

siderable amounts of ammonia in the soil, also interfere with the test for potassium and where large amounts of compost, organic nitrogen carriers, or ammonium sulphate are being used, the potassium test may give much higher results than it should. The test for nitrates may also be affected by interfering substances and the results may indicate much larger supplies of nitrates than actually exist in the soil.

The above considerations apply more particularly to the short chemical tests made with test kits. In the laboratory, the chemist can better control the freshness and purity of his reagents; he can prepare standards of known concentration for comparison with his tests, and by modification of his methods overcome the effects of otherwise interfering substances in the soil. In these respects, the chemical testing done in the laboratory, is likely to be more satisfactory, than that done on the course by the inexperienced operator with a chemical test kit.

Correlative Studies Needed

In summarizing what has been said about the use of chemical tests in diagnosis of soil problems in general, and golf course soil problems in particular, it must be

emphasized again that interpretation of the results in terms of needed treatment is the real problem at the present time. The limitations of the tests themselves have been briefly discussed with regard to the information they can give on the soluble nutrient content of the soil. When used with these limitations in mind, and for the purpose of studying fertility problems of the golf course, chemical tests are undoubtedly of great value. What is needed, as far as conditions in this Province are concerned, is systematic application of chemical tests to golf course soils under various systems of treatment, to determine the relationship between the results of the tests and the actual response of the turf under the different conditions of treatment. When considerable test and response data have been accumulated, and properly correlated, the basis for reliable interpretation will have been established. Only then, will the chemical tests have their greatest usefulness. The need for further research and investigation along such lines is evident. The standards for comparison ordinarily used, in the interpretation of chemical tests on cultivated soils in general agriculture, do not necessarily apply to golf course soil conditions, according to our experience.

BROWN-PATCH*

By J. HUNTER GOODING

***It's Better to Use Preventives
Than Be Forced to Cure It***

THE only genuinely satisfactory method of maintaining greens free from brown-patch lies in preventive rather than in curative measures. By preventive measures, we mean the systematic application of disinfectants to the turf during that portion of the summer when brown-patch infections are likely to occur.

Delaying the application of fungicides until the disease gains a foothold on the greens, can hardly be called brown-patch control.

Once brown-patch fungus has attacked an area of turf, the damage is done. Damage occurs even before we can see the symptoms of the infection on grass. No control measure is effective in so far as that area is concerned. All we can do is to wait a couple of weeks or more until nature restores that section of turf to nor-

mal healthy conditions. We all have been slow in realizing that entirely too much emphasis has been laid on the matter of curing brown-patch attacks, and too little attention paid to the far more practical question of preventing attacks.

In 1922, when brown-patch was becoming recognized as one of the major problems of turf maintenance, Lyman Carrier wrote, "The value (of the treatment) lies in prevention rather than cure. After grass has become infected with the fungus nothing can be done for the areas that are hit. Those who have had brown-patch on their greens in the past had better not wait for the disease to appear before beginning treatment."

Professor Carrier's words are just as true today as when they were written 13 years ago.

Brown-patch gives no warning. Like fire, it strikes quickly—and usually at

*NAGA Convention address.

night. We go to bed with our greens in perfect playing condition; we arise in the morning to find them scarred with large brown-patch or dollar spot. Rushing the sprayer, sprinkler or compost cart out may help to check further damage, but it is not control. Of course, if you and your players are satisfied with any condition of the greens short of the necessity of resodding or rebuilding, then maybe you can get by with curative measures.

In 1925 Dr. R. A. Oakley emphasized control when he wrote: "The large field that is open for chlorophenol mercury to fill is that of *prevention*. The nature of brown-patch is such that when once it has attacked turf great harm is done. The subsequent spread from a particular infection or attack is, as a rule, not so serious. Consequently, checking measures in the main may be said to have much the same value as locking the stable after the horse has been stolen."

Watching Weather Not Enough

Much has been said about the importance of observing weather conditions closely, the general idea being to delay applications of disinfectants until weather conditions indicate that a brown-patch attack is imminent. But, what greenkeeper can be expected to forecast attacks accurately by observing temperatures, humidity, air drainage and other factors. Sometimes he will guess right and sometimes wrong. When he guesses correctly, he is a smart greenkeeper. When he guesses wrong, he is—well you know what is said when brown-patch ruins the greens. And so, when the club management insists on curative rather than preventive measures against brown-patch, they are putting the greenkeeper "on the spot."

The control of the brown-patch diseases of grass is based on the same general principles of disease control as in human beings, and in other forms of plant life. Physicians, dentists, health officers all emphasize prevention as the most satisfactory means of reducing the misery caused by illness and disease. The orchardist learned years ago that his only hope of controlling diseases of his trees and fruit lay in the prevention of the fungous infections. Likewise, the grain grower does not wait to control smut until smutted heads appear in his crop.

