2002 TURFGRASS WEED MANAGEMENT RESEARCH UPDATE

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Research Program: This report summarizes the turfgrass weed management research conducted by Michigan State University in 2002. Progress status or results from highlighted facets of our research program are included in this report. Many of our research projects have been developed in response to the specific needs of the Michigan turfgrass industry and directly supported by the MTF. Also in our program, product evaluations continue to be an important and justifiable emphasis. However, in recent years we have increased efforts to examine the factors that allow weeds to compete in the first place. With this knowledge we will be better able target weed management and weed control practices to increase effectiveness, extend the interval between herbicide applications and reduce the impact of weeds in turfgrass systems. To this end, we have received a GREEEN grant to begin examining the biology on ecology of *Poa annua* and *Poa trivialis*. Part of the GREEEN project included a graduate student. We are excited to announce that Aaron Hathaway, who has worked with our program for the last four years, started a graduate school in August 2002 and will be developing field plots in 2003. We are pleased that someone with Aaron's experience and skills has joined our research team. It continues to be a privilege to serve and work with so many fine and dedicated professionals in our industry. The research reported on in this document would not be possible without the efforts of the regional associations that wholeheartedly support the MTF and its mission. Finally, and it seems entirely inadequate, Thank You, Gordie for the countless hours you have poured into our industry.

Weed Garden: In 1998 a weed garden was established at the south end of the turf center property. This display has been very useful for learning the identification of broadleaf and grassy weeds of turf. Proper identification is the first step to control. Although very labor intensive, the garden has been very useful during training sessions with extension agents, and visits from lawncare operators. The garden is a major component of the Weed ID workshop held on the afternoon of field day and has served as a ready source of plant material for the Turfgrass Pest Management class and Turfgrass Short Course, which are taught each fall. The number of specimens has been increased over the last two seasons and the quality of specimens has also improved. Due to the success of the weed garden, permanent plastic signs have been made to identify the plots year-round. Additionally, enough plant material has been generated to ensure that live plant samples can be used for the Turfgrass Weed ID and Management Workshop at the MTF Conference This is a tremendous addition to the workshop and has resulted in an increase in re-certification credits awarded from the MDA and CEU's from the GCSAA.

Best Management Practices for Weed Control: Common recommendations to LCO's and homeowners include mowing high and providing adequate fertility. Without proper management weed control will be at best, temporary. This study is examining mowing height, fertility, and postemergence herbicide treatment. Plots were maintained at two or four inches, and received either no fertility or 3 lb of nitrogen per 1000 ft^2 per year (holiday program – 1# Memorial Day, ½# July 4, ½# Labor Day and 1# Thanksgiving). In October of 1998 postemergence broadleaf herbicides were applied to half of the plots. Broadleaf weed populations have been monitored since the beginning of the experiment. The re-infestation of white clover and dandelion has been slowest in the fertilized plots and those treated with Confront. Unfertilized plots maintained at four inches have proven to be an excellent environment for clover. The taller height of cut in conjunction with the 'holiday' fertility program has not eliminated existing weeds. However, these management practices have proven to create a more competitive turfgrass stand that better resists re-infestation after a postemergence broadleaf herbicide application. Broadleaf herbicides (same treatments as 1998) were reapplied in October 2001. Herbicide treatments were very effective in 2001. Both herbicides provided excellent control of dandelion and clover. Weeds counts are continuing in order to identify those practices that will delay additional herbicide treatments after the weeds have been eliminated. Two weed species (common mallow and smartweed) present at the beginning of the study are no longer being evaluated as they have disappeared from all plots. Smartweed pressure was moderate to high in 1998. The site was converted from a corn/soybean rotation to turfgrass in 1996. After two seasons without cultivation (i.e. plowing) the smartweed was no longer able to compete with the turfgrass. It is interesting to note that plots maintained at 4 inches and receiving 3 lb of nitrogen per 1000 ft^2 have shown a 75 percent reduction in broadleaf weed populations without any herbicide treatment.

