TIMELY TURF TOPICS

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REMOVE MAT OF EXCESS STOLONS BY VIGOROUS RAKING: This year under necessary wartime modifications in maintenance programs, the greens in many cases have been allowed to grow somewhat longer than usual. Also on some courses there probably have been fewer applications of topdressing than usual. On creeping bent and Bermuda grass greens these changes may be expected to result in increased mat formation which, in addition to reducing the putting qualities and encouraging the development of undesirable grain on the turf, makes the grass more susceptible both to the summer diseases and to snowmold. A dense mat of leaves and stolons encourages the development of the disease-producing fungi often resulting in severe attacks of disease which are extremely difficult to control. In severe cases the mat of dead and dying stolons and roots may become so thick that the growing layer of grass loses contact with the soil and therefore does not receive sufficient moisture. The consequent drying out of the turf increases the susceptibility of the grass to injury from low temperatures in the winter as well as to summer injury.

It will be wise to remove the mat as soon as hot weather is over and when the grass begins to grow vigorously. This is best done by raking the grass vigorously and repeatedly in several directions and cutting close immediately thereafter. This treatment should be followed by a heavy application of topdressing. A true surface can then be produced by working the topdressing into the turf with a brush or mat. This treatment will remove any spongy pockets which tend to form in low areas if the surface is not properly leveled.

Such a treatment will cause the green to appear unattractive for a time but it should not injure its putting qualities. If this work is done when weather conditions are conducive to rapid growth the scarred areas will soon recover and the good appearance of the green will be restored promptly. A similar treatment should be given to the greens again in the spring before hot weather in order to help prevent disease attacks during the summer.

The removal of the mat of excess stolons from creeping bent greens in the spring and fall is generally advisable under normal conditions. With wartime curtailments in labor and material, however, it is even more important to do it as a preventive measure against both winter and summer injuries.

SPIKING MAY IMPROVE LOCALIZED SPOTS OF DYING BENT: From time to time in various sections of the country reports have come in of yellowed and dying spots occurring on otherwise healthy greens, the injured turf of which has not revealed the presence of a casual fungus. Such localized spots are not uncommon. They are frequently characterized by a dense mat of undecayed roots and stolons, under which the soil is hard and dry, in which cases general automatic watering does not improve the condition. This is due to the fact that, because of the impervious mat of undecayed organic matter, the water runs off onto surrounding grass which consequently becomes overwatered.

It has been found that frequently, therefore, the grass on the affected areas will respond favorably to a generous spiking followed by carefully directed hand watering. The spikes break through the impervious layer of organic matter as well as the hard soil beneath, thus allowing the water to get through to the lower levels. Water should be applied after spiking until the soil is moist down to a depth of 4 or 5 inches, as determined by soil samples taken down to that depth.

CHEMICAL NITROGEN AGAIN AVAILABLE TO GOLF COURSES: According to the new order of the War Food Administration (FPO 5 Revised, July 3, 1943) chemical nitrogen is once more available for use in Specialty Fertilizers, which classification includes those fertilizers used by golf courses. The section on Specialty Fertilizers in this order is quoted below.

> "During the period July 1, 1943, to June 30, 1944, each fertilizer manufacturer may manufacture no more than one grade of mixed specialty fertilizer, and in addition, may sell and deliver straight chemical nitrogenous material as specialty fertilizer. For such purposes, each manufacturer may use quantities of nitrogen and potash not to exceed 50 percent of the quantities of each used by such manufacturer for such purposes during the period July 1, 1941, and June 30, 1942. The grade of mixed specialty fertilizer need not be an approved grade of fertilizer. The water-soluble organic nitrogen content of the mixed specialty fertilizer shall not exceed 25 percent of its total nitrogen content, and its total plant food content shall consist of at least 16 units."

According to other sections of the order, only specialty fertilizers can be used on "lawns, golf courses, parks, cemeteries, roadsides, or non-commercial plantings of trees, shrubs, or flowers" except for fertilizers which were on hand on July 1, 1943, for use and not for sale. Such fertilizers may be used for any purposes.

