Application Timing Affects Herbicide Options for Oxalis Control in Bermudagrass Turf

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Introduction

Creeping woodsorrel (*Oxalis corniculata L.)* is a common perennial broadleaf weed in California landscapes. It is a particular problem in warm season turfgrasses, especially bermudagrass, because there are limited herbicides known to control oxalis without causing some phytotoxicity to the turf. Cultural management practices have not proven to be effective in controlling oxalis.

Brief description of *Oxalis corniculata*

The cotyledons of creeping woodsorrel are oval in shape, whereas the true leaves are compound with three heart-shaped leaflets that resemble clover leaves. Leaves often close and droop at night or under intense light. An oxalis plant can contain leaves of various shades of green to deep purple. Yellow flowers with five petals are borne singly or in small groups. The mature plant has creeping stems emerging from a slender taproot. Stems root at nodes and the plant spreads. Roots also survive cold temperatures and regrow. Seed pods are about 1/3-inch long and bear a resemblance to miniature okra. Each pod produces 10-50 seeds and it is estimated that each plant averages 5000 seeds. Pods burst open spreading reddish seeds 10 feet or more. Since the plants spread by seeds, roots, and stems that root at the nodes, eventually a carpet of oxalis occurs in a lawn.

Background and Justification

In the late 1980s triclopyr (Turflon®) was tested on lawns for broadleaf weed control and was soon registered for use in cool season lawns for the postemergence control of creeping woodsorrel and other broadleaf weeds. Because it was found harmful to bermudagrass lawns, triclopyr was not registered for use in warm season turfgrasses. Common postemergence broadleaf herbicides (two or three way combinations of 2, 4-D, mecoprop, and dicamba) have provided limited control of oxalis in warm season grasses. Several preemergence herbicides claim to control or suppress oxalis from seed, yet it continues to be a serious weed problem. In recent years new herbicide chemistry and products have been introduced.

Objectives of herbicide field trials

There are several objectives for these experiments:

- to determine which active ingredients control oxalis;
- to compare similar products available to both professional applicators and homeowners, but formulated at different concentrations;
- to evaluate the impact of preemergence herbicides in the weed management plan;
- to evaluate the relationship of application timing; and
- to develop a best treatment plan for the control of oxalis in bermudagrass.

Methods and materials

Two field experiments were conducted in established common bermudagrass sites in Fresno County: one was initiated in November of 2003 (winter experiment) in a city park and the second experiment was established in May 2005 (summer experiment) at the UC Kearney Research and Extension Center in Parlier, CA. Each experiment was designed as a split plot with 4 replications. Main plots were preemergence herbicide treatments and subplots were postemergence herbicides.

Three common preemergence herbicides and six postemergence broadleaf herbicides were evaluated for reducing oxalis weed populations and for turf phytotoxicity. At each site label rate applications of Dimension® (dithiopyr), Pendulum® (pendimethalin), and Barricade® (prodiamine) were applied to a uniform, dense stand of oxalis (minimum 70% cover at trial initiation).

Postemergence materials included 2,4-D, MCPP, dicamba, MSMA, carfentrazone, and fluroxypyr or combinations of these products. Professional and homeowner products containing the same active ingredients but differing in percentages of active ingredients were compared for their effectiveness on oxalis control. Fluroxypyr, related to triclopyr, and Speedzone®, containing carfentrazone, were developed specifically for broadleaf weed control in warm season lawns.

Each experiment received a minimum of two applications of all herbicides. Herbicide applications were made with a CO_2 backpack sprayer at 30 psi using 1.5 gal/1000 ft^2 water volumes. Experiment details including application dates and rates for the products tested are listed in Table 1. Plots were evaluated for weed control using a visual rating system of 1 to 10 with 1 being no control, 5 being less than satisfactory, and 10 being excellent control. Plots were also evaluated for percent cover of weeds and bermudagrass.

WINTER Experiment 2003-04: Pre- and postemergence applications were made on November 18 and February 24. Plots were visually evaluated for oxalis control on December 9, February 20, April 30, and August 12.

SUMMER Experiment 2005: Preemergence applications were made on May 13 and October 17. Postemergence herbicides were applied on May 13, June 23, and November 4. Weed control ratings and % cover ratings were made June 9, July 13, and November 4.

