

Experiments On the Control of Brown-Patch With Chlorophenol Mercury*

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Early in July, 1924, small brown-patch began to appear in the turf of the Hudson River Country Club, near Yonkers, New York. An appeal for help was made by the manager of the Club to their neighbor the Boyce Thompson Institute for Plant Research. At that time I was at the Institute engaged in research work with various plant disinfectants, and as I had expressed an interest in the problem it was turned over to me for study by Dr. William Crocker, director of the Institute.

The disease was more or less universally distributed over the 14th and 15th greens and to some extent was present on the 16th. The turf on these greens was a nearly pure stand of *Poa annua*. At that time the disease was in an early stage of development, but very active in its spreading. A fungus was quite obviously seen to be the cause of the condition. Early in the morning on any humid, sunless day the threads of this fungus could be seen in the brown patches, spreading outward on newly infected grass blades. It was very readily obtained in "pure culture"—that is, secured growing by itself on gelatine, according to the regular laboratory methods. The organism has not yet been positively identified. The spots, none of which was larger than a dollar, were still individual; that is to say, there was as yet no running together. The first experiments were started on the 15th green. Figure 1 shows the approximate condition of the green at the time the experiments were begun.

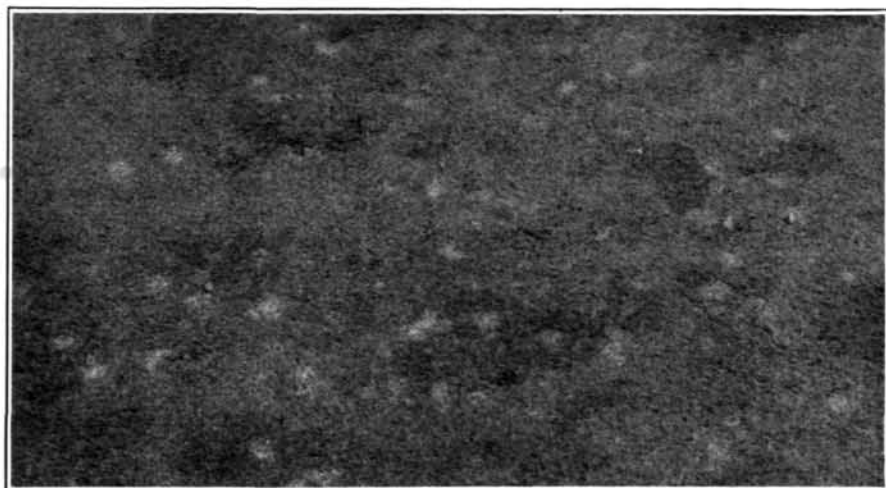


Figure 1.—The small brown-patch disease of golf turf in its early stage of development. The applications described in experiment No. 1 were made in about this stage of the development of the disease.

* There are two common American preparations of chlorophenol mercury. These appear under the names of Uspulun and Semesan. They are identical as to the disinfectant agent, chlorophenol mercury, though differing in other respects. Uspulun was used in the experiments here reported.

Experiment No. 1.—In order to determine, first of all, whether or not a fungicide would have any effect on the disease, Bordeaux mixture 4-4-50 was applied to a strip 1 yard wide across the center of the green, while to another area of the green a form of chlorophenol mercury was applied in a solution of 1 to 200. A common garden hand sprinkling can was used in making these applications. In about ten days strikingly favorable results were evident from both treatments. As weather conditions were favorable for the spreading of the disease, it had increased rapidly in the untreated area. Spots had increased in size, new spots had developed, and much running together had occurred. The treated strips, on the other hand, were of a solid, vivid green, showing complete checking of the organism and actual healing-over of the spots that were evident at the start.

