TURFGRASS PHYSIOLOGY, HERBICIDE, AND PGR RESEARCH UPDATE

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This was a busy year for turfgrass physiology research program. Dr. Jim Baird, formerly of Oklahoma State University, arrived in East Lansing in May. A full compliment of graduate students and a new baby daughter have kept him busy ever since. Graduate Assistants Ryan Goss, Beau McSparin, and Geoffrey Rinehart acquainted themselves with the turf center and started their thesis projects over the summer. Ronald Calhoun was hired in the spring as the research assistant for Dr. Baird. Ron is a veteran of the turf center and we feel very fortunate to have him as a part of our program. Without the efforts of the graduate students and support staff it would be impossible to conduct the field research and report these results.
The following report summarizes much of the activities in turfgrass herbicide and PGR research conducted in 1997. It should be noted that the data contained in this report represent only one year of research. It is difficult, and perhaps risky, to make conclusions from only one season of research.

Herbicide and PGR Research

The general preemergence crabgrass evaluation was initiated on April 21, 1997. Split treatments were applied on June 16, 1997. Evaluations of phytotoxicity on Kentucky bluegrass were made at 2 and 4 weeks after treatment. No differences among treatments were observed at either rating date. Turfgrass quality was rated on May 9, 1997. All plots received acceptable turfgrass ratings and were rated for color from 1-9 where 9=best turfgrass color (Table 1). Percent crabgrass cover was recorded on three dates. All treatments, with the exception of the untreated check and the fertilizer blank, provided excellent control crabgrass in this study (Table 1). It should be noted that 1997 was a mild crabgrass year in East Lansing and throughout much of Michigan. In the three preemergence crabgrass studies that we performed this year, nearly all products provided acceptable control.

A study comparing non-selective herbicides was initiated on June 30, 1997. Applications of Finale, Roundup and Roundup Pro were made alone and in combination with ammonium sulfate. A complete list of treatments is shown in Table 2. Evaluations of burndown of annual and perennial vegetation were made 2, 3, 7, 14, 22, 28, 31, 36, and 44 days after application. Ammonium sulfate provided minimal synergistic effects on herbicide performance. For the purposes of comparison, treatments applied with and without ammonium sulfate were combined in the analysis. The rate of burndown is illustrated in Figures 1 and 2 for both annual and perennial vegetation, respectively. Overall, there were no significant differences in vegetation control between the old and new formulations of Roundup. Perennial vegetation control was best achieved with formulations of Roundup.

The postemergence crabgrass control trial was started on July 24, 1997. Acclaim, Acclaim Extra, Dimension, and Drive (quinclorac) were included in this study. Treatments were made to 3-4 leaf and 3+ tillered crabgrass. All products were safe on desired turf and provided excellent crabgrass control for both treatment timings (Tables 3 & 4).

The growth regulator Primo (trinexapac-ethyl) applied as a 1EC will reduce clipping yield and increase quality ratings of creeping bentgrass from 14 to 35 DAT. Primo is primarily foliar absorbed. If granular formulations of Primo provide equivalent results, less expensive equipment could be used for application. The objectives of this study were to determine the effect of granular vs. sprayable formulations on clipping yield of fairway height creeping bentgrass and to determine the change in efficacy, if any, when applying granular Primo to a wet or dry turf canopy. Eighteen treatments were applied on May 21, 1997 to a 3-year old 'Providence' creeping bentgrass fairway. Granular formulations were applied with or without a fertilizer carrier. Granular products were formulated to apply Primo at 0.12 lb ai/A. Sprayable Primo was applied at 0.28 lb ai/A. Turfgrass quality ratings were taken at 1, 3, 4, and 5 WAT. Turfgrass quality ratings were increased by all treatments. Clipping yield was measured at 1, 3, and 5 WAT. Sprayable Primo applied to a dry turf canopy reduced clipping production by 50%. Sprayable Primo applied to a wet turf canopy reduced clipping production by 15%. Application timing did not affect the granular treatments. Granular applications reduced clipping production by 27%. Granular Primo formulated with fertilizer did not reduce clipping yield.

