The figures in Tables 1 and 2 indicate that at rates of 4 and 8 pounds of endothal in 100 or 200 gallons of water per acre there was a marked thinning out of the turf. In making field observations it was noted that what turf remained in these plots was dark blue-green while that in the untreated plots and plots receiving lighter applications was a brighter and definitely more yellow-green. All ryegrass had been eliminated from the turf. The elimination of ryegrass from a bluegrass turf has promising practical aspects. Also, this suggests that had our plots contained more bluegrass the injury ratings for some plots would have been much lower. Further observations on the selective effect of endothal on various grass species are being undertaken.

Practical Aspects

Based on work to date it appears that clover can be eradicated from mixed fairway, park or lawn turf by a single autumn application of endothal at rates as little as 50 gallons of water per acre. Lower rates may be satisfactory, but their effects are yet to be investigated.

Endothal has two faults that prevent it from being an ideal material. It is a toxic material, approximately as poisonous as sodium arsenite, so it must not be handled carelessely. Also, at the rates and gallonages used in these experiments the turf was temporarily browned by the applications even at the lower rates. This browning may be much less at the minimum effective rates, a problem requiring further testing. Even if the burning effect cannot be reduced, the fact that effective applications can be made in the autumn, when turf use is lessened and when grass growth is most vigorous, makes temporary discoloration of less importance. With these two exceptions endothal seems an almost ideal material for clover control. It is readily soluble, it seems to be adapted to the convenient low volume-low pressure apparatus used for 2,4-D work, and a single application of a small amount of the chemical appears to be adequate for clover eradication. The cost of the material*, while not yet fixed, will probably be low enough to be appropriate for inclusion in the most modest turf budget.

Problems Ahead

While considerable information has been gained about the use of endothal for clover control by experiments to date, much work is yet to be done before complete recommendations can be made. Obviously we have not yet determined the minimum rates of application necessary nor do we yet know the minimum gallonage (apparently between 10 and 50) needed for adequate coverage.

While results of the present fall treatments seem conclusive, verification is needed. We need to know for how long the endothal will be effective—how long it will be before clover reappears. This will require periodic clover counts, a follow-up of the present experiments, as well as additional tests. In addition to fall treatments, information is needed and experiments are under way to determine the effects of spring and summer applications. While fall would seem to be an ideal time to treat clover, conceivably there would be situations where spring or summer applications might be necessary. There is also need for comparisons between spring, summer, and fall treatments as to clover control and turf injury.

Information will also be needed on compatabilities with other chemicals. While it is known that endothal and chlorates are not compatible, it is conceivable that both endothal and 2,4-D can be applied at the same time in the fall or early spring. Since both materials are adapted to low-volume applications, and since fall applications are effective with both, time and labor would be saved by combined applications. Perhaps other materials, such as fungicides for snowmold prevention, might be compatible with endothal. Thus experimentation is needed to explore these avenues.

Last, but by no means least, we expect to gather information on the use of endothal on bentgrass turf. Will it be suitable for watered bent fairways where clover is commonly such a pest? Can it possibly be used on putting green turf?

It seems to us that the importance of this discovery and the amount of information gathered to date demands further immediate research. For the coming year much of our time and efforts will be directed along these lines. Obviously we can not at this time make general recommendations for the use of endothal for selective clover control in turf, but there is reason to hope that sufficient information will be uncovered during this season to make recommendations possible.

Green Section's 2nd Edition Turf Research Review Ready

The USGA Green Section announces the second edition of Turf Research Review, a compilation of all turf work in the United States covering projects, workers, publications, conferences, field days, and other features of the National Coordinated Turf Program.

Turf Research Review belongs in the library of every progressive golf course superintendent. Since only a limited number of copies will be printed you are urged to place your order now with the USGA Green Section, Plant Industry Station, Beltsville, Md., and enclose $1.25 for your copy. It will be mailed to you, postage free, within a short time.