

PROGRASS FOR ANNUAL BLUEGRASS CONTROL
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Annual bluegrass is the most difficult weed species to control on golf courses in the northern United States. Attempts to control this species have been many and varied over the last 40 years including everything from picking it out by hand to burning it - yes a machine was actually built called the singifier that used a propane torch to try and burn the annual bluegrass. In the last five years, two products have appeared on the commercial scene which offer real possibilities of controlling Poa annua. One product is actually a group of plant growth regulators (PGR's) which regulate annual bluegrass more severely than other desirable grasses. Examples of these products are flurprimidol (Cutless) and paclobutrazol (Scott's TGR). The second product is a true herbicide which selectively controls annual bluegrass both preemergence and postemergence and is called ethofumesate (Prograss). This paper will discuss some of the results we have seen with this product at MSU.

This product has four possible uses in golf course management. The first would be as a simple preemergence control of annual bluegrass. Ethofumesate is an effective preemergence herbicide for controlling annual bluegrass with a single fall applications of 0.75 lbAI/A providing fall preemergence control. Some preemergence activity may be seen in the following spring as well, but that has not been well studied. Use as a preemergence would be important if you have a new course and would like to keep annual bluegrass out or if you have just completed a successful conversion program and would like to maintain the new species. Unfortunately, few people are in that situation and therefore we have not done a great deal of research on this use of the product. One study which we initiated in 1987 is shown in Table 1.

The other uses are all postemergence applications which include use on fairways, use in renovation, and use on greens. Each will be discussed in the rest of this article. However, first some general observations on how ethofumesate works postemergence on annual bluegrass. Ethofumesate is applied in the fall and the results are seen the next spring. The herbicide probably affects the annual bluegrass's cold tolerance because applications in the spring or summer have no effect on the annual bluegrass. Furthermore as you go further south, more applications are required to get the same level of control we observe in Michigan. In order to get postemergence action, multiple applications are required. Usually 2-3 applications beginning in September and spaced 3-4 weeks apart are sufficient to control the annual bluegrass. Results

observed in the spring range from a severe injury to outright kill. The injury can be described as a bleaching of the turf that takes 2-4 weeks in the spring to return to normal color. The multiple applications are necessary because the first application simply sets up the plants for injury from subsequent applications. That is, one application will cause little to no injury and only if subsequent applications are made will injury occur. If rates are high enough complete control will be obtained, however, the labeled rates generally do not give complete control but result in 50-75 % control with the rest of the annual bluegrass being injured. With this background, we can discuss the postemergence applications.

Use on mixed poa annua/creeping bentgrass fairways is the least desirable of the postemergence options. This is because ethofumesate at the label rates will either severely injure or kill annual bluegrass. While this sounds great, imagine how 25 acres of fairway would look in the spring following an ethofumesate treatment if the fairways contained a significant amount of annual bluegrass. Because of this, use on established fairways should be limited to situations where the fairways are predominately creeping bentgrass, perennial ryegrass, or Kentucky bluegrass. Thus, unless you have 80% or more of the desired species, you should not be using ethofumesate on established fairway turf unless you are prepared for the results.

A second use of ethofumesate is in fairway renovation. If you wish to convert fairways from annual bluegrass to creeping bentgrass, using ethofumesate will prevent the reinfestation of the fairways with annual bluegrass. The best approach is to kill off the fairway with Roundup, reseed with a good quality creeping bentgrass, and then followup with ethofumesate. The timing of the ethofumesate applications are critical to a successful renovation program. Data in tables 2 and 3 show the effects of ethofumesate application on the establishment of annual bluegrass and creeping bentgrass. The studies described in tables 2 and 3 were conducted separately with the ethofumesate treatments being applied to separate seedings of either annual bluegrass or creeping bentgrass. The data in table 2 shows the percent cover for each species during the fall of 1987 and the spring of 1988. Data in table 3 shows the quality (injury) ratings from the ethofumesate treatments for each species over this same time period. The results show that the 4 + 8 weeks after germination (WAG) treatments gave the best annual bluegrass control but injured the creeping bentgrass more severely than did the 6 + 10 WAG treatments. The best results were seen with the lowest ethofumesate rate (3/8 + 3/4 lbAI/A) applied at 4 + 8 WAG. We have initiated a major study of this approach and expect to have better information next year.

