1992 WEED CONTROL AND TURF MANAGEMENT UPDATE

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Our research program at Michigan State University is active in several different areas. Those areas currently the focus of research activity are: the fate of nitrogen, phosphorus, and pesticides in turf; the sorption of organic compounds to turfgrass thatch and leaf blades; annual bluegrass control; bentgrass breeding and genetics; and general turf weed control and PGR's.

One area that has become very important in turfgrass management is the environmental fate of nutrients and pesticides used on turf. Many assumptions have been made about turfgrass based upon research and observations made on field crops and applied to turf. Many of these assumptions may be invalid since turf is a totally different cropping system than annual crops. In order to collect data on the environmental fate of nutrients and pesticides applied to turf, we went to considerable efforts to install four intact soil monolith lysimeters at the HTRC. These intact soil cores are $1m^2$ in surface area and 1.2 m deep. We have begun an intensive study of the fate of fertilizer nitrogen and 8 commonly used turfgrass pesticides when these materials are applied to turf. These studies are in progress and data has been collected for approximately 1.5 years of a 3 year study. Our initial data indicates that turf does a good job of scavenging nitrogen and nitrate levels in the leachate appear to be low. For detailed information on our results see the article by E.D. Miltner and B.E. Branham (*Fate of Nitrogen and Pesticides Applied to a Kentucky Bluegrass Turf*).

A second area of study is related to the first topic of environmental fate. This is a more basic study of the adsorption characteristics of wide range of organic compounds on turfgrass thatch and leaves. This work should help give a clearer understanding of the role of the turfgrass leaf blades and thatch on the environmental fate of pesticides used in turf. We have selected a group of 5 organic compounds with water solubilities from 1 to 5400 PPM. Generally, adsorption onto organic matter is related to water solubility. The more water soluble a compound is the less likely it is to be strongly adsorbed. By selecting a wide range of water solubilities in our model compounds, this should allow us to model the behavior of other pesticides within this range of water solubilities which would include most commonly used pesticides.

The control of annual bluegrass in golf course turf has been an ongoing project for the last 7 years. A graduate student, Will Carlson, is just finishing his MS research project which has examined the effect of freezing temperatures on the efficacy of Prograss for annual bluegrass control. See Will Carlson's paper (*Creative Use of Annuals*). However, one area of research which we can summarize concerns the use of Prograss during the renovation of annual bluegrass fairways. A study initiated in 1991 and evaluated in the spring of 1992 was the third and final study on the ability of Prograss to reduce the reestablishment of annual bluegrass into newly renovated turf. This study was performed by killing an area of annual bluegrass turf with Roundup herbicide and reseeding the area with creeping bentgrass (*Agrostis palustris* var Penncross). To evaluate the effect of the time of seeding, seeding dates of 8/15, 8/31, and 9/15 were used each year. After seeding, various rates and timings of Prograss were applied. Results are shown in tables 1–3. Data were collected on the amount of annual bluegrass reestablishing in the plots and on the percent cover in the plots. Percent cover data is the sum of the annual bluegrass plus creeping bentgrass present in the plots since no other species were present in the plots. One interesting observation is that the efficacy of all the Prograss treatments seemed to increase with the later seeding dates. This was especially apparent in 1989–90 and 1990–91 data. The 1991–92 data was not particularly good because of a cold snap in early October which seemed to injure/kill some of the bentgrass from the later seeding dates. Many of these plots took until mid–summer of 1992 to really achieve 100% cover and most of the cover was annual bluegrass.

The reason why Prograss works better at later seeding dates is not obvious, however, we believe that it is related to the fact that Prograss has little preemergence activity on turf and is only a postemergence herbicide. The earliest seeding date received Prograss applications earlier than the other seeding dates so germination of annual bluegrass may occur after the last Prograss application has been made. Later seeding dates will receive later Prograss applications so that all applications are effectively post with regards to the annual bluegrass.

From this data we can make several recommendations to golf course superintendents who wish to convert annual bluegrass fairways to creeping bentgrass. First, better results should be obtained with seeding dates after 9/1. The only danger in this approach is if an early cold spell occurs. Second, the best rate and timing of Prograss is 0.75 lb/A at 4,6, and 8 weeks after bentgrass germination. This approach will result in 95–100 % bentgrass and should be combined with preemergence applications starting in the spring following seeding if turf conditions permit. A preemergence program will be necessary for at least 2–3 years until some of the annual bluegrass seed supply is buried by the production of organic matter from the new turf and a tight turf canopy is developed.

Biotechnology holds tremendous promise as a tool to improve grasses used for turf. A new graduate student, Scott Warnke, in our program has been examining the genetics of bentgrass from a plant breeding perspective. Scott is being jointly advised in his graduate research by Dr. Dave Douches, a plant breeder, and Dr. Bruce Branham. His research involves the use of genetic markers to help improve our understanding of the breeding habits of the bentgrasses and to use these markers to try to identify genes that may have desirable traits. The main goal of this introductory work is to learn more about the breeding traits of the three bentgrasses with turf use: creeping, colonial, and velvet bentgrass. A secondary goal is to study the level of resistance of a wide variety of bentgrasses to the disease dollar spot. Identifying genes that provide some level of resistance to the dollar spot organism would be very valuable to the turfgrass industry.

Table 1. EFFECT OF PROGRASS ON TURF INJURY AND ANNUAL BLUEGRASS CONTROL DURING FAIRWAY RENOVATION 1989–90.

