

"Winter-Kill"

A Discussion

This discussion has been introduced by Mr. W. J. Rockefeller, of the Inverness Club, Toledo, Ohio, who at a recent date has written us as follows:

In nearly every issue of THE BULLETIN some mention is made of the winter-killing of grass; "winter-kill," as it is commonly called. Inasmuch as in my nineteen years of experience I have never met "no such animal," I am venturing some statements of what I do not know about the subject.

I have never seen any turf that had been killed by the winter, though I have seen the Inverness turf pass through all kinds of winters; the frigid kind that makes one think he is in Medicine Hat or in the Polar regions; and the open kind; and, worst of all, the kind where the range of temperature is the widest—warm and thawing one day and bitterly cold the next.

The only thing I've seen that answers at all to "winter-kill" appears after ice has been on a spot of grass during the winter, and then it is not a kill but a setback. Such grass is slow in recovering in the spring, but I have never observed a kill. Where the surface drainage is good enough to permit rainfall and water from melted snow to run off, I have never noticed a bad result due to winter. There is one little spot on our No. 11 green that appears to be set back every winter by an accumulation of ice but that is the only one, and it is so trivial that it has never been fixed, though it is one of the things we intend to do "some day."

To my mind, winter-kill, as described, appears to be the result of poor drainage, both subdrainage and surface drainage, and I would like to see or hear of a case which occurred where the drainage was good. Mulching greens during the winter with straw or similar material has often been proposed by inexperienced persons, but though it may be all right on a lawn or something like that, it would never do on a green. The mulch might protect against the temperature changes of the winter, but it would do more damage in the spring than it did good all winter. The mulch would stimulate a weak, spindly, unhealthy growth that would be likely to perish shortly after the removal of the mulch. It would be a practical impossibility to remove the mulch without damage.

I have heard green-keepers advise covering greens with a thin layer of sharp sand, but I can not see how that treatment would protect against the winter. The sand might work into the ground in the spring and have a beneficial effect then, but I can see no good in it as a protection against winter-kill.

It seems to me that grass was intended to live out of doors unprotected, and that it is more or less hazardous to try to improve on nature. But drainage is another thing, and that involves merely reproducing the best conditions of nature. If grass growing in a well-drained position will do better than that which is covered at times by water or ice, it seems reasonable to provide good drainage. Of course it must be expected that a thin growth from a fresh fall seeding will suffer more from the winter than an old-established turf, but these statements refer only to old turf. The recording of experiences in THE BULLETIN affords the best means of making progress in the art of green-keeping, and I am submitting these statements in order that others may contribute their experience.

WM. J. ROCKEFELLER,
Inverness Club, Toledo, Ohio.

Mr. Rockefeller discusses a subject on which accurate knowledge is rather scarce. We hope that green-keepers who have had actual experience with winter-killing of turf will give us all the benefit of their observations. In the meantime the following information and expressions of opinion may be helpful:

Winter-killing of plants is not all due to the same condition of factors. If one left his pet rubber tree out of doors on a freezing night he would not be at all surprised if it died. Many tropical plants are killed by a temperature at or near the freezing point. Fall-sown oats will survive a mild winter but will be killed in a severe winter. Even fall-sown wheat is not rarely killed by very low temperatures at times when there is no snow cover for protection. Fall-sown

wheat is but rarely killed by very low temperatures at times when there is no snow cover for protection. Fall-sown grass is sometimes killed in the same way. In all these cases the factor is the same—the chilling or freezing of the plant to so low a temperature that it fails to recover. Some botanists think that death is due to a coagulation of the protoplasm. Be that as it may, it is an absolute mystery why some kinds of plants are killed at freezing point while others remain uninjured. It is well known, however, that any perennial plant in a dormant condition will withstand much more cold than when it is actively growing.

A second kind of winter-killing is due to uprooting of the plants by the alternate freezing and thawing of the soil. This process is called "heaving" and often results in pulling the roots out of the soil and leaving them on the surface. In the case of alfalfa the roots may be pulled up as much as one foot.

So far as known, winter-killing of either of the above-described types does not apply in the United States to well-established grass turf of any of the really northern grasses. But such southern grasses as Bermuda, carpet-grass, and others have their northern limits fixed by winter cold—or in other words, they are killed by cold that northern grasses easily survive. Nevertheless the killing of large patches of old turf on northern golf courses and in lawns is by no means rare, at least in New England.

