## The Weather and Its Influence on Plant Diseases

The influence of weather on the disease situation was particularly well exemplified by the observations made in the Prairie Provinces in 1942. In general, the weather was exceptionally cool and wet throughout the growing season in contrast to the hot and dry weather particularly of the drought years. Most diseases were more prevalent, as for instance ergot (Claviceps purpurea) on wheat and barley, take all (Ophiobolus graminis) on wheat, the leaf rusts of wheat, oats, and barley (Puccinia triticina, P. coronata and P. anomala. The leaf rusts were unusually prevalent due to the cool weather. In fact, it was so cool for a time, particularly in Alberta, that their development was definitely retarded, until warmer weather came. Septoria nodorum was epidemic on the leaves and heads of wheat in Southern Man. and southeastern Sask. recalling the epidemic of 1923. Rhizoctonia (Pellicularia filamentosa) was unusually severe on potatoes in the field, while sclerotium formation on the tubers was insignificant, a situation encountered quite regularly in the Maritime Provinces. The presence of late blight (Phytophthora infestans) in Man. for the second year is a sure indication of the wetness of the season. Some of these observations will be further elaborated in the individual reports of the respective provinces.

The weather in the coastal areas of B.C. was characterized by a mild winter and dry and moist periods alternating so that January and February were dry, late spring and early summer moist and late summer and fall dry.

The mild winter was favourable to the early appearance of foliage diseases, e.g. scald (Rhynchosporium Secalis) of fall barley, tulip fire (Botrytis Tulipae), leaf spots of grasses and downy mildew (Pseudoperonospora Humuli) of hops. During the moist late spring and early summer, late blight of potatoes and downy mildew of hops became epidemic in some fields and yards. Much damage was also suffered by strawberry fruit owing to unfavourable harvesting weather during this period. Diseases such as late blight of potatoes and downy mildew of hops were materially checked during the dry late summer and fall, and the weather was satisfactory for the harvesting of all fall crops. (W. Jones)

The unusual number of parasitic diseases and their destructiveness in the interior of B.C. in the past two years has been no doubt due to the weather conditions in those seasons. The differences are well illustrated by the rainfall. At Salmon Arm the average monthly rainfall from April to September is 1.28 in. and at Summerland 0.81 in. At Salmon Arm the average monthly rainfall from May to September 1941 and from May to Aug. 1942 was 2.64 in. and at Summerland from April to Sept. 1941 and from April to July 1942 was 1.94 in. This average is over double the long-time average for these months. The occurrence of late blight of potato and downy mildew of onion in the Okanagan indicate how quickly these diseases will penetrate an area just as soon as weather conditions permit. Their sudden appearance over such wide areas would seem to require their presence in the Okanagan every year, but at such a low level of incidence as to pass unnoticed. (H.R. McLarty)

In Alberta, a scanty snow cover during the latter part of the winter was apparently responsible for the severe winter-killing of winter wheat and clovers which occurred in the northern areas. Despite dry conditions at the start, the season became unusually wet in nearly all parts of the province

except the Peace River district. As a result, crop growth was exceptionally heavy and late-maturing, and there was considerable damage from lodging and frost. The abundant rainfall and the heavy dews at night produced moisture conditions apparently ideal for the development of stem, foliage, and head diseases, but, with few exceptions, they were not unusually prevalent. Notable among these exceptions were the Septoria leaf diseases, ergot, and the bacterial blights of beans. The stem and leaf rusts of cereals developed at an alarming rate in early August but were checked by the extremely cool, wet weather which prevailed during the latter part of the season. In the late fall, wet weather further delayed harvesting and much grain still remained unthreshed with the onset of winter. (M.W. Cormack)

