Project: Evaluation of Pre-emergent Herbicides for Control of Smooth Crabgrass on Turfgrass

Principal Investigators: Larry J. Stowell, Ph.D., CPPP, CPAg and Wendy Gelernter, Ph.D.

Cooperator: Bruce Duenow, La Jolla Country Club

Sponsor: Dennis Shepard, Novartis; Randy Smith, Rohm and Haas

Summary: In a replicated field trial conducted on a hybrid Bermudagrass tee at La Jolla County Club, La Jolla, CA, residual activity, various formulations, rates and application timings for the herbicides Dimension, Barricade, Ronstar and Pendulum were evaluated for pre-emergent control of smooth crabgrass, *Digitaria ischaemum.* Key results included:

- In warm winter climates such as California, it is possible that applications of pre-emerge herbicides for control of crabgrass can be made later than the manufacturers currently recommend (current recommendations are to treat when soil temperatures reach 50 - 55° F), thus extending the activity of these products into the summer months. This is based on our observation that soil temperatures at La Jolla CC reached 50 - 55° F on 3/3/97, but crabgrass seedlings didn't emerge until 5/5/97 -- a full two months later. We hope to investigate this further in 1998.

- The best performance (100% control for 4 1/2 months) came from Dimension 1EC at either 1.5 oz/1000 (applied once on 3/3/97) or 0.75 oz/1000 (applied twice on 3/3/97 and 5/5/97), Pendulum 60 DG, at 1.8 oz/1000 (applied once on 3/3/97), a single application of Barricade 65 WG, applied at 0.55 oz/1000, and split applications of Barricade 65 WG (applied 3/3/97 and 5/5/97) at either 0.28 oz/1000 followed by 0.28 oz/1000, or 0.37 oz, followed by 0.18 oz/1000.

- Lower rates of Barricade did not perform as well as either the high rate of Barricade or the split applications of Barricade, and the granular formulation of Dimension did not perform as well as the Dimension 1EC formulation.

- For reasons that are not clear, the performance of Ronstar 2G was equivalent to that of the non-treated control throughout the trial.

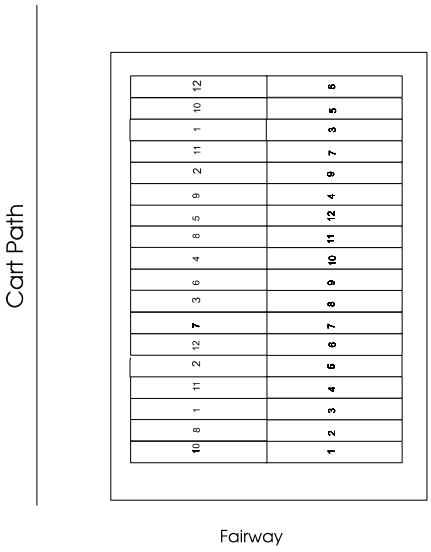
- The most effective products had a residual activity of 140 days (4 1/2 months).

Materials and Methods:

Location: Research plots were located on a hybrid Bermudagrass tee (#15) at La Jolla Country Club, La Jolla, CA. This site was selected based on a past history of crabgrass infestations.

Experimental design and application: Plots measuring 6 feet by 15 feet were replicated three times in a randomized design (Figure 1).

Figure 1. Plot plan, Tee 15, La Jolla Country Club, La Jolla, CA.



Sprayable products were applied with a backpack sprayer with 8004 VS flat fan nozzles powered by CO2 to deliver 30 psi at the boom and 0.98 gallons spray solution/1000 square

feet. Calibration of each nozzle was confirmed prior to each application to be within 5% of the desired nozzle flow rate. The boom height was 17 inches. The spray swath was 5 feet. The two liter spray bottles were agitated by shaking 10 times prior to charging with compressed CO2. Spray lines were purged with water and CO2 between treatments.

Granular products were applied with a Gandy drop spreader, with a 33 inch swath. Calibration to deliver 1.0, 2.1, 3.2 and 4.3 lb/1000 square feet of Dimension G resulted in Gandy settings of 18, 23, 27 and 30. Calibration to deliver 4.5 lb Ronstar 2G resulted in a Gandy setting of 26. The accuracy of calibration was confirmed to be within ± 5% of the desired rate by conducting 3 passes of 15 linear feet each at the specified setting, collecting the product in question and weighing it. All plots were irrigated with 1/10 inch water after application.