It is not at all surprising that Mr. Rockefeller has never seen winter-killing of turf; neither has it ever been observed here at Washington. During January and February, 1919, the golf courses about Washington were covered for at least six weeks with a solid sheet of ice, the result of alternate thawing and freezing of snow. Some of the green-keepers were very much worried over the situation, yet no harm resulted to the grass.

In New England, however, it is not a rare thing to see large patches of grass killed between fall and spring. These dead patches very often are in places from which the water does not drain, but not infrequently in well-drained spots which for a time at least during cold weather were full of water or water-logged. These killed patches may be found on a hillside below the place where there was a snowdrift. Sometimes they occur in well-drained lawns, possibly because the freezing of the deeper soil allows the upper layers to become water-logged for a time. At any rate winter-killing is associated very often and perhaps always with a water-logged soil, even though the water-logging may be for a short period.

No experimental investigations to determine the factors involved in winter-killing of grass turf seem to have been made. Not many half-baked theories have been advanced. One of these is to the effect that the grass is killed by the ice covering acting as a burning-glass to concentrate the rays of the sun! If this were true, all the grass should have been killed around Washington by the conditions in January and February, of 1919.

C. V. PIPER and R. A. OAKLEY,
Green Committee, U. S. Golf Association.

In response to letters of inquiry, several New England gentlemen have sent us accounts of their observations and experiences, from which the following quotations are extracted:

I have had considerable experience in building skating-rinks on city parks here in Burlington. We plow a strip in the fall, making a bank perhaps a foot high. When cold weather comes and freezes the ground a few inches we put on water with a hose and spray-nozzle, being careful to put on just enough to freeze without thawing the ground. This is followed by a similar treatment or treatments until we get a good base, when we put on about ten inches of water and let it freeze to form a skating area. The result usually is good skating. However, the next spring and summer we always find that the grass is, for the most part, dead. One can easily get the exact area which was flooded, by the weed flora of the area. The lines are so sharp and distinct that no one could mistake them. This holds on both sandy soil and clay. In fact, it is so detrimental to our parks that we refused this winter to build rinks on our grass areas. It would seem that this exactly fits into the water-logging idea.

GEORGE P. BURNS, *Botanist,*
University of Vermont, Burlington, Vt.

Let me preface what I shall say concerning the causes of winter-killing of grass in mowings and pastures with the statement that I have not planned and carried out experiments with a view to throwing light upon the problem. I have, however, been a student of the conditions affecting the herbage in mowings and pastures for a good many years, and I have opinions, supported, I think, by sufficiently well-established facts, to justify me in expressing them.

Let me say further that I think the conclusion that excess of water is one of the commonest causes, is correct. I do not think, however, that it is necessary, in order that killing may follow, that the soil be actually water-logged. I have seen the grass, for instance, killed in my lawn, where I know the soil is never water-logged, because of water. I should express it in this way: If there is in a mowing or pasture, or lawn, for that matter, a hollow, large or small, in which water will accumulate during the season of the year when its conversion into ice is probable and under conditions under which it can not sink into the soil, perhaps because of frost below, the grass is killed. This same condition, of course, is fatal to alfalfa, which is yet more sensitive than ordinary grasses and clovers.

Of course, in water-logged soil grasses are rather frequently killed by heaving, especially that type of heaving under which the whole surface becomes, as it were, honey-combed, and without doubt this result is much more likely to follow in the case of newly-seeded land.

Another condition which, without doubt, sometimes great injures, perhaps even kills, grass roots is the presence of too heavy a growth of succulent leafage, which, under heavy snows particularly, is packed down and, especially if there is little or no frost in the ground, begins to decay or ferment, to the serious injury or even killing of the grass roots.

On the other hand, I think that sometimes too close grazing and trampling by animals pastured until late in the fall strips the roots of protection, and to such an extent that, as in the case of a grass like timothy (dependent for persistence upon the bulbets), the destruction of these results in what may be called by some "winter-killing"; and indeed, from a certain point of view, the term is sufficiently descriptive, unless it be perhaps in the case of timothy, where the disappearance of the grass is due to the fact that the animals have eaten or trampled the bulbets.