Experiment No. 2.—About the middle of July the green was divided into quarters by north and south and east and west lines. In the south half copper sulfate and chlorophenol mercury were compared for efficiency. The former was applied in the form of a prepared Bordeaux mixture consisting of dry lime and copper sulfate, in a liquid application of 5 pounds to 50 gallons of water, in the southeast quarter of the green. A form of chlorophenol mercury was applied to the southwest quarter in a solution of 1 to 200. Applications were made by means of the ordinary 2-wheeled water barrel with sprinkler attachment. The barrel was pulled along at a speed thoroughly to wet the surface of the green and saturate the turf for a fraction of an inch. No more than sufficient to soak in was applied. Approximately 50 gallons to 1,000 square feet gave this degree of wetting.

By August 1 this south half of the green showed surprising results. The prepared Bordeaux did not meet the situation other than perhaps to check the progress of the disease to a certain extent. The quarter on which it was used was of about the same degree of green color as at the start. The quarter treated with chlorophenol mercury, on the other hand, however, showed not only a complete checking of the fungus, but a complete come-back of the grass, as it was a vivid, healthy green in color, and the turf covered the ground completely except in small spots where other agencies, such as ants, were a factor.

Experiment No. 3.—At the same time that the treatments in experiment No. 2 were made (July 17) the northwest quarter of the green was divided into checks of a yard square, as shown in figure 2. In these yard-square areas a series of treatments with chemicals and various combinations with compost top-dressing was given. Six replications of each treatment were given, in as many rows, each treatment being shifted one square to the south in each successive row, so that any particular treatment occurred in a diagonal, instead of a horizontal row. The treatments applied were as follows, reading from left to right, or north to south: (1) untreated; (2) top-dressing followed by Bordeaux 4-4-50; (3) top-dressing alone; (4) and (5) top-dressing followed by Bordeaux; (6) top-dressing followed by chlorophenol mercury in 1-200 solution; (7) chlorophenol mercury followed by top-dressing; (8) and (9) top-dressing alone; (10) top-dressing followed by chlorophenol mercury in 1-400 solution; (11) top-dressing followed by chlorophenol mercury in 1-200 solution.

The applications were made with a sprinkling can at the rate of $\frac{1}{2}$ gallon to 1 square yard, which was just enough to soak the grass without

permitting run-off. This is approximately the same rate as that used in experiment No. 2, namely, 50 gallons to 1,000 square feet.

I was away for several days and feared that in the regular course of watering and from such rains as might occur the lime check-marks would be washed out and that therefore we would have difficulty in observing the effects of the treatments in the individual yard-square checks. The lines actually were washed out, but to my surprise two weeks later a regular checkerboard was nevertheless evident.



Figure 2.—Northwest corner of the 15th green marked off in squares of 1 yard each for the application of the treatments described in experiment No. 3. Photograph taken July 17.

The squares treated with chlorophenol mercury were of a good, uniform green throughout. There was no difference in the results from the 1-200 solution and the 1-400 solution, showing that the weaker solution (1-400) was as efficient as the stronger.

The squares which had been left untreated were nearly 75 per cent brown, indicating the condition in which the entire green would have been without treatment.

The squares treated with compost were a trifle better, notwithstanding the disease had actually increased in them.

The squares treated with Bordeaux were better than the squares that had been top-dressed but not nearly as good as the squares that had been treated with chlorophenol mercury.

The contrasts shown in figure 3 give only a suggestion of what was actually evident in the field, since it is difficult to bring out color contrasts in a photograph.

Experiment No. 4.—Simultaneously with experiments No. 2 and No. 3 another series of treatments was made in the northeast quarter of the

green, this time in strips a yard wide. Here again chlorophenol mercury showed up to advantage over every other treatment. This is likewise evident in figure 3, where in the left background a dark strip of 6 feet is visible; this had been treated with chlorophenol mercury in 1-200 and 1-400 solutions. On the right it is bordered by a strip treated with Bordeaux, and on the left by a strip treated with top-dressing alone.

Other disinfectants, principally organic salts not now on the market, gave varying results in duplicated applications made in others of the yard-square areas.