The final application is use of ethofumesate to control annual bluegrass on putting greens. This is a somewhat risky approach but in many respects superintendents have

less options for replacing the grass on a green than on a fairway. Additionally, many superintendents feel they can grow annual bluegrass on a fairway if they have the budget necessary to combat the many pests that attack this species. On greens however the annual bluegrass affects the uniformity and thus the playability of the putting surface. Many superintendents would like to remove the annual bluegrass from the putting green not necessarily because they have difficulty maintaining the annual bluegrass but because they would prefer to have a uniform stand of creeping bentgrass for better putting conditions. Regrassing options on a green are less viable because they generally put the green out of play for an extended period of time.

Research at MSU has concentrated on finding the right rate and timing of ethofumesate applications to achieve effective control with minimal injury to the creeping bentgrass. Our studies began in the fall of 1986 on a practice chipping green at Blythefield Country Club in Grand Rapids, MI. Results of that study were quite encouraging (Table 4) and convinced us to try additional studies. In 1987 studies were initiated at Blythefield and at Traverse City Country Club again on practice chipping greens. The results of these studies were also quite encouraging with excellent annual bluegrass control and little to no injury to the creeping bentgrass from any of the rates tested including rates of 1.0 + 1.0 lbs AI/A which is above the current recommendation of 0.75 + 0.75 lbs AI/A for fairway turf. Based on these results test were put out in the fall of 1988 on practice putting greens at Blythefield, Walnut Hills C.C., and the Inverness C.C. Results at these sites were variable with the turf at Walnut Hills exhibiting severe injury. This was disturbing but indicated that as mowing heights became shorter, the turf was more susceptible to herbicidal injury. Results of the Walnut Hills and Blythefield trials are shown in tables 5 and 6, respectively. The Inverness site was a new Pennlinks creeping bentgrass green which contained very little annual bluegrass so no ratings on percent control were taken. Injury data at Inverness is not shown but would be considered acceptable.

In summary, use on greens is not recommended at this time. If one was interested in using ethofumesate on greens, I would suggest starting off with a rate of 0.25 + 0.75 lbs AI/A on 1/2 to 1/4 of one green to see what kind of control and injury you get from this rate. Based on those results, you could decide what rates to choose in subsequent years. Remember, controlling annual bluegrass will not be achieved in one year. It will take a multi-year approach and require follow-up treatments to keep out the annual bluegrass. Ethofumesate offers the promise of controlling annual bluegrass, however, more research is needed to better understand how this product works.

TABLE 1. Effect of preemergence applications of ethofumesate on Annual bluegrass establishment.

Treatment [†]	Rate	% Annual Bluegrass		
		11/24/87	4/12/88	5/20/88
Ethofumesate 1.5 EC	2 lbs AI/A	0	0.3	2.0
Ethofumesate 1.5 EC	1.5 lbs AI/A	0	0.3	3.7
Ethofumesate 1.5 EC	1.0 lbs AI/A	0	0.7	3.7
Ethofumesate 1.5 EC	0.5 lbs AI/A	0.3	4.0	18.3
<u>Control</u>		<u>10.7</u>	<u>50.0</u>	<u>63.3</u>
	LSD (P=0.05)	3.3	9.0	10.7

[†]Bare ground overseeded with annual bluegrass and treated 9/21/87. Application conditions 56°F, 86% RH, winds SW @ 5 MPH, and overcast.

TABLE 2. Effect of Progress applied postemergence to annual bluegrass and creeping bentgrass. Data displayed as percent cover of each species.

Treatment	10/20		11/3		11/13		4/12		5/20	
	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB
*4 + 8 WAG (9/21 + 10/14)										
0.75 + 0.75 lbs AI/A	52	17	55	9	48	6	32	1	77	2
0.38 + 0.75 lbs AI/A	60	18	65	11	57	6	72	3	82	5
0.75 + 1.5 lbs AI/A	47	22	53	8	42	7	12	1	87	1
6 + 10 WAG (10/1 + 10/28)										
0.75 + 0.75 lbs AI/A	58	57	55	35	57	42	58	1	88	20
0.38 + 0.75	60	48	62	23	68	37	90	2	88	13
0.75 + 1.5	62	53	60	28	63	47	27	1	88	10
Control	<u>48</u>	<u>63</u>	<u>57</u>	<u>40</u>	<u>57</u>	<u>45</u>	<u>60</u>	<u>50</u>	<u>95</u>	<u>90</u>
LSD .05	21	27	19	24	19	19	30	6	NS	8

* W.A.G. = "weeks after germination"; dates shown correspond to creeping bentgrass germination. Annual bluegrass germinated four days later and herbicide was applied accordingly.

