THE WEATHER AND ITS INFLUENCE ON PLANT DISEASE

The weather in the lower Fraser Valley of British Columbia was relatively mild during the winter of 1963-64 with one 4-inch snowfall in January but only trace amounts in the two following months. At the seacoast a minimum temperature of 25°F was recorded during the last week in Feb-

After the last frost in April the cold, late spring delayed growth of perennial forages and the seeding of annual grains, potatoes, peas and other crops. Blossom set was also delayed and some small fruits were late coming into maturity. Because of the low temperatures there was considerable loss of plants in strawberry fields by mid.-June from Rhizoctonia infection. This situation occurs no more than once in several years. However, strawberry yields were fair on good farms but, where control measures were not followed, rotted fruit (Botrytis cinerea) lowered yields considerably. Raspberry yields were generally down despite mold control programs and sugar content was often poor owing to the low temperatures.

As in 1963 growth of ornamental annuals was much delayed and peculiar cold temperature effects were again observed. The cool, rainy summer weather was detrimental to putting up good quality hay and silage. Harvesting of the oat crop was also delayed. This was the third successive summer season with below-average temperatures. It was also notable for excess rainfall and deficiency of bright sunshine.

Late blight in potatoes first appeared in mid.-July but foliar infection was not severe. By September downy mildew was severe in susceptible varieties of onion. September was the coolest and one of the wettest on record. Frost was reported in low, peat bog land during the second week and a 25% blueberry crop loss was claimed in the press. By mid.-October some loss *of* potatoes occurred in bin storage, caused both by late blight and a Pythium - bacterial soft rot complex. The first general killing frost was recorded on 28 October (H.N.W.Toms).

Mean temperatures in the Okanagan Valley of British Columbia for all months of the 1963-64 winter were remarkably close to average, and no extremes were experienced. There was an unusually prolonged period with snow *on* the ground from early December until the end of January but no snow cover throughout February. For February and March total rainfall at Summerland was 0.55 inches, approximately one-fifth average. By contrast, the weather from the first week of June until the third week of September was unusually wet, with a total of 7 inches rain (35-year average, 4 inches). Hours of sunshine were appreciably below normal for these months, and mean temperatures slightly below normal for August and September. October was unusually dry and sunny.

The result of this sequence of weather conditions was an unusually large crop of stone fruits and pears, and an average crop of apples; but lower than normal quality for all fruits, and relatively high incidence of several fungus and bacterial diseases.

The crop of field tomatoes was reduced by an estimated 50% because cool, damp weather delayed ripening. Unsprayed fields suffered severe damage to foliage and fruit from early blight. Sprayed fields were not seriously affected, and mold counts in canneries were low. *On* all other vegetables, incidence of fungus and bacterial diseases was high. Onions suffered particularly, with serious occurrences of smut, downy mildew, pink root, bulb rot and neck rot.

The dry conditions in April and May provided no infection periods for apple scab through the southern part of the Okanagan Valley, but one infection period at full bloom (May 20-21) occurred in the northern districts. In these northern districts there were leaf' infections on earliest-formed leaves, but no subsequent leaf' or fruit infections where recommended dodine or dichlone programs were followed, despite numerous infection periods in June and later months'. No reports were received of pin-point scab despite prolonged wet periods in August and September.

Powdery mildews, after 13 successive winters without extreme temperatures reached almost record levels of severity on most tree fruits, especially apple. Bull's eye rot did not develop seriously in stored apples

of the 1963 crop. Undoubtedly the sunny, dry conditions during the 1963 picking season reduced opportunity for infection of the fruits entering storage.

During the unusually dry spring period no brown rot blossom blight occurred on any of the stone fruits, although there was abundant overwintering of inoculum from the 1963 season. However, infections occurred in some orchards on green apricot fruits during the wet period in June and July, and ripe fruit infections occurred on cherry, apricot, peach and plum. Cherry losses were heavy only in some Kelowna orchards where the cherries ripened slowly and late.

Fire blight, which reached epidemic proportions in many south Okanagan orchards in 1963, was much less prevalent in these districts in 1964. Apparently in the B.C. Interior region very favorable conditions for infection in midsummer are not effective in inducing widespread infection if they are preceded by exceptionally dry weather in April and May. In north Okanagan districts, which did suffer rainy periods in May, fire blight was even more destructive than in 1963.

Fruit symptoms of the apple virus diseases McIntosh leaf pucker and Newtown ring russeting were moderate to fairly severe. Heat units recorded during the 2 weeks following full bloom were slightly below average. Thus the negative correlation between heat units and severity of virus symptoms observed in 8 previous seasons has been suported (M.F.Welsh).

Rainfall in the grain area of the Rocky Mountain foothills in north and central Alberta was adequate throughout the growing season. Barley leaf diseases, and particularly scald, were generally prevalent in this area,. Conditions were progressively drier proceeding eastward to the Saskatchewan border and in this area there was a very low incidence of leaf diseases and stem rust was not observed. Conditions in the Peace River region were dry at the outset but soon were characterized by consistently heavy precipitation with the result that level fields remained flooded during most of the season. Some rarely encountered diseases such as Fusarium scab of cereals were therefore, fairly prevalent (W.P.Skoropad).

Abnormally heavy precipitation in April and early May delayed seeding of spring crops in south Alberta. The cool, wet conditions followed by normal June weather favored the growth of winter wheat and reduced the expected losses from wheat streak mosaic. Cereal root rot development was reduced. Powdery mildew of peas and pea root diseases too, were less severe than in 1963. Conversely, symptoms of bacterial ring rot of potato appeared earlier in inoculated plots this year and the incidence of cereal leaf spots was abnormally high (E.J. Hawn).