In Saskatchewan, the weather was cool and rainfall was lighter than usual. Seed germinated slowly in early May and some damage was caused to coarse grains and flax by frost. The soil temperature during the latter part of May and early June at Saskatoon was much higher than the long-time average. Reports from the alfalfa growing area of north-central Saskatchewan indicated severe damage to alfalfa by crown rot and winter killing. Heavy to light rains fell during June and July in most areas, and growing conditions were excellent. However, in the south-west and south-central areas, the rainfall was light and moisture reserves soon became depleted by the heavy crop. The showery weather and heavy dews were favorable to development of the leaf rusts of cereals and rust of flax. A notable feature was the absence of stem rust of cereals. High winds and heavy rains caused severe lodging in heavy crops. The weather during August was cool and showery, and very unfavourable for ripening. Wheat, particularly ripened slowly; and many troubles appeared in the form of head, leaf and stem discolorations, in part due to bacteria, but much of a physiological nature. An outstanding feature of this season was a severe outbreak of common rootrot (Helminthosporium and Fusarium) of wheat in south-western Saskatchewan centering around Cadillac. It is considered that this was brought about by wet weather in this area following a dry spell in July. In general, the wet, cool weather of the latter part of the growing season favoured the development of diseases which have not appeared for many years: namely black chaff of wheat, bacterial blight of barley, and common rootrot of wheat in epidemic form. (H.W. Mead)

Precipitation throughout most of Man. was somewhat above normal during April and May and these satisfactory moisture conditions, combined with favourable temperatures averaging from 1 to 2 degrees above normal, favoured the growth of all field crops and heavy stands of grain were general throughout the whole of the province. Moisture conditions, owing to frequent timely rains, remained favourable for the entire growing season and many districts received rainfall totalling more than 25% above normal. From June 15 to July 6 temperatures throughout the whole of Man. ranged from 4 to 9 degrees below normal. From then on to the end of the season temperatures ranged from 1 to 2 degrees below normal.

The favourable moisture conditions which prevailed over the entire season afforded very favourable conditions for the germination of the spores of rusts and other fungi. However, the abnormally low temperatures which prevailed during the latter part of June and early July retarded the development of cereal rusts, particularly stem rust, a rust which develops best at high temperatures. This rust developed very slowly, in fact only very slight traces of stem rust developed on suceptible wheat and barley varieties. It was not until after the barley crop was harvested, in mid August, that stem rust became general on wild barley,

Hordeum jubatum, a grass which grows abundantly along roadsides and in many hay pastures throughout Manitoba. The virtual absence of stem rust from Man. during the earlier part of the season was, no doubt, in part due to the unfavourable temperature conditions which prevailed during the very period that this rust usually gets established in this area. However, it should be borne in mind that perhaps the most important factor retarding the progress of stem rust in the spring wheat area, these last few years, is the large acreage of rust resistant wheat varieties now grown in this area, which very materially limits the availability of suitable host plants for this rust.

Leaf rust of wheat apparently was also somewhat checked by adverse temperatures during late June and early July. This rust, however, tolerates cool conditions better than stem rust and it developed more abundantly and when the temperatures became favourable for its development, during most of July and early August, it developed rapidly and infections of this rust became very general and severe, averaging over 80 per cent on Thatcher wheat by harvest time. However, this heavy rust infection did not seem to reduce the yield of Thatcher greatly except in late crops which were naturally subjected to the action of the rust for a longer period than the main crop. The failure of this heavy leaf rust infection to cause very appreciable reduction in yield, bushel weight, and grade of Thatcher was due to the fact that this rust, owing to the retarding effect of unfavourable low temperatures during the early part of the season, did not get established on the crops until they had advanced far enough towards maturity to escape to a considerable degree the damaging effect of the rust.

Leaf rust of barley, a rust which develops best under relatively cool conditions, was more abundant in Man. this year than for some time past. A light infection of this rust was general throughout the province. In seasons when above normal temperatures prevail in Man. leaf rust of barley occurs only sparsely or not at all.

Crown rust of oats was affected by the low temperatures of late June and early July in much the same manner as leaf rust of wheat. Namely, its progress was slowed down, and, although heavy infections of this rust developed in many fields before the end of the season, much of the crop had advanced so far towards maturity before rust infections became heavy that they escaped appreciable damage. (B. Peturson)

In the Niagara peninsula, Ont., the weather during the growing season of 1942 was distinctly favourable for fungous diseases. The season opened early, the fair warm weather of late April favoured rapid development and many sweet cherry and peach trees were in bloom on April 30. In May, the weather was wet with fifteen periods of precipitation with the abnormal total of 5.33 in. of rain. It was almost continuously wet May 15-24 during which time scab ascospore discharge was very active, resulting in heavy primary infection apparent on May 25. This infection period was closely followed by a second from May 30 to June 4, a six-day period of high relative humidity decidedly favourable for spread of apple scab and abundant fruiting of lesions.