Creeping Speedwell is a problem weed in most turf landscapes. Most single applications of broadleaf herbicides will not control this species. This study examined the efficacy of postemergence applications of sulfentrazone and carfentrazone on creeping speedwell. Table 7 includes a complete list of the treatments used in this study. Treatments were applied on July 2, 1997 to a Kentucky bluegrass lawn. Percent control data are shown in Table 8. The data indicated that combinations of Trimec with Drive (quinclorac) or Dimension (dithiopyr) were more effective than the experimental herbicides in controlling speedwell. Turfgrass phytotoxicity was not evaluated in this study as the plots contained 60-100% speedwell. However, the initial injury sustained by the speedwell was observed and is shown in Table 9.

Table 1. 1997 general preemergence trial.

TREATMENT	FORMULATION	RATE	COLOR	CRABGRASS COVER (%)		
		Lbs ai/A	5/6/97	7/1/97	8/4/97	9/4/97
Barricade	65 WG	0.48	3	—	0	0
Barricade	65 WG	0.65	3	—	0	0
Barricade	65 WG	0.25+0.25*	3	—	0	0
Barricade	65 WG	0.33+0.17*	3	—	0	0
Barricade	65 WG	0.42+0.23*	4	—	0	0
Dimension	1 EC	0.25	3	—	0	0
Dimension	1 EC	0.38	4	—	0	0
Dimension	1 EC	0.25+0.125*	3	—	0	0
AD444	0.072 G	0.125	6	—	1	1
AD445	0.164 G	0.25	5	—	0	0
AD442	0.035 G	0.06+0.06*	6	—	0	0
AD444	0.072 G	0.125+0.125*	5	—	1	0
Fertilizer Blank	G	—	5	—	8	5
Team	2 G	2.0	3	—	1	1
Dimension	0.11 G	0.25	2	—	1	0
Pendulum	60 WDG	2.0	2	—	0	0
Ronstar	2 G	3.0	3	—	1	1
Team Pro	0.86 G	2.0	9	—	1	0
TeamPro	0.86 G	1.5+1.5*	6	—	0	0
Control			3	—	10	13
Control			2	—	10	14
Control			3	—	11	16
$LSD_{(0.05)}$			2		6	3

*Split applications were made 8 weeks after the initial treatment.
Plots were 4x6 feet in three replications, located at Evergreen Cemetery in Lansing, MI. Sprayable formulations were applied in 59.3 gal water A^{-1}.

Table 2. Non-selective herbicide treatments.

#	TREATMENT	FORMULATION	RATE
1	Roundup	4 EC	2.7 oz/gal
2	Roundup + 2% AMS	4 EC	2.7 oz/gal
3	Roundup Pro	4 EC	2.7 oz/gal
4	Roundup Pro + 2% AMS	4 EC	2.7 oz/gal
5	Finale	1 SC	4 oz/gal
6	Finale + 2% AMS	1 SC	4 oz/gal
7	Control		
8	Control + 2% AMS		

Table 3. Postemergence crabgrass control (pre-tillered).

#	TREATMENT	FORMULATION	RATE	TIMING	CRABGRASS CONTROL (%)	
			Lbs ai/A		14 DAT	21 DAT
1	Acclaim	1 EC	0.25	3-4 LEAF	74	90
2	Acclaim Extra	0.57 EW	0.125	3-4 LEAF	78	100
3	Drive	75 DF	0.75	3-4 LEAF	92	95
4	Dimension	1 EC	0.5	3-4 LEAF	93	93
5	Control				7	4
	$LSD_{(0.05)}$				13	10

Table 4. Postemergence crabgrass control (post-tillered).

