THE WEATHER AND ITS INFLUENCE ON PLANT DISEASE

H. N. W. Toms reports that temperatures fell suddenly to an unusual 0°F accompanied by 30 mph winds in mid-December, 1964 in some districts on the British Columbia coast and in the lower Fraser valley. Snow fell early and the total recorded fall for December was 35 inches compared to the normal average of 3.3 inches. As much as 35 inches of snow had accumulated by the end of January in the coastal area.

These low temperatures in December were responsible for heavy losses in strawberry fields and a large acreage had to be replanted. Raspberry plantings also suffered some damage. Forage crops such as the ryegrasses, ladino clover and, to a lesser extent, red clover suffered damage. Damage was severe to many ornamental shrubs and cherry laurel hedges, many species of cotoneaster and climbing roses were killed to the ground. Fruit trees in home gardens were severely affected and over 600 acres of sugar beet stecklings were killed outright.

Spring was drier than usual and by May nearly ideal conditions prevailed for land preparation and seeding. The last general frost occurred early in May though a late frost in June damaged fruit of some highbush blueberry cultivars in low-lying peat bogs.

The growing months, May to August, were remarkable for the amount of sunshine and for the high mean monthly temperatures in July and August. The 1965 season was notable for the absence or extremely low incidence of diseases such as early and late blight of potato and tomato, gray mold and sclerotinia blight of pole beans and downy mildews of onion and canning peas, all diseases typical of the wet, cool growing season of 1964. With the exception of clubroot of crucifers and sclerotinia drop of early-planted lettuce, the diseases observed during the summer of 1965 were of minor economic importance.

The relatively dry summer favored the occurrence of root rots in shallow-rooted crops. The combination of winter damage and low moisture availability produced premature senility in older portions of ornamental and native conifers. The first killing frost in the inland areas was recorded on 29 September but no heavy frost had occurred in the coastal area by the beginning of November.

According to M. F. Welsh the two most significant weather experiences of the year in the Okanagan and neighboring valleys of British Columbia were a suddendrop to subzero temperatures in mid-December, 1964, and a sharp temperature drop in late March. Strong north winds on December 15 rapidly dropped temperatures nearly 40 degrees to subzero levels with an ultimate minimum of -15°F at Summerland on the 16th. These were the first subzero temperatures ever recorded in December and the wind chill factor reached -53°F in more exposed locations.

This combined experience resulted in the killing of many fruit trees with the heaviest losses occurring in peaches but also considerable killing or injury in cherry, and lower losses in pear, apricot and the more tender varieties of apple. There were no commercial peach or apricot crops in 1965; other stone fruits and 'Bartlett' pears bore commercial crops only in favored locations in the southernmost districts. The apple crop was reduced by several million bushels. Tree damage and crop reduction were most severe on the north sides of trees in exposed locations.

All tree injury has been attributed to the December experience. There was evidence that much of the crop loss resulted from the effect of spring frosts on trees already weakened in December. Apple fruits suffered several types of deformation that appeared to be the direct result of spring frost injury and an assortment of breakdown conditions that have been assessed as secondary results of the December low temperature injury to trees. Many roses and other ornamentals exposed to north winds were severely injured or killed. In the Kootenay valleys the December temperature drop was less serious.

The loss of vines in Okanagan Valley vineyards was low, except for those planted in 1964. Many mature vines were killed to ground level but, as almost all plantings are self-rooted, they were renewed by growth from the uninjured roots. 1965 crops were eliminated or seriously reduced, the extent varying with the variety and location.

The incidence of several diseases was influenced by the winter experience of the trees. Weakened apple bark tissue proved to be unusually susceptible to invasion by Gloeosporium perennans so that canker extension was much greater than normal. The incidence of powdery mildew was much lower than in the last few years although the depression of this disease was not as great as in 1950 and 1956 following previous severe winters. The complete loss of peach and apricot crops and the loss of cherry crops in most districts provided no opportunity for the occurrence of brown rot and rhizopus rot. There is some hope that the increase in brown rot incidence evident in the last several years may be arrested by the lack of overwintering mummies. The vigorous replacement growth from the roots of winter injured grape vines displayed unusually distinct symptoms of fanleaf and other virus diseases.

February and March were unusually dry, with only 0.33 inches of rain. Two brief but heavy rains in April induced a high incidence of peach leaf curl. There were several extended wet periods in May and June and inadequately sprayed apple orchards developed varying amounts of early season foliage and fruit scab. These rains also permitted moderate fire blight levels on pear to be maintained in the two districts where the disease had occurred in 1964 but other districts remained relatively free.