In view of the experiences of the physician, the orchardist and the grain grower does it not seem probable that we who are combating turf diseases should also

lay greater emphasis on preventive measures?

Many will admit that prevention is the most practicable method of controlling brown-patch, but, they will argue, a preventive program is too expensive. It cannot be denied that the brown-patch problem calls for a considerable outlay of money. On the other hand, we must not forget that the maintenance of large turf gardens, and the reseeding, resodding and rebuilding of greens are also expensive. The expense of rebuilding a single green may far outweigh the slight additional cost of preventive over curative measures. And then, too, greens that are frequently in poor condition because of brown-patch are certainly not likely to improve club membership.

Let us examine briefly some of the many factors which must be taken into consideration in developing a good brown-patch preventive.

First: A good fungicide for use on turf should be effective in preventing infection by the important fungi controlled by chemical treatment. For example, it should control both the large brown-patch, the small brown-patch or dollar spot and snow mold.

Second: It must prevent these fungous infections without any serious injury to the turf. Those who used Bordeaux mixture in the early history of brown-patch control found to their sorrow that copper burning was frequently more injurious to the turf than the disease supposed to be controlled. Probably 95% of the chemicals we have studied during several years of experimentation have been discarded because they were unsafe under at least certain conditions.

One of our preliminary methods used in determining the safety factor for an experimental product is to apply the chemical every 48 hours until 12 or 15 treatments have been made. If the grass does not go off color, show signs of burning or slow up in growth, we conclude the safety factor for that chemical is high.

Third: Any satisfactory fungicide must retain its disease prevention properties for a reasonable length of time after its application to the grasses. The length of this period for any given chemical depends upon many factors—its cost, the type of chemical, whether soluble or insoluble, volatile or non-volatile, adhesive or non-adhesive. It depends also very largely on weather conditions, rain, possibly temperature and other influences.

And so, it is impossible to state definitely the exact number of days or weeks during which period a chemical will remain effective. Common sense would dictate, however, that during prolonged rainy periods in the brown-patch season it may be necessary to apply disinfectants at shorter intervals than when the weather is dry.

These three factors—effectiveness, safety, and persistence of fungicidal effect—may be considered of paramount importance. And yet a chemical may possess all three of these qualifications and still be unsatisfactory for our purpose. For example, the chemical must be stable so that it does not deteriorate on the dealers' shelves or in your tool house, it must be non-injurious to equipment—sprayers, etc., it must be reasonably safe to handle.

A chemical difficult to mix with water and to keep in solution or suspension is objectionable and may cause trouble through irregular distribution on the turf. All these are factors which we must consider in developing new and better products.

Mr. Gooding also referred to the work being done to reduce the cost of brown-patch control and promised notable development in this respect. His address was illustrated by motion pictures.

STANDARDIZED BRIDGES Collapsible Form Provides Neat and Inexpensive Concrete Work

By R. W. TREACY,

Business Manager, Woodmont CC,
West Allis, Wis.

WOODMONT'S course is traversed by a small creek, over which it is necessary to provide crossings at twelve places.

Last year we decided to give up the continuous job of trying to keep wooden bridges in repair and set about replacing them with concrete. Fortunately this creek is of practically the same width throughout, which made it possible to construct a form that could be taken apart after concrete had set on one bridge job, and set up again for the next one.

Two half circular forms of 2-in. plankings were made for the sides, and on the lower, inner side of each one was nailed a rest for the floor pieces, which were also of 2-in. material. After setting foundations 2 ft. deep, the side forms were put in place, floor pieces laid in (not nailed)

and the whole form pulled up tight with four loops of heavy wire.

In case of a straight walled ditch such a form would be all that would be necessary. In our case the creek walls are sloping and at times the little creek is a torrent, which made it necessary to construct wings to act as retaining walls and also to conform to the lines of the creek. This was done by constructing triangular box forms, of 1-in. material, to fit against the main bridge form, to which they were temporarily nailed. These triangular forms were made in such a manner as to



The concrete bridges at Woodmont are attractive, permanent and, best of all, cost but six dollars for material.

leave a 4-in. wall on each side, with 4 ft. open in the middle to provide a dirt walking floor. They were made an inch wider at the bottom than at the top to allow for swelling of the wood and so they could be pried up easily after the concrete had set, for use on the next job.

With the forms in place and with some bracing, for concrete has a habit of pushing things around, we put in a layer of cement and a filler of niggerhead rocks, which we never lack in Wisconsin; then the whole thing was smoothed off and left to set.

In three or four days the triangular boxes were pried up after removing the nails holding them to the main form, the wires holding the form cut, and the whole thing carted away intact, ready to be used again.

With plenty of niggerheads available to be used as filler these bridges cost us about \$6.00 each for sand and cement. They have gone through a severe winter without signs of cracking. We plan to use the same side forms, with longer floor pieces, for mower and tractor crossings.

LAST CALL !!

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GOLFING subscribers.