

Endothal, 2, 4, 5-T Tests Show Effective Clover Control

By JOHN F. CORNMAN

The first article on clover control in turf with endothal appeared in the May-June, 1951 issue of the N. Y. State Turf Ass'n. Bulletin. General aspects of the clover problem in turf were reviewed and results of earlier experimental work with endothal were presented at that time.

We pointed out in the earlier article that before a satisfactory working knowledge of this new clover measure could be achieved, a considerable amount of research work remained to be done. Among other things, we mentioned the need for further studies to determine the optimum gallonage and rate of chemical and the relationship between these two factors. We indicated the need for compatibility tests with endothal and 2,4-D. The present article reports the investigation of these problems.

Gallonage and Rate of Chemical

Our earlier work indicated that it might be possible to reduce the rate of endothal below one pound per acre of active ingredient without sacrificing the degree of clover control and at the same time gain by a reduction in turf discoloration. Further tests were also needed of gallonages within the ten to fifty gallons per acre range. An experiment was set up in July, 1951 to study these aspects.

Procedure

In this study rates of endothal tested were 1/16, 1/4, 1 and 4 pounds per acre in 10, 25, and 50 gallons of water per acre. The tests were established at Stewart Park in Ithaca, New York on a mixed Kentucky bluegrass-clover-bentgrass turf in excellent growing condition. The experimental design selected was a randomized block with three replicates. Plot size was 10 by 15 feet.

A single application was made on July 13, 1951 with the first analysis following a week later. The clover control analyses were made by estimating the amount of clover remaining after treatment and are reported here as percentage control when compared with the amount of clover in the untreated plots. For the first clover analysis square foot quadrats were used and three estimates were made per plot by each of two investigators. For the 1952 analyses the clover population of twelve square-foot quadrats per plot was estimated by one analyst. The turf injury analyses were made by estimating the

relative degree of turf injury on a scale ranging from 0 to 10 in which increasing numerical order indicates increasing turf discoloration.

Results

The results appear in tabular form in Table 1. It will be noted that two sets of turf injury ratings are presented in Table 1. Maximum discoloration was evident seven days after treatment. The discoloration rating 14 days after treatment is included to show rate of recovery. Turf injury ratings over 3.0 in this test are considered to be objectionable.

General Trends

As in the previous tests, a general gallonage-rate of chemical relationship is evident. For a given rate of chemical, the greater gallonage the more severe the turf injury. At any particular gallonage, clover control increased with increasing rates of endothal until complete clover eradication resulted. Also, the greater the amount of endothal applied the greater the turf injury. Increased clover control was always accompanied by increased turf discoloration.

Rates of Endothal

Complete clover control (as observed one week after treatment) was not achieved with 1/16 pound of endothal at any gallonage tested. The 1/4 pound per acre rate gave from 94.4% to 100% clover control depending upon the gallonage. Turf discoloration was not severe at these rates but it was serious where the higher rates of chemical (1 and 4 pounds per acre) were applied.

Persistence of Control

The figures in column 4, table 1, indicate a striking persistence of clover control. Wherever plots gave evidence in one week of complete or nearly complete clover control they had only trivial amounts of clover present 11 months later. This was in spite of expected new individuals arising from the current year's seed crop and possibly from occasional hard seeds brought up by earthworms. Where too little chemical or inadequate coverage produced much less than complete control at the end of one week (as with 1/16 pound per acre at all gallonages, and with 1/4 pound in 10 gallons of water per acre) there was an appreciable amount of recovery or regrowth within 11 months. Thus it appears that, if results obtained

TABLE I
CLOVER CONTROL IN TURF WITH ENDOTHAL

Effects of gallonage-rate combinations on
clover control and turf injury

Gallons per acre	Endothal pounds per acre	% Clover Control		Turf discoloration	
		After 7 days	After 11 months	After 1 week	After 2 weeks
10	1/16	80.4	58.6	1.10	0.92
10	¼	94.4	75.7	1.92	1.41
10	1	100.0	99.0	2.67	2.00
10	4	100.0	99.7	4.00*	3.17*
25	1/16	88.8	70.3	1.17	1.00
25	¼	97.2	95.0	2.33	2.00
25	1	100.0	99.7	4.17*	3.67*
25	4	100.0	99.7	5.33*	4.50*
50	1/16	92.4	76.3	1.50	1.50
50	¼	100.0	95.0	2.67	1.67
50	1	100.0	99.7	5.67*	5.17*
50	4	100.0	99.3	6.83*	5.50*
LSD ₀₅			7.39		
LSD ₀₁			10.01		

Application date: July 13, 1951.

Clover control: Reported as percent control of amount of clover in untreated plots.

Analysis dates: July 20, 1951 and June 6, 1952.

Turf injury scale: 0.0 = no injury, 10.0 = severe to complete kill. Starred values indicate injury considered to be of an objectionable degree. Analysis dates: July 20 and July 27, 1951.

under our circumstances occur consistently under other circumstances, the clover situation for at least a year can be judged within a week or two after endothal is applied.

Practical Conclusions

In this experiment we reduced the rate of endothal to a point where good and persistent clover control was not achieved. Contrary to our practical hopes, turf discoloration accompanied even the lowest applications. It appears, then, that with the formulation used in these experiments rates in the vicinity of ¼ pound of endothal in 25 gallons of water per acre hold the greatest promise of adequate clover control with minimum turf discoloration.

Compatibility With 2,4-D

Because endothal is a very specific herbicide at selective concentrations, killing legumes but causing relatively little harm to other broad leaf turf pests, it does not do away with the need for 2,4-D. Endothal and 2,4-D are alike in that each is effective in a single low gallonage, low rate of chemical application and they can be applied most appropriately with the same type of equipment at approximately the same time of year. The ability to apply these materials in a single operation would result in considerable savings of labor where large scale applications are contemplated. In August 1951 an experiment was set up to determine if endothal and 2,4-D used together would act independently or whether the presence of one would increase or decrease effect of the other on weeds and turf.

As sometimes happens, variabilities other than planned applications so influenced the results of the treatments that our data shows nothing of significance in the statistical sense and are not presented here. On the other hand, it is worth noting here that when endothal was used at rates sufficient to control clover, the addition of 2,4-D (amine salt at the rate of one pound per acre of acid equivalent) to the same spray solution produced little difference in results. Clover was controlled to about the same degree as when endothal was used without 2,4-D and apparently the 2,4-D was as active in killing dandelions and plantain as though the endothal were not present. Repetition of this experiment under more favorable circumstances may show that endothal and 2,4-D do interact to a certain extent but our first trials strongly suggest that any such interactions are not large and are probably of no great significance. These initial trials also indicate that when endothal and 2,4-D are applied in the same solution at ordinary rates, there is no reason to fear disaster to the turf.

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The worst thing about low wages for golf course labor is that they have men working with a "get by" feeling instead of getting and holding the right kind of men who take an interest in their work and want to make their results show that they are stars on the job.

— Lee Bowman
Supt., Cedar Crest GC,
Dallas, Tex.