I think it not unlikely that in some cases the disappearance of certain grasses from mowings, especially those newly seeded, may be due to the fact that those particular species do not find conditions essential to their healthful and vigorous growth, but that coincidentally there may be other species, which find the conditions much more congenial, which suppress and finally drive out the first. Thus persons not thoroughly informed in relation to grasses may perhaps sometimes conclude this to be due to winter-killing, which of course it should be understood may have nothing whatever to do with it.

Please observe that nowhere do I explicitly state an opinion as to the cause of the death of grass. It, however, seems to me that cutting off the supply of oxygen needed by the roots and bulbs is probably the most important among the factors which result in killing.

WM. P. BROOKS, *Consulting Agriculturist,*
Agricultural Experiment Station, Amherst, Mass.

I have paid little attention to the winter-killing of grass in pastures and lawns except in a very general way, and this has been limited more to the late-sown grasses for purposes other than pasture. The experience here is that such crops late planted have not developed sufficient root surface to hold them in the soil and in severe winters are often more or less heaved out of it through freezing, with death resulting. So far as water-logging of the soil is concerned, I know that serious injury often occurs to the roots of our fruit trees in such soils, and presume the same effect might occur to a less degree with the grasses.

G. P. CLINTON, *Botanist,*
Agricultural Experiment Station, New Haven, Conn.

I have no definite knowledge on winter-killing and can find no one who can help me out, so I can only give my theory, for what it may be worth. There has been a rather commonly held theory here that this damage results from patches of ice which act as lenses or burning-glasses and focus the rays of the sun to such an extent that they burn the roots of the grass. Personally I do not believe in this theory. So far as I know, winter-killing has resulted about here only from patches of ice which stayed on the ground unusually late in the spring

after a severe winter. I do not see how this ice could injure the roots of the grass while the ground is frozen solidly, and believe that the damage is done in the spring when the grass roots are coming to life and the ice would not normally remain. Perhaps a better term would be *spring-killing*. Whether the damage results from a smothering effect at a time when the ground is opening up and the roots require air, or whether it is a rotting effect from the continual wetting from the melting ice with frequent refreezing at night, or perhaps a combination of this action with a lack of air, I do not know, but I believe that this is the time when the harm is done. It would be interesting to try the experiment of breaking up and removing these patches of ice as soon as the ground began to thaw out in the spring. So far as I know, this experiment has not been tried around here, and this does not look like a very promising year to test it.

N. STUART CAMPBELL,
Agawam Hunt Club, Providence, R. I.

The winter-killing of grasses is not considered a serious matter here in New England, as far as my observation and experience goes. Of course, we have some winter-killing of grass in meadows, pastures, and lawns where the water tends to stand for some days during the early spring. The cause of the winter-killing in such cases I have always attributed to the water-logged condition of the soil, which results in actually drowning the plants through the lack of sufficient air. Alfalfa very frequently winter-kills, but mainly as a result of the heaving up of the plants and the tearing off of the roots on soils with any considerable amount of clay in them. Timothy is also subject to winter-killing, particularly when the field has been mowed or pastured late in the season and not sufficient substance has been stored in the bulbs to withstand the rigors of continued low temperatures with the absence of a snow covering. Our clovers also frequently winter-kill, and this I have usually attributed to the alternate freezing and thawing which we have in the early spring after the snow has left.

F. W. TAYLOR, *Agronomist,*
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Early Spring Work on a Golf Course

DR. WALTER S. HARBAN, COLUMBIA COUNTRY CLUB

This has been an unusually bad winter for anything more than the winter work at the barns such as detailed in the article in the February 23, 1921, number of THE BULLETIN (pages 16 and 17). It is therefore assumed that the green-keeper is prepared, ready, and waiting for the opportunity to go to work on the course.

FAIRWAYS

As soon as the snow has disappeared and the frost is out of the ground, when yet too wet to do anything to the fairways and putting-greens, it would be well to inspect the wet places about the course to see whether the drains are sufficient, and put in others where necessary. All such places show up more clearly in the spring than at any other time, and the evidence of needed lateral branches is more apparent. It may also be found that banks of the streams, bunkers, and water hazards are broken down by the frost. These should be protected to prevent further disintegration, and made more sightly.

Perhaps, after all these things have been done, the fairways may be dry enough to roll. Of this, however, one should be certain, as there is nothing that can be done that will be more injurious to the development of turf than heavy rolling when the ground is very wet. The only com-