#	TREATMENT	FORMULATION	RATE	TIMING	CRABGRASS CONTROL (%)		
			Lbs ai/A		14 DAT	21 DAT	42 DAT
1	Acclaim	1 EC	0.25	3+ Tillers	73	93	98
2	Acclaim Extra	0.57 EW	0.125	3+ Tillers	85	90	90
3	Drive	75 DF	0.75	3+ Tillers	83	88	90
4	Dimension	1 EC	0.5	3+ Tillers	33	93	93
5	Control				0	0	0
	$LSD_{(0.05)}$				33	25	23

Table 5. Primo G for growth suppression of creeping bentgrass on fairways.

TREATMENT	FORMULATION	QUALITY RATING[1]				COLOR[2]
		1 WAT	3 WAT	4 WAT	5 WAT	5 WAT
Control		7.3 A	4.6 D	4.2 D	5.0 E	6.1 D
Fert Check		7.3 A	6.4 ABC	4.8 CD	6.0 D	6.8 C
Primo	1 EC	5.7 C	4.9 D	7.3 A	7.7 A	7.9 A
ANDPR97-55	G	7.1 AB	5.5 CD	6.2 B	6.4 CD	7.0 BC
ANDPR97-56	G	6.8 AB	5.7 BCD	5.9 B	7.0 BC	7.1 BC
ANDPR97-63 on Fert	G	6.9 AB	5.9 ABCD	6.2 B	6.8 C	7.2 BC
ANDPR97-64 on Fert	G	6.8 AB	7.0 AB	6.3 B	7.7 A	7.8 A
ANDPR97-75	G	6.6 B	5.7 BCD	5.5 BC	6.9 BC	7.5 AB
ANDPR97-76 on Fert	G	7.3 A	7.3 A	6.3 B	7.5 AB	7.8 A

[1] Quality Ratings were taken using a 1-9 scale where 1=dead, 9=excellent, and 5=acceptable.
[2] Color rated using a 1-9 scale where 9=dark green.
Treatment means in the same column followed by the same letter are not significantly different. Means were separated using Fisher's Protected $LSD_{(0.05)}$.

Table 6. Primo G for growth suppression of creeping bentgrass on fairways.

TREATMENT	FORMULATION	CLIPPING YIELD (g)		
		1 WAT	3 WAT	5 WAT
Control		25.0 A	10.5 AB	11.4 BC
Fert Check		22.3 A	11.1 A	10.8 BC
Primo	1 EC	14.9 A	4.4 D	12.0 BC
ANDPR97-55	G	20.8 A	6.1 CD	7.4 C
ANDPR97-56	G	17.1 A	4.9 CD	6.9 C
ANDPR97-63 on Fert	G	19.1 A	6.7 CD	12.6 BC
ANDPR97-64 on Fert	G	20.3 A	8.2 ABC	14.4 AB
ANDPR97-75	G	20.6 A	7.6 BCD	10.1 BC
ANDPR97-76 on Fert	G	20.1 A	7.5 BCD	19.9 A

Clipping yield measured in g/m^2.

Treatment means in the same column followed by the same letter are not significantly different. Means were separated using Fisher's Protected $LSD_{(0.05)}$.

Table 7. Postemergence control of creeping speedwell (*Veronica filiformis*): treatments.

#	TREATMENT	FORMULATION	RATE
			Lbs ai/A
1	NB-20515	LIQ	0.255/0.255/0.015
2	NB-20515	LIQ	0.51/0.51/0.03
3	NB-20518	LIQ	0.407/0.05/0.009
4	NB-20518	LIQ	0.814/0.1/0.018
5	NB-20647	LIQ	0.256/0.05/0.009
6	NB-20647	LIQ	0.512/0.1/0.018
7	Trimec Classic	LIQ	0.75/0.405/0.079
8	Trimec Classic	LIQ	1.0/0.54/0.105
9	Trimec Classic + Dimension	LIQ	1.0/0.54/0.105+ 0.5
10	Trimec Classic + Drive	LIQ	1.0/0.54/0.105+ 0.75
11	Control		

Table 8. Postemergence control of creeping speedwell (*Veronica filiformis*): weed control.