Treatments: Treatments and application dates are listed below. Applications were initiated on March 3, 1997, when soil temperatures reached 50° F at a depth of 2 inches..

	PRODUCT	LB AI/A	RATE/1000	APPLICATION DATES
1.	Dimension 1EC*	0.5 lb	1.5 oz	3/3/97
2.	Dimension 1EC*	0.25/0.25	0.75/0.75 oz	3/3/97, 5/5/97
3.	Dimension 270G*	0.5 lb	4.2 lb	3/3/97
4.	Dimension 270G*	0.38 lb	3.2 lb	3/3/97
5.	Dimension 270G*	0.25/0.125 lb	2.1/1.0 lb	3/3/97, 5/5/97
6.	Barricade 65 WG	0.75 lb	0.43 oz	3/3/97
7.	Barricade 65 WG	0.97 lb	0.55 oz	3/3/97
8.	Pendulum 60 DG	3.0 lb	1.8 oz	3/3/97
9.	Ronstar 2G	4.0 lb	4.5 lb	3/3/97
10.	Barricade	0.5/0.5 lb	0.28/0.28 oz	3/3/97, 5/5/97
11.	Barricade	0.65/0.32 lb	0.37/0.18 oz	3/3/97, 5/5/97
12.	Non-treated control			

Evaluations: Crabgrass control ratings were conducted every 4 weeks, beginning on 5/5/97 when crabgrass seedlings were first observed, by counting the number of patches of crabgrass per plot. Data was subjected to analysis of variance, and treatment means separated using Fisher's LSD, where $P<0.05$.

Results and Discussion:

Identity of weed species: Smooth crabgrass, *Digitaria ischaemum*, was first noted in the 3 -4 leaf stage on 5/5/97. The key feature used to identify the weed species were the lack of hairs on blades and sheath, the membranous ligule, and the closed sheath. No other weed species were noted during the trial.

Phytotoxicity: No phytotoxicity was observed on hybrid bermudagrass from any of the treatments tested.

Efficacy (Table 1, Figure 2): The best performance (100% control for 4 1/2 months) came from Dimension 1EC at either 1.5 oz/1000 (applied once on 3/3/97) or 0.75 oz/1000 (applied twice on 3/3/97 and 5/5/97), Pendulum 60 DG, at 1.8 oz/1000 (applied once on 3/3/97), a single application of Barricade 65 WG at the high rate (applied at 0.55 oz/1000), and split applications of Barricade 65 WG that totaled 0.55 oz/1000 square feet (applied 3/3/97 and 5/5/97) at either 0.28 oz/1000 followed by 0.28 oz/1000, or 0.37 oz, followed by 0.18 oz/1000 (Table 1). The lower rate of Barricade (0.43 oz/1000 square feet) did not perform as well as either the high rate of Barricade or the split applications of Barricade, indicating that application rates below 0.55 oz/1000 square feet would not provide 100% control. The results also indicated no advantage from the use of a split application of Barricade or Dimension 1EC, with both single and split applications providing 100% control, as long as the proper amount of

active ingredient was applied. The possibility that a split application would result in longer residual summer weed control could be investigated in the future in trials designed to last through August or September.

The granular formulation of Dimension did not perform as well as the Dimension 1EC formulation when similar rates of active ingredient were compared. We typically find that granular products do not perform as well as sprayable products, probably due to the more even distribution of active ingredient achieved with sprayable products.