Fruit symptoms of McIntosh pucker were generally moderate but were severe at Summerland; those of Newtown ring russeting were very mild at Summerland and moderate to severe in southern districts. Examination of blossoming dates for the two varieties, in the two areas, discloses that the six days following full bloom of the mildly-affected 'Newtown' at Summerland provided over 1400 heat units whereas full bloom of the more severely-affected 'McIntosh' at Summerland and 'Newtown' in southern districts was followed by a 6-day period providing only 350 heat units.

Summer conditions were excellent for field tomatoes, but a mid-September frost in northern districts shortened the cropping season. A hailstorm in mid-August injured many fruits and is believed to have increased incidence of rots by providing entry points for the causal fungi.

L. J. Piening reports that the spring and early summer in central Alberta were cool and wet, probably facilitating the infection of cereal plants by fungal and bacterial plant pathogens. The weather was warmer in mid-July and encouraged the development of abundant vegetative growth providing ample infection courts and favorable microclimates for considerable disease development. According to J. B. Lebeau, similar early-season conditions prevailed in southern Alberta. Daily sunshine in June averaged only 7.72 hours at Lethbridge and the mean maximum temperature was 68.8°F. These conditions favored the development of foliage diseases, particularly on cereals.

B. J. Sallans reports from Saskatoon that moisture conditions were generally favorable for seeding cereal crops in Saskatchewan during early May despite below-normal rainfall in western and northern crop areas. By mid-May 35% of the wheat and 15% of the coarse grains were seeded. Snow and rain then delayed seeding particularly in the southern and east central districts. However, by 1 June some 90% of the wheat and 60% of the coarse grains had been seeded. Several degrees of frost occurred on a number of nights during May but little significant injury occurred as most seeded grains had not emerged.

Spring rains continued well above normal throughout June and by 13 July all crop districts had excellent moisture conditions. Cool weather following late seeding, however, delayed development some 10 days later than usual. Leaf rust became epidemic on most bread wheats during a period of frequent though generally light rains. A period of high temperatures then hastened maturity; bread wheats were largely defoliated by leaf rust and some areas suffered considerable crop damage due to heat and insufficient moisture. Prospects were still good on 9 Aug. for an estimated average wheat crop of 28 bushels per acre.

Swathing of crops was general by the end of August when heavy to light rains halted harvesting operations. Rain and snow continued at intervals through most of September and harvesting was not resumed until about the end of the month. The wet weather resulted in an estimated loss of 8% of the crop and the quality of wheat was reduced by 1-3 grades. Some frost damage occurred in the late-maturing cereal crops.

In addition to widespread occurrence of and damage by leaf rust of wheat, stem rust was severe on susceptible durum varieties and caused appreciable injury to late fields of 'Thatcher'. The moist growing season favored speckled leaf blotch (Septoria spp.) of wheat and barley and glume blotch (Septoria nodorum) of wheat. Net blotch (Pyrenophora teres) was also fairly common on barley. Common root rot of cereals was not suppressed as much as usual by wet weather. Ergot was more common in wheat than normal although infections were not usually more than trace amounts.

According to W. J. Cherewick, temperatures in Manitoba were near normal in May and June but heavy rains delayed seeding considerably. Crops seeded before the wet weather matured about four weeks earlier than those seeded later. Leaf rust of wheat and stem and crown rusts of oats were severe on the later-sown cereals. Lack of snow cover in the early winter of 1964 appeared to have reduced the populations of overwintering stages of the six-spotted leafhopper and wet weather in the spring of 1965 further hindered a build-up. Consequently, transmission of aster yellows by local sources of leafhoppers was minimal and the incidence of the disease was light in 1965. Cold, rainy weather in early September prevented harvesting of cereals and much of the crop lay in the swath for about two weeks. Seed discoloration by species of Alternaria and other organisms was severe in samples of weathered grain.

The growing season in southwestern Ontario, as reported by C.D. McKeen, was characterized as being cool over the entire period. Abnormally low night temperatures were recorded several times in June, July, August and September. In much of southwestern Ontario precipitation was extremely light until the end of July. Normal to above-normal precipitation was reported for many areas in August and September with more than the usual amount of overcast skies and high humidities for much of the period.

The cool dry weather in June and July induced a high incidence of fusarium root rot in dry beans in Kent, Lambton and Huron counties. Late season rains and high humidities led to considerable infec-

tion by Sclerotinia sclerotiorum in white bean fields in the same counties. The cloudy, humid conditions favored outbreaks of botrytis stem mold in many fall greenhouse tomato crops in Essex County.

