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## Results of Snow-Mold Work During Winter of 1928-1929

By Arnold S. Dahl

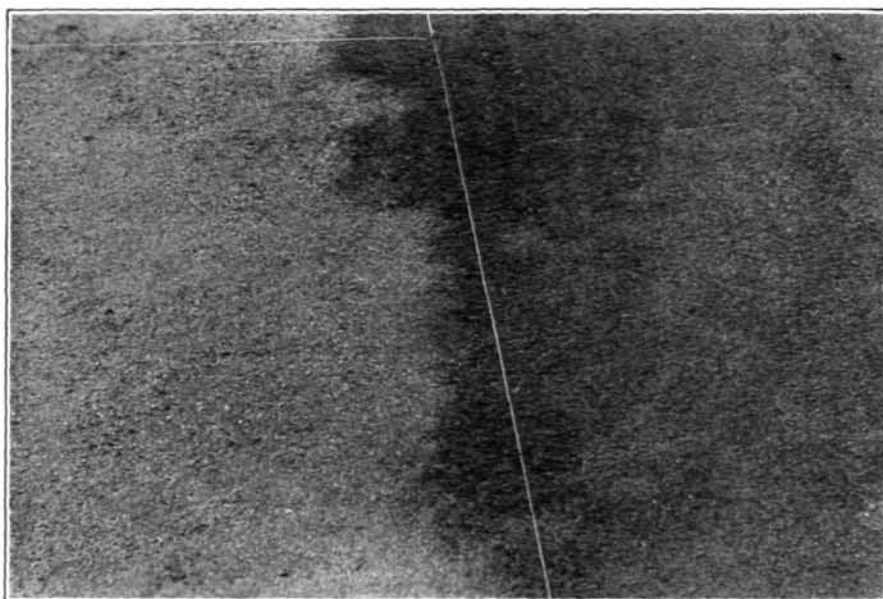
Snow-mold was generally distributed during the winter of 1928-1929 in the northern states but the damage it caused was not severe except in a relatively few cases. The most severe injury was found on those strains of bent which had in other years proved particularly susceptible. The more resistant strains were not attacked or not severely injured by the disease. Conditions as a rule were not favorable to the development of the disease because of the absence of winter thaws and the early and quick disappearance of the snow in the spring. Experiments were conducted during the winter to find the conditions most favorable to the disease, and to determine what influence the growing condition of the grass when it went into the winter had on its susceptibility to attacks of the organism. Work was also continued on control measures.

At the Woodhill Country Club, Wayzata, Minn., plots were laid out on No. 14 green on which all combinations of the following treatments were applied: straw covering, corrosive sublimate (3 ounces to 1,000 square feet), heavy fertilization late in the fall, and two different lengths of cut. Only on those plots which were covered with straw did snow-mold appear. The plots which were covered with straw without other treatment, and those covered and fertilized, were completely killed out. Those treated with corrosive sublimate and heavily fertilized were severely injured on about half of their areas. The corrosive sublimate plot had very little disease.

In some sections of the northern states it has been a general practice among some greenkeepers to cover their greens with straw during the winter. The results of this practice have been variable. Some greens have come through the winter in good shape while others have been severely injured. It is probable that when a susceptible grass is grown the damage from snow-mold is much increased by the covering and that if the grass is particularly resistant to fungous attacks the straw covering may not be harmful. However, since no grass has as yet been found to be immune to the disease, it is doubtful that the practice of covering greens with straw is advisable. In the plots mentioned above, where the turf under the straw was injured it was found that straw made conditions ideal for the development of the fungus. Apparently it kept the moisture and temperature at the optimum condition for the growth of the organism. Temperatures were recorded during the winter and were found to be constantly at or just below the freezing point. Even when the outside temperature went much below freezing, the temperature of the soil under the straw remained almost constant. The temperature of the

soil remained at this point even during thawing weather until the snow disappeared, and then it began to be influenced by the air temperature. That the fungus had been working all during the winter was shown by the fact that when the snow disappeared the injury to the turf was apparent and the mycelium of the fungus permeated the straw covering so that each straw was covered with it.