Thus although each manufacturer may only prepare one grade of mixed specialty fertilizer he is permitted to sell straight chemical nitrogenous material so long as he does not use more than 50 percent of the total nitrogen used in 1941-42. There are, however, certain limitations which exist at present which are not indicated in the order. Neither nitrate of soda nor sulfate of ammonia are available for this purpose at the present time. The amount of nitrate of soda which will come in from Chile is uncertain and all available sulfate of ammonia must be conserved for use in mixed fertilizers. Large amounts of ammonium nitrate, however, are available since more has been produced than is needed by the Army.

Ammonium nitrate contains from 32 to 34 percent nitrogen as compared with sulfate of ammonia, which contains 20 percent; and urea, which contains 40 percent nitrogen. It is readily soluble in water and both the ammonia and nitrate nitrogen will be available to the grass immediately after application. Extreme care should be exercised in applying it to turf, particularly on greens, to prevent burns. However, considering the highly specialized nitrogen requirements of the turf on greens as well as the specialized methods used in the maintenance of greens, the greenkeepers are one group of fertilizer users who will be able to make good use of this high nitrogen material and take advantage promptly of the large supplies of it which will be available.

Attention should be drawn to the fact that ammonium nitrate has an extremely strong tendency to take up moisture from the air. Industry and the Department of Agriculture officials are working together on various methods of coating the particles of ammonium nitrate with materials to reduce their water-absorbing capacity and thereby prevent caking. It is hoped that for topdressing purposes the coated product will distribute much more easily than the uncoated product. If the ammonium nitrate is to be used in solution the uncoated product probably will be preferable to the coated. Uncoated material probably should be purchased only as needed, however, in order to avoid the problem of storing it in moisture-proof containers.

Because of its strong water-absorbing properties, and until a satisfactory coated product is available commercially, it may be best to apply the ammonium nitrate to greens in solution and promptly water it in. It can also probably be applied directly to the green dry, mixed with compost, provided caution is exercised to prevent burning of the foliage. Another possible use may be in the compost pile to speed up the process of disintegration and the killing of weed seed.

PROPER TOPDRESSING MAY HELP AVOID LAYERING: Greens are topdressed primarily for three general reasons,--to keep the grass growing in a healthy, vigorous condition; to create a true putting surface; and to provide a surface sufficiently resilient to hold a pitched ball. To keep grass growing well there must be continuous soil connections between the growing grass on the playing surface and the soil and subsoil of the green. Such connections are necessary in order that water falling on the green may penetrate well down into the soil and in turn be drawn up by capillary attraction to the roots of the grass plants as the surface dries out. Layers of any materials such as organic matter arising from matted turf, sand, clay, peat, or muck, break these soil connections and therefore interfere with the normal movement of water up and down in the soil.

Material applied to the surface of the green as a topdressing should be of the consistency of sandy loam and should be well brushed or if necessary spiked into the turf to maintain a good soil connection between the surface and the soil beneath. The application of pure materials such as sand, peat, muck, or the like, should be avoided. When they are needed to improve the soil texture of the green they should be mixed in the compost with soil to give the topdressing the consistency of sandy loam. The consistency of topdressing material used in successive applications should be as nearly constant as possible over long periods of time.

Layers also result when heavy applications of topdressing are made on matted turf without first removing the mat of excess stolons and leaves by vigorous and repeated rakings and mowing. The topdressing cannot be worked down into such dense growth and therefore covers the mat like a blanket, resulting in the formation of a layer of organic material which interferes with the penetration of water into the soil.

The acidity of the topdressing material should be determined and properly adjusted if too acid. Where coastal sand is used it should be made certain that it does not contain enough salt to be toxic. Also the material should be composted long enough or with enough of a nitrogen carrier (see pages 4 to 6 of this issue) to kill the weed seed. If fertilizer is to be applied at the same time it can be incorporated in the topdressing before it is applied in order to reduce the number of operations. However, over-fertilizing should be avoided. In planning the fertilizer program, therefore, the fertilizer content of the compost should be taken into consideration before additional fertilizer is applied.