Winter killing caused severe damage to forage legumes and to strawberry plantings in the Lower St. Lawrence area of Quebec, according to H. Généreux. The crop season was delayed due to cold soil conditions and wet weather between 8 and 23 May. Dry weather prevailed in June and July and soil moisture content was 50% lower than normal from 20 June to the end of July. These conditions were not favorable for the initiation of apple scab and orchards were also free from fire blight and rust. Leaf spots of forage legumes were at a low level of incidence. Green petal of strawberry and clover phyllody were virtually absent in the area and in the Lake St. John district.

Conditions in August and September were not favorable for late blight development. Traces only were observed on potato foliage in Kamouraska and Témiscouata counties at the beginning of September. Elsewhere in the province the disease was observed in August and September in a few scattered fields. Striking symptoms of bacterial ring rot were evident on foliage and tubers. A frost in late September and a severe one in early October arrested late blight development but also caused severe damage to the potato crop.

Excessively cold weather in February and March with little snow cover in New Brunswick resulted in severe winter killing in strawberry and raspberry plantings, according to S. R. Colpitts. Cool weather prevailed through May to early July and extended the bloom period of apples and strawberries. Rainfall was well spaced and the first apple scab ascospore discharge was on 12 May with scab first found in early June. The disease did not develop extensively and scab was not a problem in 1965.

July and August were extremely dry except in the northern areas. Rainfall was about one-half of the 10-year average in most southern districts. Yields of most crops were greatly reduced but diseases, as a rule, were not serious. Fruit size in apples was greatly reduced and symptoms of deficiency of magnesium and possibly of zinc were evident. There was an early dropping of fruit in September; the crop was further reduced by early fall frosts. Temperatures fell as low as 14°F on 7 October and apples in storage later showed severe browning as a result of the frost,

Some gray mold rot developed in irrigated strawberry plantings but where irrigation was not used the severe drought reduced the picking season to 10 to 14 days and rots were not a problem. Leaf spots, usually serious in some strawberry varieties, were of no importance in 1965. Beans for processing were severely affected by gray mold in the northern areas. Showery, cool weather in August made cucumber scab a serious problem in all parts of the province.

Late blight, for the second successive year, was virtually absent. Although adequate rainfall for an epidemic was recorded in the northern potato growing area, cool temperatures prevented outbreaks. Excessive drought in the southern districts was a factor in controlling the disease. Early blight was serious on tomato but of minor importance on potato.

R. G. Ross reports that although the winter of 1964-65 did not seem severe there was serious winter killing of peach trees in Nova Scotia and most peach orchards failed to set fruit. Raspberries wintered well and good yields were obtained when irrigation was used. New canes did not grow as well as normal but they were relatively free of cane disease.

Average temperatures during April and May were below normal and the development of apple scab perithecia and apple buds were retarded. No ascospores could be found in perithecia examined on 22 April and only a few colored ascospores were present on 4 May. The first spore discharge was recorded on 10 May and the first infection period was on 18 May. Apple buds developed very slowly with bloom about a week later than normal. Warm weather beginning on 6 June brought all varieties into bloom at about the same time. About ten infection periods occurred during the spray season but the remainder of the growing season was relatively free of infection periods so that there was little significant spread of scab. Growers, with few exceptions, had no difficulty in obtaining complete control of apple and pear scab. The apple crop, following an excellent bloom and set, suffered from below-normal rainfall and fruit were small in many orchards.

Rainfall from May to September at Kentville was 9.83 inches as compared with a 50-year average of 15.17 inches although June rainfall was normal giving crops a good start. This lack of total rainfall along with above-normal hours of sunshine and a high evaporation rate affected the development and spread of diseases on all crops. Diseases dependent on rainfall for distribution and high humidity for infection were absent or present in small amounts only; powdery mildews were active. Late blight of potatoes was not found in any of the main potato-growing areas either in cull piles or in the growing crop. There was a 10-day period in August that provided conditions favorable for late blight but low humidity returned before blight could develop. One specimen only, from Cape Breton, was seen.

As in the other Maritime Provinces, abnormally low rainfall characterized the growing season in Prince Edward Island, according to G. W. Ayers. Precipitation from June to September inclusive was the lowest on record. Under the conditions of low rainfall and humidity foliar diseases developed little, if at all, though powdery mildews were prevalent on forage legumes and ornamentals. Only a trace of late blight was present in potato fields and unsprayed tomatoes remained blight-free until harvest. Crops were little affected by diseases although they suffered yield reductions due to the lack of rainfall.