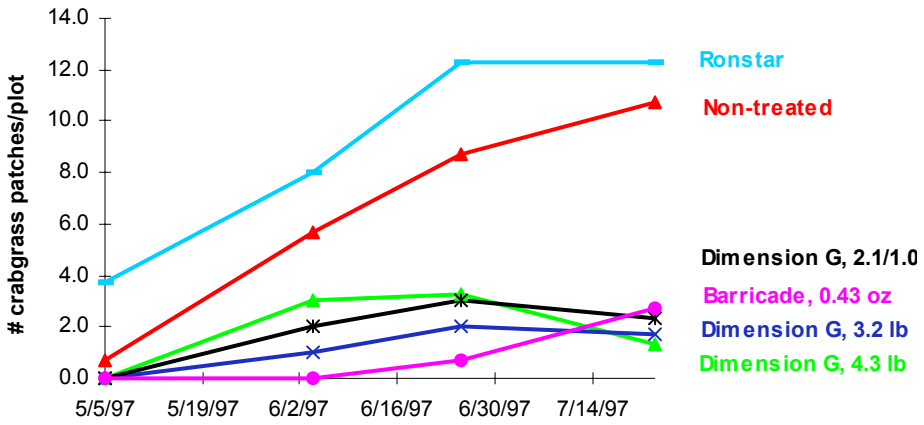
For reasons that are not clear, the performance of Ronstar 2G was equivalent to that of the non-treated control throughout the trial, even though this product is labeled for control of crabgrass. It is possible that the product sample tested was somehow inactivated prior to testing, in which case the results are inaccurate. This unfortunately cannot be confirmed, as the sample in its entirety was used in this trial. Unless more data is obtained with a new sample of Ronstar 2G, the lack of efficacy that was observed in this trial should be taken with a grain of salt.

The later than expected appearance of crabgrass seedlings (May 5 at this location) indicates that in warm winter climates such as California, it is possible that applications of pre-emerge herbicides for control of crabgrass can be made later than the manufacturers currently recommend (current recommendations are to treat when soil temperatures reach 50 - 55° F). This strategy would serve to extend the activity of these products into the summer months. We recommend a further look at the question of timing in 1998, in an experiment that tests some of the more effective products above (Dimension 1EC, Barricade 65 WG, Pendulum 60 DG) at a variety of application dates, beginning when soil temperatures reach 50° F, and every two weeks thereafter, until soil temperatures at the 2 inch depth reach 65°F.

Table 1. Crabgrass control on hybrid Bermudagrass tees, La Jolla Country Club, La Jolla, CA. Values followed by the same letter are not significantly different (Fisher's LSD, P<0.05). Treatments producing 100% control of smooth crabgrass over the 4 1/2 month duration of the trial are highlighted in yellow.

			Mean # crabgrass patches/plot							
Treatment	**Product**	**Rate/1000 sq ft**	**5/5/97**		**6/4/97**		**6/25/97**		**7/23/97**	
1	Dimension 1EC	1.5 oz	0.0	b	0.0	c	0.0	c	0.0	b
2	Dimension 1EC	0.75 oz/0.75 oz	0.0	b	0.0	c	0.0	c	0.0	b
3	Dimension 270G	4.3 lb	0.0	b	3.0	abc	3.3	bc	1.3	b
4	Dimension 270G	3.2 lb	0.0	b	1.0	bc	2.0	bc	1.7	b
5	Dimension 270G	2.1lb/1.0 lb	0.0	b	2.0	bc	3.0	bc	2.3	b
6	Barricade 65WG	0.43 oz	0.0	b	0.0	c	0.7	bc	2.7	b
7	Barricade 65WG	0.55 oz	0.0	b	0.0	c	0.0	c	0.3	b
8	Pendulum 60 DG	1.8 oz	0.0	b	0.0	c	0.0	c	0.0	b
9	Ronstar 2G	4.5 lb	3.7	a	8.0	a	12.3	a	12.3	a
10	Barricade 65WG, split application	0.28 oz/0.28 oz	0.0	b	0.0	c	0.0	c	0.0	b
11	Barricade 65 WG, split application	0.37 oz/0.18 oz	0.0	b	0.0	c	0.0	c	0.0	b
12	Non-treated control		0.7	b	5.7	ab	8.7	a	10.7	a

Figure 2. Efficacy of pre-emergent herbicides for control of smooth crabgrass. The best treatments tested had no crabgrass patches detected throughout the trial, and therefore do not appear in this figure.



Slides

NOTE: The non-treated control is erroneously labeled as treatment #10 in the slides below. The correct treatment number for the non-treated control is treatment # 12.

1887-01	5/5/97: First observation of smooth crabgrass, *Digitaria ischaemum,* in non-treated check plots
1887-02	7/23/97: Barricade split applications (0.28 oz/1000) vs.Non-treated control
1887-03	7/23/97: Dimension 270G single application (4.2 lb/1000) vs. Non-treated control
1887-04	7/23/97: Dimension 1EC split application (0.75 oz/1000) vs. Non-treated control
1887-05	7/23/97: Overall plot plan