Heavy topdressings are usually applied in spring and fall and it is these applications which should be preceded by vigorous raking and cutting to remove the mat in the case of creeping bent or Bermuda greens. Frequent light topdressings of sandy loam material during the growing season, when well brushed into the turf, may help prevent mat formation and at the same time help to maintain a true putting surface and a resilient turf.

MAINTENANCE PRACTICES INFLUENCE SNOWMOLD: In areas where snowmold is likely to prevail it is more important than ever this fall to put into practice all possible preventive measures. The proverbial "ounce of prevention" will require much less labor than the alternative "pound of cure," and labor is rapidly becoming the most critical limiting factor in golf course maintenance.

A knowledge of some of the climatic and soil conditions which encourage the development of the fungus causing snowmold will facilitate an understanding of preventive measures. The fungus grows most vigorously in the presence of sufficient moisture and at moderately cold temperatures. Consequently it frequently develops under melting snows or on areas where snow falls on unfrozen ground. However, snow is not necessary for the occurrence of the disease so long as abundant moisture is furnished by mist, fog, or rain at a sufficiently low temperature.

Therefore where snowmold has occurred in years past all efforts should be made this year to keep the grass leaves as dry as possible. No winter cover such as straw or leaves should be used on turf since any cover of that sort will help to hold a blanket of moisture over the surface of the grass. Where early snows are to be

expected, and deciduous trees are present, the raking of fall leaves, particularly from turfed areas in low places, should be considered a "must" in the maintenance program regardless of how critically the labor has been curtailed. This should not be overlooked even where courses are closed to play if any effort is being made to maintain the turf for post-war play. In general any provision which can be made for rapidly drying the surface when winter snows melt - such as provision for rapid run-off of water from melting snows, improvement of drainage of low areas, etc., will be advisable if practicable this fall.

Mats of excess stolons, leaves, etc., if present on creeping bent greens should be removed by vigorous raking and cutting sufficiently early to allow the scars to heal before winter sets in.

Grasses stimulated into vigorous fall growth are particularly likely to suffer from severe attacks. Therefore, in areas where snowmold is to be expected no fertilizers should be applied after the end of August.

In addition a fungicide should be applied to turf before the first snow falls if possible. When mercury compounds were available for use on turf, an application of calomel or corrosive sublimate or a mixture of these two mercury compounds, applied dry mixed with the sand at the rate of 2 to 3 ounces to 1,000 square feet, usually gave satisfactory control of the disease. Two years ago, Green Section tests in snowmold areas of various possible mercury substitutes demonstrated that tetramethyl thiuramdisulfide (now available commercially as Thiosan) gave almost equally as effective control when applied at the same time at the rate of 4 ounces to 1,000 square feet.

If any new turf is to be established this fall in snowmold areas care should be taken to avoid the use of strains or species which are particularly susceptible to snowmold, such as seaside, Columbia, and Inverness strains of creeping bent; red fescue; and Poa annua.

WEED SEEDS IN COMPOST DESTROYED BY NITROGENOUS MATERIALS: Results of tests made several years ago at Arlington Farm by Marvin H. Ferguson, who then was a member of the Green Section staff and now is employed by the Division of Forage Crops and Diseases of the U. S. Department of Agriculture, indicate that the addition of nitrogenous materials to compost not only accelerates decay of organic material but also destroys viability of a large percentage of weed seeds present, in a month or less. Ferguson's experiments were conducted as a result of earlier Green Section tests initiated in 1938.