Table 1. Broadleaf Weed Persistence over Time (BMP 1998)

Management Factors	Dandelion Persistence		Clover Persistence	
	1998	2002	1998	2002
2" ONLY	47	80	1	59
4" ONLY	22	67	5	20
2" HOLIDAY	52	33	6	16
4" HOLIDAY	39	23	11	11
2" TRIMEC[1]	45	2	2	6
4" TRIMEC[1]	34	7	20	2
2" CONFRONT[1]	32	0	12	2
4" CONFRONT[1]	32	1	22	0
2" HOLIDAY TRIMEC[1]	34	1	7	0
4" HOLIDAY TRIMEC[1]	50	2	5	0
2" HOLIDAY CONFRONT[1]	38	0	3	0
4" HOLIDAY CONFRONT[1]	38	1	5	0

[1] Broadleaf herbicides applied 10/98 and 10/01.

A second BMP area was established in the fall of 2001. This area has a history of heavy crabgrass pressure which was evident in 2002 and should facilitate the study of broadleaf and annual grassy weeds as affected by mowing height and 'holiday' fertilization. Weed populations were monitored in these plots throughout 2002. Dandelion, white clover and crabgrass have begun to infest these plots. However, herbicide treatments were not made in October as it was decided to let the weed pressure build for at least another season. Results from the initial BMP plots indicated that evaluating alternative mowing heights could help determine minimum and maximum parameters. After conducting a survey of residential mowing equipment, we have decided to maintain the new BMP plots at 1.5 inches and 3.0 inches in 2003. Additional changes for this trial include limiting mowing frequency to once per week to further stress the grass during luxury growth periods in the spring and fall.

A Lawn Goodbye for Clopyralid: In late July, Dow AgroSciences announced that they were voluntarily removing certain uses of clopyralid. This affects the label of clopyralid for use on residential sites. Dow's decision was made in response to reports of contaminated compost in the state of Washington. A grower there lost a crop of tomatoes that he was trying to grow in a compost growing media that included clopyralid treated grass clippings. Although clopyralid degrades rapidly in the soil, the degradation is significantly slower in compost. The decision to remove residential uses of clopyralid will limit some of the herbicide choices that we have come accustomed to in recent years. Clopyralid is very active on clover, medic and thistle and is included in many postemergence broadleaf products (Confront, Momentum, Millennium Ultra and Battleship). Golf courses, commercial properties and sod farms will retain their labels. Returning clippings is the key to proper dissipation of clopyralid. Clippings should be returned for at least for six weeks following application. If clippings are collected and composted, the compost should not be used for one year.

In response to the loss of clopyralid, Dow has been actively pursuing the labeling of fluroxypyr, another pyridine class herbicide, to replace clopyralid. Fluroxypyr has shown excellent clover activity in our studies and appears to breakdown very rapidly. Currently fluroxypyr is labeled in Europe and has shown good tankmix compatibility with triclopyr and the phenoxy acids (2,4-D, MCPP, MCPA).

In light of these recent developments the MSU Turf Team would like to remind you that we recommend returning clippings whenever possible. Clippings are mostly water and do not contribute to thatch buildup. Raising mowing heights will help facilitate your ability to return clippings. Returned clippings will also reduce the amount of nitrogen fertilization required by 0.25-0.5 pounds of nitrogen per 1000 square feet per year.

"Mow high, and let it lie!"

Table 2: Postemergence broadleaf herbicides containing clopyralid.

Product	Rate	Active	Cost per Acre
	Pt/A	Lb/A	
Lontrel	¼–½	0.19	$ 22.50
Confront	1-2	0.19	$ 27.50
Millenium Ultra	2-3	0.14	$ 15.38
TruPower	2-3	0.14	$ 15.75
Chaser Ultra	2-3	0.14	$ 15.00
Battleship	3-4	0.07	$ 17.00
Momentum	3-4	0.07	$ 18.00