Adequate moisture for seed gemination was provided throughout Saskatchewan by general rains of 1 to 2 inches during the first week in *May*. Thereafter precipitation was generally low through June. Unusually high temperatures from *May* 17 to 21 resulted in leaf banding in wheat and heat canker in flax at several locations. Leaf rust of wheat, speckled blotch of wheat, and net blotch of barley were favored in eastern sections by frequent rains during July, but were held in check by dry conditions through the rest of the province. August was marked By twice the normal rainfall in the mid-section of western Saskatchewan and by cool weather with widespread frosts, August 11 to 13. These, with killing frosts on September 10 and 11, followed by high temperatures from the 16th to 18th, caused considerable injury to grains. The germination of the frozen wheat was remarkably good, but barley and oat samples germinated rather poorly. Harvest was delayed in many areas for several weeks by frequent rains, consequently, many samples of grain were bleached or weathered in appearance (B. J.Sallans).

The spring weather in Manitoba favored good development of cereals but frosty nights until 10 June prevented the proper establishment of tender garden crops. A relatively dry July and a cool August helped to slow the development of cereal rusts. Cool wet periods and frost in August lowered tbe grade of wheat (W.J.Cherewick).

Close to normal weather conditions in southwestern Ontario for the first seven months of the year gave rise to no unusual incidence of plant diseases during that time. Weather permitted the timely spraying of fruit and vegetable crops with protective chemicals. The cool, wet weather that set in late in July and continued throughout August and the first ten days of September caused slow ripening of canning tomatoes in Essex and Kent Counties and extensive cracking and leather-end of fruits. The heavy, drenching rains that fell in Middlesex and Huron counties in early August caused plant drowning and heavy defoliation in *many* fields of dry beans. Normal weather conditions held aphid populations at low levels and consequently there were no aphid-borne virus epidemics in burley tobacco, pepper, tomato and cucurbit crops (C.D.McKeen).

The mean temperature in May was three degrees above normal in the La Pocatière, Que. region. Normal temperatures prevailed in June and precipitation was above normal. These conditions were not too favorable for the initiation of apple scab.

July was cool and wet. Consequently, root disorders were noticed in some oat fields in Matapedia and l'Islet Counties and a complex of soil organisms was involved. The population of leafhoppers was greatly reduced and diseases like clover phyllody and strawberry green petal were much less abundant than usual in 1964.

Mean temperature in August was two degrees below normal and 2.46 inches of rain were recorded. These cool conditions initiated late blight but, in general, its development was retarded by the deficiency of rainfall. These conditions favored the development of powdery scab of potato in sandy soil, loose smuts of wheat and oats, and ergot of rye.

Dry conditions which prevailed in September and frost which occurred at the middle of the month, checked the spread of potato late blight. In other hand, black dot disease was more abundant in sandy soils (H. Généreux).

Both temperatures and precipitation were below the 50-year average in New Brunswick. The cool weather delayed the maturity of many crops, notably corn, strawberries, processing beans and tomatoes; in some cases up to two weeks. Apple scab ascospore discharges did not occur until late May and were then well spaced with the result that scab was well controlled by a protective spray schedule only.

The cool weather favored some development of gray mold on strawberries and on potato foliage, though in neither case did it become serious. Cool, showery weather in August was conducive to the development and spread of cucumber scab and early blight of tomatoes. Both diseases became widespread and destructive. The low temperatures in August hindered the development of late blight of potatoes with the result that that disease was virtually absent in the province (S.R.Colpitts).

Weather in Nova Scotia was favorable for the development and spread of apple scab and, where good spray practices were not followed, scab readily developed on the foliage and fruit. Perithecia containing mature ascospores were found on April 20 but the first spore discharge did not occur until May 10 with the first infection period on May 11-12. At this time the early varieties were at the green-tip stage of development. Scab lesions appeared about June 4. There were 15 infection periods up to July 30 with one on July 3-6 of 80 hours' duration. Considerable late or pin-point scab appeared near harvest in poorly-sprayed orchards.

The growing season in 1964 was rather cool for vegetable production. May had above-average temperatures and low rainfall but monthly temperatures were below normal during the rest of the summer. June was 0.8°F below, July, 3.4°, August, 2.7° and September, 2.2°. Rainfall for each month was close to the mean except for August when 3.19 inches of rain in one day caused an excess of 1.8 inches for the month. The regularly recommended spray programs were effective against foliage diseases. Late blight of potatoes and tomatoes developed slowly. The first infection in potato fields was not found until early August but it progressed steadily so that by mid.-September some cases of defoliation were reported in unsprayed fields. Unsprayed tomato fields were a total loss before the end of the season. Foliage blights of carrots were also late in developing but were controlled by 3 applications of fungicide. Onions were raised commercially on a larger scale than usual and Botrytis diseases proved to be troublesome with some loss of bulbs after harvest (R.G.Ross).

In Prince Edward Island the summer and fall of 1964 were characterized by below-normal temperatures and rainfall. Despite lack of normal precipitation, excellent crops were harvested. Apparently the effects of low rainfall were balanced by cool temperatures and overcast skies with a consequent retardation of the evaporation rate.

Because of relatively short periods of free moisture in the soil and on foliage surfaces diseases favored by such conditions did not become serious at least until very late in the growing season. Well-sprayed potato fields contracted little late blight infection and poorly-sprayed fields had only slight to moderate infection up to the time of top-killing in late September or early October. Unsprayed tomatoes showed little infection by mid.-September. The above-normal yields of barley and oats testify to the lack of damaging effects of diseases affecting these crops. Cherry leaf spot, extremely serious in 1963, did not cause serious damage in 1964, probably due to the relative absence of free moisture. Some club-root infection of crucifers occurred in June when soil moisture levels favored spore germination and host penetration. Lack of free soil moisture in July and August precluded infection by the club-root organism (G.W.Ayers).