For years it has been generally recognized that if the compost pile contains manure a period of one year or less will generally suffice for killing weed seeds present. As early as 1920 experiments at the Rothamsted Experiment Station in England demonstrated that straw and similar vegetable matter could be converted into an excellent imitation of farmyard manure by moistening the straw thoroughly and adding "some nitrogen compound of which sulfate of ammonia is at present most easily obtainable." Green Section tests of this method resulted in recommendations (published in the Bulletin in February, 1922) that 100 pounds of sulfate of ammonia and the same weight of ground limestone be added to thoroughly moistened straw for composting. Later in the same year it was suggested in the Bulletin that in composting manure or sod 25 pounds of sulfate of ammonia or nitrate of soda would be sufficient to add to one ton since manure and sod were approximately one-fourth as bulky as straw. Again in June, 1924, it was stated in the Bulletin that in a compost pile "both weed seeds and straw will decay in a relatively short time if properly treated," and that sulfate of ammonia "hastens the devitalization of weed seeds in the compost pile." The conclusion was drawn in that year that "where heat is spontaneously generated in manure piles, practically all the weed seeds contained are killed within a year or less."

In the investigations reported here it was found that when nitrogenous materials were added to soil at a rate which supplied 5 pounds of nitrogen per cubic yard of soil, 88 to 99 percent of the weed seeds were rendered non-viable in 30 days or less. Daily soil temperature records kept for 30 days throughout some of the experiments, however, indicate that heat could not have been responsible for the death of the weed seeds.

It can be seen from the accompanying table that addition of a combination of peanut hulls and sulfate of ammonia or peanut hulls and calcium cyanamide reduced the viable weed seed content of the soil more than 99 percent although the temperature of the soil was essentially the same as that of untreated soil. On the other hand, addition of cornmeal elevated the temperature appreciably and yet reduced the weed seed population only 52.6 percent, whereas Milorganite, when added in amounts sufficient to furnish 12 pounds of nitrogen per cubic yard, elevated the temperature at the same time as it reduced the weed seed 97.6 per cent.

Percentage Reduction in Number of Viable Weed Seeds in Soils by Nitrogenous Materials as Related to the Amount of Nitrogen Added. Figures Are Given for the Resulting Soil Temperatures Where They Are Available. The Flats of Untreated Soil Averaged 583 Weeds Per Flat.

Material	Lbs. Material Per Cu. Yd.	Approximate Lbs. N. Per Cu. Yd.	Percent Reduction in Weed Seed	Temperature Within Compost During Composting Period		
				Maximum	Minimum	Average
Air Temperature				89	73	81
Untreated Soil				82	68	75
Sulfate of Ammonia	25	5	99			
Sodium Nitrate	25	5	97			
Urea	12	5	99			
Calcium Cyanamide	25	5	91			
Cottonseed Meal	85	5	90			
Soybean Meal	80	5	88			
Milorganite	100	6	82.1	84	72	78
Milorganite	200	12	97.6	94	74	81
Peanut Hulls	200	2	66			
Peanut Hulls Sulfate of Ammonia	100) 27)	6.4	99.7	81	70	75
Peanut Hulls Calcium Cyanamide	100) 27)	6.4	91.9	83	69	76
Peanut Hulls Calcium Cyanamide	100) 54)	11.8	99.3	81	68	75
Manure	400	2.0	68.0			
Cornmeal	100		52.6	94	72	77
Cornmeal Sulfate of Ammonia	100) 27)		97.3	91	77	82

As may be seen from the table, both organic and inorganic sources of nitrogen were used. Nitrogen in the natural organic products was effective but not quite as efficient as was chemical nitrogen. Results of other tests (not included in this table) in which smaller amounts of material were used indicated that the control effected within 30 days did not warrant their use.

These tests were made by thoroughly mixing nitrogenous materials with measured amounts of moist soil known to contain a large number of weed seeds. The lots of soil were then placed in metal cans, covered, and left for 30 days. At the end of this period, soil was taken from these containers and placed in flats in the greenhouse under conditions favorable for germination. The flats were left in the greenhouse for enough time to allow all seeds to germinate. The weeds in each flat were then counted and these counts in comparison with counts of the weeds present in the control flats provided the data from which the percentage reduction of viable seeds was calculated. The control flats were filled with untreated soil of the same kind subjected to conditions identical to those to which the treated lots were subjected.

