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APPLYING CORROSIVE SUBLIMATE AND CALOMEL TO TURF

In the interval of ten years since the Green Section first developed the method of controlling turf diseases with corrosive sublimate and calomel, these chemicals have become the most used fungicides on turf. In that interval various methods of application have been tested and a few of the better have been recommended.

To be rated satisfactory, a method for applying chemicals to turf must provide for even distribution, rapid and economical use, as little interference as possible with play, and, above all, minimum danger to those who handle them.

The fungicides commonly used against turf diseases all contain mercury and are therefore dangerous. Corrosive sublimate is one of them with well-known deadly possibilities if carelessly handled. Certain methods of application, particularly the dusting method, which seemed to present unnecessary hazards to workmen were from the first discouraged by the Green Section.

In spite of the fact that hundreds of thousands of applications of these extremely poisonous chemicals have been made on turf during the past ten years, we have yet to learn of a serious injury by them to any member of a greenkeeping staff. However, there have been some recent reports of poisoning cases which, although fortunately not serious, have nevertheless served to focus attention on the possibility of serious consequences of careless or improper methods of using these chemicals.

The recent reports of poisoning have resulted from a modified dusting method. The breathing of fine dust of these poisons is to be avoided and any method that unnecessarily exposes workmen to mercury dust must be strongly condemned. Mercury poisoning is accumulative in the human system and therefore may be slow in its action. With ordinary care these mercury compounds may be used without danger.

The best methods for applying corrosive sublimate and other fungicides were described in detail in The Bulletin of the United States Golf Association Green Section, Vol. 12, pp. 125-132. One of the methods there described is that of applying the chemical mixed in small quantities of sand or compost. This method has been gaining in popularity in recent years.

One of the principal objections to the latter method is that the chemicals tend to form lumps in the packages and considerable care is required in breaking them. Unless all lumps are reduced to powder there cannot be an even distribution of the chemical. A method used at Arlington to remove these lumps effectively was described in the Bulletin referred to above.

During the past two years an improvement has been made in this method. It provides for a much more nearly uniform distribution of the compound through the sand or compost carrier, saves time in preparation and greatly reduces the poison dust hazard.

This improved method consists of putting the corrosive sublimate into solution instead of breaking the lumps. The concentrated solution is then mixed through the sand or compost carrier, thereby coating each particle with a film of poisoned solution. This eliminates the dust of the old mixing method and prevents the escape of poisoned dust during application. The procedure is as follows:

Preparing stock solution: Put two pounds of corrosive sublimate and one pound of table salt in a gallon bottle and fill with water. This may be shaken until the chemicals are dissolved or it can simply be allowed to stand for an hour or more until the corrosive sublimate is in solution. The salt is included as an aid to dissolving the corrosive sublimate.

Spread 64 quarts of dry, finely-sifted sand (finishing sand) in a thin layer on a cement floor or in a mortar box. Put the above gallon of solution in a watering can and sprinkle over the sand. Then with a circular motion stir the mixture with a rake until it is well mixed, which will be clearly indicated by the darkening due to the added water.

Larger quantities can be mixed in the same proportions, using earthenware or wooden containers for preparing the solution and for storing the poisoned sand. This mixture may be prepared on a rainy day or on other occasions when work is slack, and set aside to use as needed. It will not deteriorate noticeably even when left standing for several months.

Each quart of the above sand contains ½ ounce of corrosive sublimate. If one wishes to treat a green of 5,000 square feet at a rate of 1 ounce to 1,000 square feet, he simply takes from the reserve stock a 10-quart bucket of the poisoned material and broadcasts it over the green. If the 10 quarts are considered insufficient for even coverage by the man who is assigned to the task, it is a simple matter to mix it with sufficient additional sand or fine compost to assure good coverage; or if preferred, the original quantity of sand in the stock mixture can be increased to meet the particular requirements of the distributor.

Mixtures of calomel with corrosive sublimate may be prepared in the same manner. The calomel will not go into solution but will remain in suspension. The mixture should be well shaken or stirred to make a milky fluid before adding it to the sand.

Much larger quantities of calomel than of corrosive sublimate may be added to the water, thereby providing a means for increasing the strength of the sand mixture if desired. The amount of corrosive sublimate should not greatly exceed 2 pounds to a gallon of water, especially if there are lumps or large crystals which will not dissolve in more concentrated solutions. Any excess of corrosive sublimate which fails to dissolve but which remains in the bottom of the bottle as a fine sediment will mix through the sand and be just as effective as when in solution, provided it is well shaken or stirred before pouring on the sand.

The advantages claimed for the sand or compost method of application are that no expensive equipment is required for applying it, less time is used than with some methods of liquid application, there is no need of spraying or other equipment and hose to interfere with play, distribution may be made by the simple process of hand broadcasting or by means of various seed and fertilizer distributors.

One of the principal disadvantages of the method has been the time required to break up lumpy material and get even distribution through the sand or other material used as carrier. The preparation of the stock solutions as above described completely eliminates the difficulty experienced in mixing lumpy corrosive sublimate. It also practically eliminates the breathing of dust of this poison during the process of mixing and spreading. During the short time required in handling the dry powder for weighing and placing it in the containers for solution, the workman can be further guarded by using a suitable mask or simply by tying a moist towel across the nose and the mouth. This precaution should be taken in handling any of the mercury fungicides and arsenate of lead as well.

In using the above method it is important to have

on hand a good supply of dry, fine sand to be used in mixing. If the mixture proves to be too moist to distribute well, a larger quantity of dry sand may be used or the mixture may be permitted to dry out until the right consistency is reached. The effectiveness of the chemical will not be changed by such drying. The mixture may be kept moist in storage by covering the container tightly or by the occasional covering with wet burlap.