Figure 3.—Photograph of the 15th green taken about August 7, showing the beneficial effects of applications of chlorophenol mercury. In the foreground is seen the northwest quarter divided into squares of 1 yard. The four dark rectangles in the foreground had been treated with chlorophenol mercury. Immediately in front of these are squares treated with compost alone. Next back of the four dark rectangles that had been treated with chlorophenol mercury are four light squares, which had been left untreated. Next beyond the untreated squares is a row treated with Bordeaux mixture, and next beyond these a row treated with top-dressing of compost alone. In the left background is seen a portion of the northeast quarter of the green, treated in strips in experiment No. 4. The dark strip is that treated with chlorophenol mercury, on its right the strip treated with Bordeaux, and on its left the strip treated with top-dressing alone. In the right background are the two quarters of the green treated as described in experiment No. 2.

It was, of course, desired to bring the entire green back into condition as quickly as possible. Consequently, on August 4, sulfate of ammonia was applied and the few squares left untreated were then top-dressed. On August 7 a uniform application of chlorophenol mercury in 1 to 400 solution was made over the entire green. Within a couple of weeks the whole area became uniformly green except for the untreated diagonal row, which, however, came back slowly. By September 15, without any further treatments, the 15th green was uniformly green, no checkerboard being evident to the slightest degree, and the green had remained in this condition until its last inspection, November 26.

Meanwhile applications of chlorophenol mercury in 1-400 solution were made on the other greens at the rate of 50 gallons to 1,000 square feet, and the progress of the brown-patch was checked immediately. On the 16th green only about three-fourths was covered by August 6. A week later the line could be easily distinguished where the treatments had left off. Treatment was continued, and the green brought back into uniform condition.

A few general remarks may be of interest here. The green strips secured as a result of experiment No. 1 were invaded anew by the fungus after about ten days. The fungus was, of course, very abundant on all sides. The fungicidal effect was obviously no longer present on the blades of grass in the treated strips, so that the fungus was enabled to invade from the edges.

On the 14th green brown-patch developed, without treatments, to a serious extent. In its weakened condition it became a prey to crab grass, which became thickly established. An attack of brown-patch is therefore not only serious in itself but also in that it permits the invasion of weeds.

Where chlorophenol mercury was applied in the solution of 1 to 200 (2 pounds to 50 gallons of water) sometimes a slight yellowing of the grass became evident the following day. This effect disappeared after the first cutting. None was evident after the application of the weaker solution of 1 to 400, and this solution is therefore recommended. No permanent injury from an accumulative effect of the organic mercury has as yet been apparent. Since the chemical is already in the form of an organic compound it is hardly possible that it can accumulate in an inorganic form, and such injury as Dr. Oakley has reported from copper sulfate is not likely to occur.

In conclusion I wish to express my appreciation for the facilities and help rendered me in connection with the conduction of these experiments by the Boyce Thompson Institute for Plant Research, and particularly to Dr. L. O. Kunkel, of the Plant Pathological Division.

The Philadelphia Green Section *

By H. K. Read

The Philadelphia Green Section was organized in May, 1921, and was the first so-called local section formed. The officers consist of president, vice president, secretary, and treasurer. We have various committees, and their chairmen with the officers constitute the executive committee. Meetings are held at different golf clubs during the playing season—usually preceded by a tournament in the afternoon. It is at these meetings particularly that we give manufacturers and dealers the opportunity of demonstrating or exhibiting equipment or material. In the winter we hold our meetings at some city club. We make an earnest effort to have all our sessions constructive; we do not gather primarily for entertainment. We try to have at least one special talk on some subject of real importance in course maintenance. This leads to a general discussion of a most helpful character. This is a brief outline of the activities of our Green Section; they have proven to be not only enjoyable but distinctly helpful.

* Address delivered at the Annual Meeting of the Green Section, January 10, 1925.