Leaf spot (Higginsia hiemalis) of sour cherries was very prevalent on June 11 and no doubt much of the infection occurred during the middle of May when ascospore discharge was at a peak. With cool, damp weather prevailing in June, very little shot-holing developed and abundant fruiting of the fungus was evident. A second outbreak of leaf spot followed the infection period of July 17-20, four days of heavy rain totalling 3.0 in. At this time also considerable damage to sour cherries occurred in the form of scald directly a result of the 2.0 inch rainfall early on July 18, which was followed immediately by a few hours of extremely warm weather. Damaged fruit quickly developed brown rot during the damp weather which followed. On August 8-11, another infection period occurred this time after spraying operations had been completed; some late scab developed on the fruit, and leaf spot became important in many orchards previously very free from infection. The wet weather in May also favoured brown rot infection particularly of the blossom parts of sour cherries and peaches. In some cherry orchards, 10-20% of the newly formed green fruit was affected. With peaches, the fungus progressed from blighted blossom parts into the twigs and caused their girdling and death.

The heavy rainfall of May was a factor in the outbreak of Verticillium Wilt found in several areas. Excess moisture is known to be a factor in the development of this disease.

The heavy precipitation and the consequent increase in lake fogs experienced in peach orchards bordering Lake Ontario was a factor in the prevalence of bacterial spot (Xanthomonas pruni) found in these orchards.

Brown rot of peaches caused much loss on the early Rochester variety and again on the late Elberta. A four-day rainy spell, August 8-11, with high humidity and temperatures, was responsible for the outbreak of brown rot on the Rochester variety which provided a tremendous build-up of infection for the later crop. However, the harvest period for the mid-season varieties was fair and it was not until the end of August and early September when the weather was warm, damp and muggy that brown rot infection was again favoured. Much of the loss was occasioned in the distant car-lot shipments when a high percentage of the fruit was found at destination to be unmarketable due to brown rot and other fruit decays such as Rhizopus. (G.C. Chamberlain)

In Eastern Quebec, the weather conditions during May and early June were favourable for vegetation but also for the spread of bacterial diseases. The only important rainfall during the growing season occurred in the middle of June followed by a prolonged dry spell. Most crops suffered from drought, especially where sowing had been delayed. The exceedingly dry weather prevailing throughout the growing season was likewise not favourable for plant pathogens.

There was a severe outbreak of fire blight during the spring, especially in neglected orchards. Apple scab did not develop to any significant extent, even in the unsprayed orchards. Apple rust was practically absent.

Bacterial blight of beans was less abundant than in 1941 in Eastern Quebec, its spreading being probably due mostly to warm winds disseminating the inoculum in dew droplets from infected plants onto the healthy. In western Quebec, however, where precipitation was normal, bacterial blight of beans was more severe than last year which was a drier year.

Blackleg of potatoes was more severe than usual, favoured by the abundant moisture of the soil and by the warm weather at the time of planting. Ring rot was difficult to detect because sound plants showed wilting due to drought and also because the lack of moisture in light soils prevented the soft rot which usually follows tuber ring rot. On the other hand, on these dry soils, sound tubers showed a marked cracking of the skin at digging time. Many plants examined for bacterial ring rot were found to be affected with fusarium wilt, a disease favoured by the relatively high temperature of the soil. Common scab, equally favoured by warmness and dryness of the soil was prevalent on potatoes and swede turnips this year. Late blight of potatoes which was serious in Western Quebec, where precipitation was normal throughout the season, was not observed in Eastern Quebec due to the drought.

There was practically no rust on cereals in any part of the province this year. Most crops matured so rapidly that diseases failed to cause any damage. Oat blast was severe on certain varieties grown on light soils.