The preparation of stock solutions as above described will be found to offer many advantages in applying these fungicides with the liquid method also.

CONTROLLING WEBWORMS

This is the season of the year when webworms usually injure turf most seriously. Because of the drought conditions in the Central West, it may be expected that these pests will congregate in putting greens due to the parched condition of the grasses in fairways and rough.

The webworms prefer succulent grass, which they eat off very close to the soil level. In dense velvet bent turf it is not unusual to find the grass blades eaten off at the bottom and still standing to shrivel and form the characteristic brown lines over the silk-lined tunnels. The webworms' work in such turf closely resembles that of the clothes moth in plush, and in both cases the caterpillars (larvae) do the damage rather than the moths. The turf is usually injured by birds searching for the worms.

A rather complete description of the life of the webworms has been published in The Bulletin of the United States Golf Association Green Section, Vol. 10, p. 115, Vol. 12, p. 14, and in the latter volume is summarized the efficiency of various control treatments.

The life cycle of the webworm begins with the eggs dropped promiscuously on turf by the moths at night. These soon hatch into naked caterpillars. They grow rapidly and construct tunnels of silk covered with bits of grass or soil in which they feed. As they reach mature size, about one inch, they burrow into the soil and go into the chrysalid or pupa stage, from which they emerge as grayish white moths. The moths rest with the head down and with wings folded close to the body. In one important species there are three more or less distinct broods during the year.

The webworms prefer to feed in turf which is dense or tall enough to offer a hiding place, and are most active at night or when the sky is overcast during the day.

If conditions are suitable, the larvae reach maturity in two or three weeks, which means that if injury is to be prevented the measures for control should be applied as soon as their presence is noticed.

The control measures fall into two groups: contact poisons and stomach poisons. Among contact poisons are kerosene emulsion and extracts of pyrethrum, derris and rotenone, applied with a sprinkling can or barrel cart. The most effective stomach poison seems to be arsenate of lead, either in a spray or a dust.

The kerosene emulsion method is not recommended for putting greens because of the likelihood of injuring the grass.

The pyrethrum, derris and rotenone materials are not injurious to the grass when applied at a dilution of 1 - 400, which has been found effective. The rate of application should be approximately 100 gallons to 1,000 square feet. The larvae are brought to the surface by these materials in much the same way as earthworms treated with corrosive sublimate. The disadvantage of the contact method is the cost of the extracts, which may amount to $4.00 for 1,000 square feet.

The stomach poison, arsenate of lead, has been found to give good control applied as a spray at the rate of 1½ or 2 pounds in approximately 5 gallons of water to 1,000 square feet. It is important that the spray be directed downward in order to coat the base of the leaves and stems with the poison.

One of the dusting methods consists of applying a mixture of 2 pounds of the arsenate of lead with 4 to 6 quarts of dry, finely-screened sand to each 1,000 square feet. The application is made either by hand or with a wheelbarrow spreader. The poison is carried down by the weight of the sand particles and dusts off enough to coat the leaves lightly. The turf is discolored less when the poison is applied in this way and no expensive equipment is needed.

The arsenate of lead treatments should be applied when clear weather is predicted. Greens should be well watered before the poison is applied and further watering should be suspended so that the poison may remain on the leaves where the grubs are feeding during one or two nights.

From the economy point of view the arsenate of lead spray or sand methods are the most practical since the applications for webworms probably carry sufficient poison to control earthworms and grubs as well.

It must be remembered that arsenate of lead is a dangerous poison which is slowly eliminated from the body. The greenkeeper's staff should be protected from the dust or spray as much as possible by covering the nose and the mouth with a towel or a mask during any work involving this compound.

COPPER FUNGICIDES

During the last two or three years there has been some renewed interest in the use of copper fungicides for the control of turf diseases. It therefore seems well to again warn against the use on turf of chemicals containing copper. It is well known that the copper fungicides will effectively control brownpatch. As a matter of fact, the first chemical control of brownpatch was with copper compounds.

We quote from The Bulletin of the United States Golf Association Green Section, Vol. 12, pp. 119, 120, as follows:

> "Experiments with Bordeaux mixture and other copper compounds led to injuries which were far worse than the disease they were intended to cure. This injury was copper poisoning, resulting from the accumulation of copper in the soil; it is likely to develop more rapidly in some soils than in others. Some of the golf courses which had used Bordeaux mixture for several years were forced to rebuild some of their putting greens to eliminate the soil containing copper."

On page 120 of that number of The Bulletin is published a picture of turf injury due to copper poisoning.

There is no test which can be made of soil to indicate where copper is likely to be poisonous and where it may prove harmless to grass. Therefore, the only way to determine this point is by trial. This trial method is on a par with the method of testing whether a mushroom is a poisonous or an edible species. One simply eats the mushroom, and if it kills him it is a poisonous variety and if it causes no harm it is an edible variety. Those who insist on using this method on their putting greens may in a few years have to pay dearly for the experiment.

Some of the copper compounds now offered for sale to golf clubs are not Bordeaux mixture. However, the Green Section experimental tests at Arlington included forms of copper other than Bordeaux mixture. The results clearly indicated that the question of toxicity was one of how much copper was used and not one of chemical combination. Therefore, we warn clubs against any extensive use of copper compounds on turf, regardless of the lure of a somewhat reduced cost in controlling disease. It is far better to let attacks of the disease go untreated than to risk permanent injury from copper poisoning.