Preemergence Crabgrass: The spring of 2002 brought cool temperatures to most of Michigan which persisted through the first week of June. These conditions were not conducive for vigorous turfgrass growth. The remainder of June was characterized by extremely hot conditions and low precipitation. By the time soil temperatures were high enough to facilitate crabgrass germination there was not enough soil moisture to support establishment. The dry conditions of June and most of July resulted in thin turf in unirrigated sites. Crabgrass germination was rampant at the end of July making the most of adequate soil moisture and openings in the turf. To make the situation worse, most of the preemergence materials had been in place for over three months. In many instances the barrier that remained was not sufficient to inhibit this late flush of crabgrass. In the past, many turfgrass practitioners used a split-timing approach for their preemergence herbicides. Products with shorter residuals would have benefited from this approach in 2002. The general preemergence crabgrass trial was established on April 15, 2002. The split-timed applications that received a booster shot on June 15 held throughout the season. Long residual products like Barricade and Dimension are also provided excellent control in this, 'late germinating' crabgrass year. In most years a low rate of Dimension granular (0.25 lb ai/A) will provide excellent control. This was not the case in 2002. See Table 3 for a complete list of treatments and efficacy.

Postemergence Crabgrass: The postemergence crabgrass trial was delayed until late in the summer due to extremely dry conditions that persisted for much of the season. The first postemergence applications were made on August 2, 2002 when 80 percent of the crabgrass had reached the 3 to 8 leaf stage. Mid-timed treatments were made on August 10, 2002 at the 2 to 4 tiller stage. Late timed postemergence treatments were made on August 16, 2002 at the 5+ tillered stage. No turfgrass injury was observed as most of the turf was dormant during this trial. Dimension (dithiopyr), Drive (quinclorac) and Acclaim Extra (fenoxyprop-p-ethyl) were evaluated in this trial. Most treatments provided excellent control in this trial regardless of formulation or crabgrass growth stage. All of the Drive treatments provided excellent control in this trial at the early (3 to 8 leaf) and late (5+ tiller) application timings. The results from this trial are presented in Table 4. The final efficacy rating was made on September 20, 2002 which was 48, 41 and 34 DAT for the 3 to 8 leaf, 2 to 4 tiller timing and 5+ tiller timing, respectively. All Acclaim Extra treatments yield commercially acceptable results in this trial. All Drive treatments yielded commercially acceptable results in this trial except for the 0.75 lb ai/A rate at the 2-4 tiller stage (67 percent control). Drive is an effective postemergence herbicide for crabgrass. It has been particularly effective on very mature crabgrass in our trials while good cool-season turfgrass safety.

Table 3. 2002 Preemergence Crabgrass Trial

Treatment	Rate	Percent Crabgrass Cover		
		Aug-01-02 108 DAT	Aug-19-02 126 DAT	Sep-20-02 158 DAT
Untreated		32 a[1]	32 a	21 a
Untreated		31 a	24 ab	10 b
Pendulum 3.3EC	1.5 lb ai/A	8 bcd	4 d	0 c
Pendulum 3.3EC	2.0 lb ai/A	3 d	5 d	1 c
Pendulum 3.8CS	1.5 lb ai/A	3 d	1 d	0 c
Pendulum 3.8CS	2.0 lb ai/A	1 d	1 d	0 c
Pendulum 2G	1.5 lb ai/A	6 bcd	4 d	0 c
Pendulum 2G	2.0 lb ai/A	9 bcd	3 d	0 c
Pendulum 60WG	2.0 lb ai/A	3 d	4 d	0 c
Barricade 65WG	0.5 lb ai/A	1 d	1 d	0 c
Team Pro 2.5G	2.0 lb ai/A	2 d	5 d	1 c
Team Pro 2.5G	3.0 lb ai/A	1 d	1 d	0 c
Dimension 1EC	0.125 lb ai/A	9 bcd	5 d	1 c
Dimension 1EC	0.25 lb ai/A	2 d	2 d	1 c
Dimension 1EC	0.38 lb ai/A	1 d	1 d	0 c
Dimension 1EC	0.5 lb ai/A	1 d	0 d	0 c
Dimension 0.164G	0.125 lb ai/A	5 cd	8 cd	2 c
Dimension 0.164G	0.25 lb ai/A	19 abc	11 cd	1 c
Dimension 0.25G	0.38 lb ai/A	1 d	0 d	0 c
Dimension 0.25G	0.5 lb ai/A	1 d	2 d	0 c
LSD (P=0.05)		14	11	8

No crabgrass was observed in any plot on June 17 or July 16, 2002.