The practice of fertilizing heavily late in the fall may also be inadvisable when one has a particularly susceptible strain of grass. It has been found with brown-patch and pythium that a fast-growing grass too heavily fertilized is more susceptible because of its soft, succulent growth, and the injury is more severe than on properly fed turf. The plots which were heavily fertilized with activated sludge and sulphate of ammonia were very badly diseased. Even the plot



Injury from snow-mold following the covering of a plot of turf with straw over winter. The plot on the left had been covered with straw while the plot on the right had remained uncovered. No other treatment had been given either plot. Photographed in spring, 1929, at Woodhill Country Club, Wayzata, Minn.

which was treated with corrosive sublimate did not escape injury but was nearly half killed by the fungus. It is probable that besides leaving the grass in a soft, succulent condition when the winter comes on, the organic fertilizer left in the soil makes a better medium on which the fungus may grow and develop. The experiment showed that it was harder to control snow-mold with corrosive sublimate when the grass had been fertilized and forced late in the fall. It is probable that when one has a particularly susceptible grass it is advisable to allow the grass to harden by not fertilizing before it freezes and that this practice will tend to lessen the injury from snow-mold.

No conclusion could be drawn that the length of cutting of greens had any influence on the occurrence or severity of snow-mold. In the

experimental plots there was no difference observed between those cut low and those allowed to grow longer. At Madison, Wis., one side of a green was allowed to grow nearly three-quarters of an inch while the other side was cut close. Snow-mold occurred equally on both sides of the green and on neither side was the injury severe.

It was observed that resodding greens late in the season encouraged snow-mold. Greens were observed at Detroit, Grand Rapids, and Madison, which had been resodded late in the fall. On all of these greens snow-mold was generally distributed. Evidently the raising of the sod in some way made conditions more favorable for the fungus. On some of the greens at Madison the snow-mold injury was most severe along the edges of the pieces of sod.

The fungi causing snow-mold were isolated from diseased turf obtained from Detroit, Grand Rapids, Chicago, Madison, and Minneapolis. These isolations indicated that snow-mold injury was not altogether due to the fungus *Fusarium nivale*, as previously reported, but to several species of *Fusarium* as well as other organisms. Injury due to different organisms could be readily recognized and differentiated, but not enough is known about which organisms are associated with any particular types of injury to be able to classify them and describe them. But the spots which have a pinkish cast are evidently due to a different organism than that which attacks those appearing to be covered with numerous small black specks. There are also some patches which are covered with what appears to be a black scum. This is apparently due to an organism different from that causing either of the above types of injury.

For years observations have been made on the differences of resistance of strains of bent to snow-mold. It was hard to explain why some courses were injured by snow-mold every year while others escaped damage. At Woodhill Country Club, however, two strains of bent were growing side by side and snow-mold occurred only on one of the strains. This particular strain had been injured by snow-mold for two winters and evidently was a susceptible strain. Most of the particularly susceptible strains observed have been of the Columbia type. Such strains are found on many of the courses in the snow-mold regions. Snow-mold may also occur regularly on certain courses where cultural practices are such as to encourage the disease.

Experiments during the winter on control measures again showed that the disease can be controlled or the injury greatly lessened by fungicidal treatment. Even when conditions were very favorable for the disease, as on the covered plots at Woodhill, the treatment with corrosive sublimate held the fungus in check. The plot so treated was the only one of those covered with straw that escaped severe injury from the disease. On other greens in Minneapolis, Madison, Grand Rapids, and Detroit both calomel and corrosive sublimate were applied at rates of 1, 2, and 3 ounces to 1,000 square feet. In all cases the 1-ounce rate was entirely ineffective. The 2-ounce treatment lessened the injury greatly but did not prevent the occurrence of the disease. The 3-ounce treatment in nearly all cases lessened the occurrence to a marked extent and prevented severe injury. Calomel apparently was just a little more effective in most of the tests than corrosive sublimate. This is to be expected, in that calomel is very insoluble and would not be leached out of the soil as quickly as the corrosive sublimate.