TABLE 3. Postemergence Progress application on new creeping bentgrass cv. 'Penneagle' and annual bluegrass seedlings.

**Quality Ratings (1-9)

Treatment	10/14		10/20		11/3		11/13		11/24		4/12	
	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB	CB	AB
*4 + 8 W.A.G. (9/21 + 10/14)												
.75 + .75 lbs ai/A	6.3	9.0	5.3	5.0	3.3	3.3	3.3	2.7	2.8	1.3	4.3	8.0
.38 + .75	6.3	9.0	7.3	5.0	5.3	5.0	7.0	3.7	5.0	1.7	7.3	8.0
.75 + 1.5	6.0	9.0	6.0	4.3	3.3	3.3	3.7	2.0	2.3	1.3	2.7	8.0
6 + 10 W.A.G. (10/1 + 10/28)												
.75 + .75	8.3	9.0	7.7	7.0	7.3	8.3	8.0	7.0	6.7	7.7	4.3	8.0
.38 + .75	8.7	9.0	8.0	7.7	7.0	8.0	8.7	8.3	7.7	7.0	6.7	8.0
.75 + 1.5	8.0	9.0	6.7	7.6	6.7	8.0	8.3	8.0	6.8	6.3	3.7	8.0
Control	9.0	9.0	8.7	8.0	9.0	9.0	9.0	9.0	9.0	9.0	7.7	8.0
LSD .05	1.7	NS	1.8	2.2	1.8	2.4	1.0	2.8	0.8	1.1	2.1	NS

* W.A.G. = "weeks after germination"; dates shown correspond to creeping bentgrass germination. Annual bluegrass germinated four days later and herbicide was applied accordingly.

** Quality ratings based on a scale of 1-9; 9 = excellent, 1 = dead, 5 = unacceptable.

Table 5. Progress for Annual Bluegrass Control. Walnut Hills Country Club. 1988-89.

<u>Progress Rate</u>	<u>10/19/88</u>	<u>4/12/89</u>	<u>4/26/89</u>	<u>5/22/89</u>	<u>5/22/89 % Control</u>
1.0 + 1.0	3.0	2.3	1.5	2.3	96.7
0.75 + 0.75	3.7	3.0	3.0	5.0	95.3
0.5 + 1.0	4.7	3.3	2.5	4.7	94.7
1.0 + 0.5	2.3	3.0	2.0	3.7	90.0
0.25 + 1.0	7.0	5.3	5.7	7.5	84.0
0.25 + 0.75	6.3	5.0	6.0	7.7	77.6
0.5 + 0.5	5.0	4.7	6.0	7.0	73.2
Control	9.0	9.0	9.0	9.0	8.3
LSD	0.9	1.2	1.0	1.5	14.4

TABLE 4. Blytheheld Putting Green Test.

<u>Progress rate (lbs ai/A)</u>	<u>Injury Ratings^a</u>			<u>Poa Control^b</u>		
	<u>10/20/86</u>	<u>11/6/87</u>	<u>5/27/87</u>	<u>Initial 8/12/86</u>	<u>Final 5/27/87</u>	<u>% control</u>
0.5 + 0.5	8.8	8.8	8.8	30.8	12.1	59.5
0.75 + 0.75	8.2	7.9	8.4	30.8	3.8	85.7
1.0 + 1.0	7.4	7.3	7.1	32.9	2.7	91.3
1.0 + 0.5	7.7	7.5	8.5	26.5	9.5	65.3
Control	9.0	8.9	9.0	30.6	58.3	0
LSD (P = 0.05)	0.4	0.6	0.7	-	4.5	13.2

^a - Injury rating on a scale of 1 - 9 where 1 = dead turf and 9 = no injury.

^b - Initial and final poa annua populations estimated visually.

Table 6. Progress for Annual Bluegrass Control. Blythefield 1988-89.

<u>Progress Rate</u>	<u>10/13/88</u>	<u>4/7/89</u>	<u>5/15/89</u>	<u>5/15/89</u> <u>% Control</u>
1.0 + 1.0	6.0	4.8	4.7	100
0.5 + 1.0	8.0	5.0	6.3	96.1
0.75 + 0.75	6.3	6.5	5.7	83.4
1.0 + 0.5	4.0	4.2	6.0	83.1
0.5 + 0.5	7.0	5.7	7.0	72.8
0.25 + 0.75	9.0	6.2	6.3	62.7
0.25 + 1.0	9.0	5.7	8.0	41.7
Control	9.0	9.0	9.0	9.5
LSD	2.0	NS	NS	35