[1] Treatments followed by the same letter are not statistically different at the P=0.05 level using Student-Newman-Keuls. Comparisons should not be made between columns.

Treatments were applied on April 15, 2002 using a shaker bottle or pressurized spraying system

calibrated at 62.9 gal/A. TeeJet 8002VS

Table 4a. 2002 Postemergence Crabgrass Trial – Early.

Treatment	Rate		Early Timing Percent Control[1] Aug-16-02 14 DAT	Early Timing Percent Control[1] Sep-20-02 48 DAT
Untreated			0 f[2]	15 b
Dimension	0.5 lb ai/A	3-8 leaf	14 c	100 a
Drive[3]	0.75 lb ai/A	3-8 leaf	99 ab	100 a
Drive + Microyl[4]	0.75 lb ai/A	3-8 leaf	100 a	98 a
Drive + Microyl	0.38 lb ai/A	3-8 leaf	100 a	99 a
LSD (P=0.05)			6	21

Table 4b. 2002 Postemergence Crabgrass Trial – Mid.

Treatment	Rate		Percent Control[1] Sep-20-02 41 DAT
Untreated			15 b[2]
Acclaim Extra	28 fl oz/A	2-4 tiller	90 a
Dimension	0.5 lb ai/A	2-4 tiller	83 a
Drive[3]	0.75 lb ai/A	2-4 tiller	67 a
LSD (P=0.05)			45

Table 4c. 2002 Postemergence Crabgrass Trial – Late.

Treatment	Rate		Percent Control[1] Sep-20-02 34 DAT
Untreated			15 b[2]
Acclaim Extra	28 fl oz/A	5+ tiller	97 a
Dimension	0.5 lb ai/A	5+ tiller	98 a
Drive[3]	0.75 lb ai/A	5+ tiller	100 a
LSD (P=0.05)			20

[1] Percent Control was determined by the Henderson-Tilton Pre count/Post count method.
[2] Treatments followed by the same letter are not statistically different at the P=0.05 level using Student-Newman-Keuls. Comparisons should not be made between columns.
[3] MSO added to spray solution at 1.5 pt/A.
[4] Microyl added to spray solution at 0.5% v/v.

Treatments were applied on June 19, 2002 using a pressurized spraying system calibrated at 62.9 gal/A. TeeJet 8002VS

Emergence dynamics of *Poa annua*: The seasonal emergence dynamics of *Poa annua* has been evaluated at five sites over the past two years. Preliminary analysis of the data indicates that the majority of the emergence (74% in 2001 and 73% in 2002) occurs in a soil temperature range of 55 to 72 F. When soil temperatures in mid-summer regularly exceeded 72 F, emergence declined significantly. However, emergence rates increased to levels similar to those observed early in the growing season in late-August and September when soil temperatures fell back into the 55 to 72 F range. This bimodal, temperature-driven emergence pattern is a useful tool for the design of integrated management systems.

Annual Bluegrass Seedhead Control: Early in the spring of 2002 we developed a website for superintendents to track the growing degree days that had accumulated in their region. Two *Poa annua* seedhead emergence models were included and updated frequently throughout March, April and early May. The base 32 (GDD_{32}) and 50 (GDD_{50}) models worked well in 2002, particularly the base 32 model which did not overestimate the effect of the three warm days of April 15, 16 and 17. In addition to seedhead emergence and suppression trials at the HTRC, data from 11 regional weather stations and several golf courses was also collected. Embark is an important tool for the control of *Poa annua* seedheads, but untimely application can seriously injure desirable turf species. Proper application timing balances control and injury potential. **A** high level of seedhead control was obtained with applications between mid-April and early-May. However, during this period, injury to the turfgrass was highly variable. Future research and data analyses will attempt to understand the environmental and application factors responsible for the response. Developing the ability to predict the injury response will be of considerable value to golf course superintendents.

Figure 1. Predicting application timing for Embark and Proxy using eleven regional weather stations.