Samples of flax seed from Eastern Quebec were found to harbour the organism causing seedling blight, Colletotrichum Lini, but the disease was not observed in the field. (C. Perrault)

In New Brunswick, the winter of 1942 was about average with considerable snow and rain falling in each month. The fields became bare early in April but on April 11 and 12, 15.5 in. of snow fell, quickly vanishing with warm weather. Sunshine, particularly in the last nine days of April, resulted in the land drying rapidly.

However, the weather was rainy and cloudy during the first week in May and except on very light land, planting operations were not general until after the middle of the month. Less than 1 inch of rain fell during the last 18 days of May. However, growth was vigorous owing to warm temperatures and ample soil water. This was partly due to abundant soil moisture when winter set in and to the absence of drying winds and a deficiency of sunshine during May.

Red clover, alsike, white clover, and the grasses came through the winter with a minimum of winter injury. Raspberries, strawberries, roses, shrubbery, and perennial flowering plants wintered exceptionally well. Apple orchards bloomed one week earlier than usual but the bloom was light.

June was warm and comparatively dry but all crops especially vegetables grew exceptionally well despite the lack of rainfall.

Dry weather during July had a deleterious effect on pasture lands and continued drought during August caused many springs and brooks to dry up. A high wind during the last week in August caused grain to lodge and resulted in a considerable drop of fruit in many apple varieties.

The fall was open and excellent for the harvesting of the grain, potato and root crops. Ploughing continued until Novemver 21 on which night the Saint John River froze over.

The total precipitation for 1942 was 31.7 in., which was considerably below the 29-year average. Many springs, brooks and wells remained dry from August until almost the end of the year. (J.L. Howatt)

Snow coverage during the winter of 1941-42 was variable in Nova Scotia during January, but excellent throughout February. During March the snow cover gradually decreased, leaving bare ground before the end of the month.

Spring weather was generally favourable to agricultural operations during April and the first part of May. Late spring frosts and wet, humid weather during the last half of May and first week of June caused considerable loss to orchardists in the form of frost injury to blossoms or unfavourable weather for pollination.

The summer as a whole was favourable to crop production. Precipitation was spasmodic in the latter part of the season. After a period of dry weather bordering on drought conditions in light soils, a heavy rain occurred in mid August. This resulted in a severe development of both blossom-end rot of tomatoes on light soils and water core in early fall varieties of apples. A month later a very heavy two-day rain giving 3 to 8 inches of precipitation in various parts of the Valley further affected the quality of apples and aggravated the late-blight rot in potatoes. October rainfall aided the spread of late blight and kept the soil in a very moist condition. There was no lack of soil moisture when winter set in. (J.F. Hockey)

In Prince Edward Island, the moderate 1941 winter left tree and small fruits in a generally vigorous condition with the exception of some severe winter damage to raspberries and pith injury to apple trees resulting from freezing due to a prolonged freezing rain. On account of the favourable weather conditions, pruning was successfully carried out and seeding completed early. By late May, tender crops such as beans, corn, cucumbers, etc., were well established and in a high state of vigour. Apple scab spore discharge was observed June 2 following light rainfall and warm weather. Subsequently, during the same month, leaf infection became general and in some orchards, heavy. During June, the weather was mild with occasional light rains. July was a month of constant rainfall. Potatoes made good growth, but the disease situation was serious. There was a big increase in leaf roll; and late blight made its initial appearance, later to become destructive in many fields and finally, due to prolonged wet weather, to cause an enormous amount of tuber rot. Plasmodiophora Brassicae, with ample free moisture for abundant spore germination, was very destructive in the seedling stage to swede turnips, some fields being a total loss. Later, the rainy weather in September was particularly favourable to the spread of club root, which resulted in a loss of thousands of bushels. Verticillium wilt of potatoes, was less apparent under conditions of wet weather and its presence was further masked by late blight. Nevertheless examination of test-plot tubers revealed a severe attack. An unexpected increase in common scab of potatoes was observed despite a wet September; possibly this was due to intermittent high temperatures during the growing season (R.R. Hunt)