#	TREATMENT	CONTROL (%)		
		14 DAT	28 DAT	42 DAT
1	NB-20515	41	64	63
2	NB-20515	67	85	85
3	NB-20518	77	70	66
4	NB-20518	55	58	54
5	NB-20647	31	37	45
6	NB-20647	60	58	56
7	Trimec Classic	41	72	61
8	Trimec Classic	79	84	88
9	Trimec Classic + Dimension	58	98	97
10	Trimec Classic + Drive	87	100	100
11	Control	0	0	0
	$LSD_{(0.05)}$	43	36	39

Table 9: Postemergence control of creeping speedwell (*Veronica filiformis*): initial weed injury.

#	TREATMENT	INJURY[1]		
		3 DAT	7 DAT	14 DAT
1	NB-20515	3.0	3.1	3.2
2	NB-20515	3.0	3.6	4.3
3	NB-20518	3.3	3.8	3.0
4	NB-20518	4.6	5.0	3.0
5	NB-20647	3.3	4.0	2.7
6	NB-20647	3.3	4.0	2.7
7	Trimec Classic	1.3	1.6	2.3
8	Trimec Classic	1.3	2.6	3.0
9	Trimec Classic + Dimension	2.3	2.6	4.0
10	Trimec Classic + Drive	2.6	3.3	4.3
11	Control	1.0	1.0	1.0
	$LSD_{(0.05)}$	2.6	2.3	1.5

[1] Injury ratings taken on a 1-9 scale where 1=none and 9=dead.

Figure 1: Burndown of Annual Weeds with Non-Selective Hercides

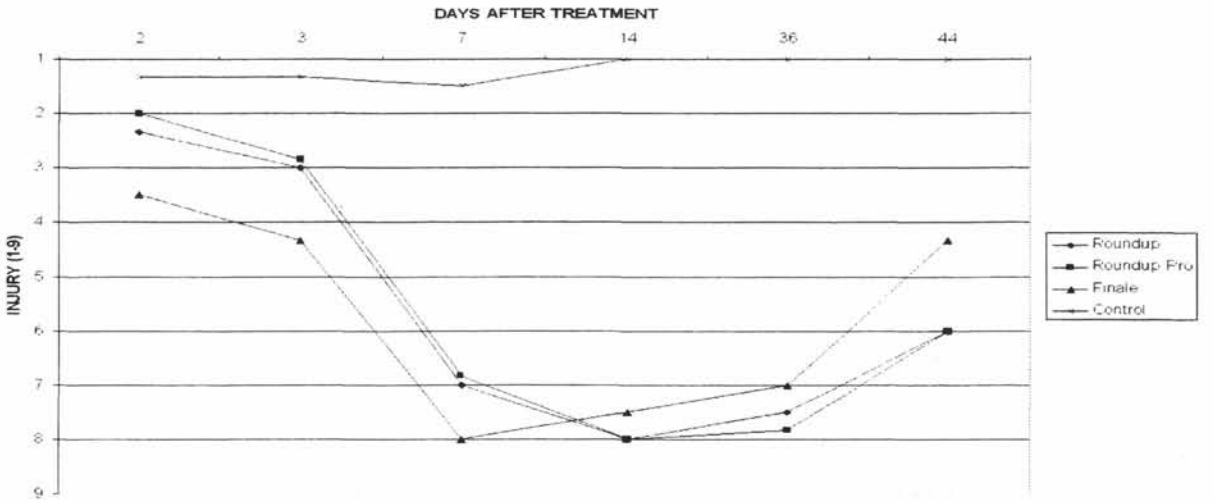

Figure 2: Burndown of Perennial Vegetation with Non-Selective Herbicides