College, Que., and matured in a moist chamber (M.C. 566). (I. H. Crowell)

BACTERIAL BLIGHT (Phytomonas translucens) caused a slight infection in 2 fields near Edmonton, Alta., and a trace to slight infection on some varieties at Lacombe. The disease was found in 4 out of 36 fields examined in Man., infection moderate at Brandon, slight at Russell, patchy, trace to moderate at Winnipeg and a trace in patches at Morris. (W. A. F. Hagborg)

LEAF RUST (Puccinia anomala) was recorded in B.C.: Slight on Regal at Agassiz and traces on several varieties at Sidney; Sask.: Slight infection at Alameda out of 18 fields examined; Que.: Common and generally distributed; N.B.: Generally very light, but 65% infection in a field at Dorchester; N.S.: Trace to 5% infection in plots at Nappan; P.E.I.: A trace to 1% in the varieties at Palmer, a trace to 5% at Charlottetown.

STEM RUST (Puccinia graminis) was not observed on barley in Alta. until Aug. 20, when traces were found in 3 fields in central Alta. Infections of 10% or less were found in only 3 out of 18 fields surveyed in Sask. in July and early August, but stem rust was common and quite heavy on late crops or in heavy stands. Stem rust was, in general, light on barley and no appreciable damage occurred in Man. However, in some late fields in southern Man., infection averaged as high as 35% and some damage probably occurred in these fields (B. Peturson). Stem rust was common and generally distributed in Que., wherever barley was grown (I. H. Crowell). Stem rust was only observed in the plots at Fredericton, N.B., infection being a trace to 1%. Only a trace was found in P.E.I.

SCALD (Rhynochosporium Secalis) was very severe on Gatami, but no infection was present on Cape, Flynn, Lansdale, Plush, Trebi and Zero in the plots at Sidney, B.C. in April (W. Jones). A trace to slight infection was present in 3 fields, moderate in 5 and severe in 3 out of 47 examined in Alta., infection was general in the plots at Edmonton, Lacombe, and Olds and ranged from a trace to moderate on different varieties. Scald was severe on several common barley varieties, such as O.A.C. 21 and Regal, in the plots at Saskatoon, Sask.

SPECKLED LEAF BLOTCH (Septoria Passerinii). Infection ranged from a trace to moderate in the plots at Edmonton, Alta.

COVERED SMUT (Ustilago Hordei) was present in 15 out of 47 fields examined in Alta., the average infection being 1.0%, and the highest 20% at Blackfalds. Infection varied from a trace to 2% in 6 out of 18 fields examined in southern Sask. Covered smut was recorded in 4 fields in Man., the highest infection being 8% at Hayfield. It was common everywhere in Que. In the 9 fields examined in N.B., average infection was 1%.

LOOSE SMUT (Ustilago nuda) was recorded as follows: Slight on Newal at Sidney, B.C., slight at Armstrong; 5% infection at Perryvale, Alta.; in 4 fields out of 18 examined in Sask., the highest infection being 4% at Beechy; infection a trace to 13%, average 3.1%, in 16 affected fields in Man.; common everywhere in Que.; in 9 fields examined in N.B., average infection 1.5%, the highest 10% at Port Elgin; infection a trace to 10% in N.S.

FALSE STRIPE (cause unknown) was light, but general at Brandon, Man.

STERILITY (cause unknown). Numerous florets were blasted in

the heads of Chevron at Sidney, B.C., but other varieties were not affected. (W. Jones)

RYE

ERGOT (Claviceps purpurea). A slight infection was found in the plots at Olds, Alta., and in a field near Calgary. A trace of ergot was reported from Winkler, Man., and in the plots at Fredericton, N.B.

POWDERY MILDEW (Erysiphe graminis). A trace was observed at Avonport, N.S. (K. A. Harrison)

BACTERIAL BLIGHT (Phytomonas translucens var. secalis) was noticeable in the University plots, Saskatoon, Sask.; infection was little more than a trace. The disease appears to be more prevalent on rye than on wheat or barley in these plots in most years. (T. C. Vanterpool)

LEAF RUST (Puccinia secalina). A 5% infection was observed at Avonport, N.S.