PROGRASS RATES (lb ai A^{-1}) AND TIMING	TURF INJURY 11/13/89			PERCENT POA 5/14/90		
	Seeding Date					
	8/18	9/1	9/15	8/18	9/1	9/15
0.75 4 WAE* + 0.75 8 WAE	8.3	7.7	7.3	11	3	0
0.75 6 WAE + 0.75 10 WAE	7.3	8.0	8.7	5	15	2
0.75 4 WAE + 0.75 8 WAE + 0.75 12 WAE	7.3	7.5	7.3	5	1	0
0.75 4 WAE + 0.75 6 WAE + 0.75 8 WAE	7.2	6.2	7.7	1	1	0
0.50 4 WAE + 0.50 6 WAE + 0.50 8 WAE	7.5	7.5	7.5	6	1	1
0.75 4 WAE + 0.75 7 WAE	7.7	6.8	7.7	13	4	1
0.75 4 WAE + 1.25 6 WAE	8.7	6.5	7.7	22	0	0
0.38 2 WAE + 0.75 5 WAE	7.8	8.0	7.3	14	3	0
Control	8.0	8.5	8.3	27	38	30
LSD (P= 0.05)	**1.2**	**1.2**	**1.2**	**7**	**7**	**7**

* WAE – Weeks after emergence of bentgrass seeds

Table 2. EFFECT OF PROGRASS ON TURF INJURY AND ANNUAL BLUEGRASS CONTROL DURING FAIRWAY RENOVATION 1990–91.

PROGRASS RATES (lb ai A^{-1}) AND TIMING	TURF INJURY 11/30/90			PERCENT POA 5/7/91			PERCENT COVER 5/7/91		
	Seeding Date								
	8/16	8/31	9/13	8/16	8/31	9/13	8/16	8/31	9/13
0.50 at Seeding + 30 DAT	8.3	9.0	9.0	6	3	3	99	97	97
0.75 at Seeding + 30 DAT	9.0	9.0	9.0	3	1	0	98	93	92
0.38 2 WAE + 0.75 5 WAE	8.0	8.0	9.0	50	18	8	100	100	99
0.75 4 WAE + 0.75 8 WAE	8.3	8.0	8.3	8	12	0	100	100	98
0.75 6 WAE + 0.75 10 WAE	7.0	7.0	8.3	18	1	9	99	99	99
0.50 4 WAE + 0.50 6 WAE + 0.50 8 WAE	7.3	7.3	8.3	22	4	2	99	100	97
0.75 2 WAE + 0.75 5 WAE + 0.75 8 WAE	7.7	8.3	8.7	10	1	0	98	98	92
0.75 4 WAE + 0.75 8 WAE + 0.75 12 WAE	7.7	8.0	7.7	15	3	2	99	100	99
0.75 4 WAE + 0.75 6 WAE + 0.75 8 WAE	7.0	8.3	7.0	6	1	0	98	99	97
0.75 4 WAE + 1.25 6 WAE	8.0	8.3	8.0	18	3	2	98	100	99
1.50 2 WAE + 1.50 5 WAE	8.3	8.7	8.3	15	0	0	93	89	82
Control	8.3	9.0	9.0	55	43	48	100	100	100
LSD (P= 0.05)	**0.4**	**0.4**	**0.4**	**13**	**13**	**13**	**3**	**3**	**3**

Table 3. EFFECT OF PROGRASS ON TURF INJURY AND ANNUAL BLUEGRASS CONTROL DURING FAIRWAY RENOVATION 1991-92.

PROGRASS RATES (lb ai A^{-1}) AND TIMING	TURF INJURY 11/13/91			PERCENT POA 5/22/92			PERCENT COVER 5/22/92		
	Seeding Date								
	8/15	8/29	9/12	8/15	8/29	9/12	8/15	8/29	9/12
0.50 at Seeding	8.0	1.0	1.0	23	6	0	98	18	23
0.75 at Seeding	7.7	1.0	1.0	47	0	1	100	3	17
1.00 at Seeding	7.3	1.0	1.0	48	0	0	100	4	7
1.50 at Seeding	5.0	1.0	1.0	15	0	0	75	3	12
0.50 at Seeding + 30 DAT	8.0	1.0	1.0	10	0	0	100	2	10
0.75 at Seeding + 30 DAT	4.7	1.0	1.0	3	0	0	82	1	10
0.50 at Seeding + 30 DAT (plots tilled)	3.0	1.0	1.0	1	0	0	62	1	2
0.75 at Seeding + 30 DAT (plots tilled)	1.3	1.0	1.0	0	0	0	14	2	4
0.38 2 WAE* + 0.75 5 WAE	8.0	6.7	2.0	15	1	0	97	83	30
0.75 4 WAE + 0.75 8 WAE	7.7	7.7	3.3	7	1	0	100	97	35
0.75 6 WAE + 0.75 10 WAE	7.7	8.0	4.3	4	3	0	100	99	45
0.50 4 WAE + 0.50 6 WAE + 0.50 8 WAE	7.7	8.0	3.7	6	1	0	100	92	33
0.75 2 WAE + 0.75 5 WAE + 0.75 8 WAE	7.3	4.7	1.3	1	0	0	83	55	7
0.75 4 WAE + 0.75 8 WAE + 0.75 12 WAE	8.0	7.0	3.3	1	0	0	100	78	25
0.75 4 WAE + 0.75 6 WAE + 0.75 8 WAE	6.3	7.7	4.7	1	0	0	99	82	18
0.75 4 WAE + 1.25 6 WAE	6.3	6.7	3.7	8	0	1	99	75	38
1.50 2 WAE + 1.50 5 WAE	3.7	1.7	1.3	2	0	0	68	10	3
Control	7.7	8.0	4.7	38	55	52	100	100	75
LSD (P= 0.05)	**1.4**	**1.4**	**1.4**	**8**	**8**	**8**	**18**	**18**	**18**

* WAE - Weeks after emergence of bentgrass seeds