After these tests had been conducted, the Green Section learned of similar control of weeds in tobacco seed beds, accomplished at the Virginia Agricultural Experiment Station with application of urea and calcium cyanamide directly to the seed bed, which was then covered with from 8 to 12 inches of straw to keep in the moisture as well as to prevent weed seeds from being blown in. In these tests the chemicals were applied at 1 pound to a square yard and worked into the soil to a depth of 4 to 5 inches (7 or 9 pounds to a cubic yard). It was found there that the most successful applications were those made on October 1 prior to planting of the seed beds in February. One week before seeding, the straw was scratched off and an 0-8-3 fertilizer worked into the soil. The resulting plants showed no injury from the use of the chemical nitrogen, but as the season progressed they began to show a nitrogen deficiency, which was easily overcome by an application of nitrate of soda in April and again in May. Similarly conducted greenhouse tests showed a complete control of the fungus disease known as black root rot by use of these relatively large amounts of chemical nitrogen.

Recently Dr. J. A. De France has published results of tests made over a period of years at the Rhode Island Experiment Station. In his tests the weed seed killing capacity of inorganic and organic nitrogenous materials was tried in compost in both greenhouse and the field. The materials were applied at rates sufficiently high to supply from 5 to as much as 15 pounds of nitrogen per cubic yard of compost. Apparently in the field tests it was necessary to apply Milorganite at the high rate of 15 pounds of nitrogen per cubic yard to kill the seeds and sulfate of ammonia when applied even at that rate did not reduce the number of viable seeds. The results of greenhouse experiments were similar to ours except that much higher soil temperatures developed with the use of organic nitrogen carriers under Dr. De France's conditions.

In one series of tests made by Dr. De France in the summer of 1942 compost was treated in wooden bins variously with Milorganite, Agrinite, calcium cyanamid, and sulfate of ammonia, at rates not exceeding 5 pounds of nitrogen per cubic yard. Not less than 95 percent of the weed seed were killed by all treatments. On July 15, one month after treatment, compost was applied to plots of creeping and Colonial bent at the rate of 1 cubic yard to 5,000 square feet. The treated compost in all cases resulted in much more pronounced increase in growth and color of the grass than did applications of untreated compost made at the same time and rate.

With greatly increased amounts of chemical nitrogen available after the war, this method of killing weed seeds in the compost pile may prove much quicker, cheaper, and more effective than the usual soil sterilization practices used on golf courses.

TURF SEED CROPS BELOW AVERAGE: It is unfortunate that this year, when the demand for turf grass seed may be expected to be unusually large because of requirements for airfield plantings and Lend-lease, the crops have been considerably smaller than average. However, with the exception of Bermuda grass and carpet grass seeds which are frozen, all of the turf grass seeds can still be purchased without priorities.

According to estimates of the Agricultural Marketing Service of the U. S. Department of Agriculture, the Kentucky bluegrass crop this year is the smallest in 4 years. The estimated 28,350,000 pounds of clean seed for this year compares very poorly with last year's record crop of 63,350,000 pounds, or the 5-year average for the years 1937-1941, inclusive, of 42,168,000 pounds. The redtop crop is the smallest in 7 years. It is estimated that the combined commercial and non-commercial production will amount to 14,000,000 pounds of clean seed in 1943, as compared with 15,800,000 pounds last year, and a 5-year average of 18,100,000 pounds. Estimates of fescues and bents have not yet been prepared.

It is fortunate that large stocks of the seed were accumulated and can now be drawn on to help take care of the demand for these seeds for this year. On June 30, 1943, the stock of the 1942 crop of Kentucky bluegrass seed carried over by the dealers (exclusive of stocks owned by the Government) was 190 percent of that on hand at the same time last year; that of the bents was 147 percent. The stocks of redtop and ryegrass still held by the dealers, in spite of the heavy drain due to the Government's needs for airfields and other turfed areas were 97 and 79 percent, respectively, of the stock on hand at the same time in 1942.