RESULTS (Table 2 and Figures 1 and 2)

WINTER Experiment: There were no significant differences between preemergence herbicides at any rating dates. All three preemergence herbicides were effective in keeping oxalis from germinating and over time had significantly higher weed control ratings than untreated plots. These herbicides were very effective in preventing oxalis germination for over six months after the second application.

Visual ratings in December 2003 and February 2004 indicated that oxalis control was better in all plots receiving a postemergence herbicide application compared to the untreated check and to plots receiving only a preemergence application. In the December rating, weed control with the trimec products was unsatisfactory (a control rating less than 5.0) and there was little difference between homeowner and professional products. Speedzone Southern had higher ratings than common broadleaf weed killers, and fluroxypyr treatments exhibited the highest weed control ratings. By February weed control ratings were significantly better and there were no differences in any of the postemergence products, meanwhile untreated areas had significant oxalis populations. No bermudagrass phytotoxicity was observed.

To summarize, initially there were significant differences between postemergence treatments with Speedzone and Spotlight providing more rapid and better oxalis control. These differences waned over time and all products provided more than adequate control of oxalis (rating > 9.0) by the end of the winter trial.

SUMMER Experiment: Significant differences in oxalis control were noted with both pre- and postemergence products, which is a different result from the WINTER experiment.

Postemergence: Spotlight and Trimec 992 (professional concentration) provided the best oxalis control overall with a weed control rating of 9 that persisted over time. Although the professional "trimec" products were significantly better than the homeowner "trimec" products, relatively good (rating >7.0) oxalis control was observed with the homeowner products. Trimec Plus (professional and homeowner) provided good crabgrass control in addition to oxalis control. Speedzone (a professional product) was not significantly different than homeowner products. No bermudagrass phytotoxicity was observed.

Preemergence: A few months after the initial application of preemergence herbicides, significant differences in oxalis weed control were observed. Barricade provided excellent, Dimension provided good, and Pendulum provided inadequate (though significantly better than the check) preemergence control of oxalis seedlings.

Crabgrass: In the SUMMER experiment it became obvious that crabgrass was a factor (Figures 1 and 2). Where there was less crabgrass there was better bermudagrass cover. Where there was more crabgrass there was less oxalis. It appears that crabgrass was more competitive than oxalis and bermudagrass unless managed with herbicides. In this experiment the postemergence weed control products containing MSMA for grassy weed control provided crabgrass control in addition to oxalis control and the bermudagrass cover was significantly better. While it is known that the preemergence herbicide, Dimension, provides early postemergence crabgrass control, we also saw this same result with Barricade. Pendulum was significantly weaker in controlling crabgrass at this timing.

SUMMARY: Oxalis control in established bermudagrass turf was significantly affected by application timing of herbicides. All active ingredients that were tested controlled oxalis to varying degrees depending on application timing. In winter less dramatic weed control results were observed early in the trial, but all products eventually worked equally well over time. An explanation may be that systemic broadleaf herbicides work more slowly in cooler temperatures. In summer differences in product performance were obvious from the beginning. Initially Spotlight was significantly better than the other postemergence products. Trimec Pro also provided good oxalis control and was equal to Spotlight at the end of the trial. Pre- and postemergence materials that controlled oxalis and crabgrass had higher bermudagrass cover and by definition higher turf quality. No bermudagrass phytotoxicity was observed in either experiment at any time.

These experiments demonstrate that *Oxalis corniculata* (creeping woodsorrel) can be successfully controlled in a bermudagrass turf with common broadleaf and preemergence herbicides in either winter or summer with either professional or homeowner products, although professional concentrations tend to provide better control. Success depends on application timing, sequential applications, and combining preemergence and postemergence herbicides in the weed and turfgrass management plan.

References

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Table 1: Experiment Descriptions and Treatment List

	WINTER Experiment	SUMMER Experiment
Location:	**Fresno City Park**	**UC KREC, Parlier**
Application dates		
Preemergence:	**NOV 18, 2003 & FEB 24, 2004**	**May 13 & OCT 17, 2005**
Postemergence:	**NOV 18, 2003 & FEB 24, 2004**	**May 13, June 23, & NOV 4, 2005**

Treatments	Amount of Product
Preemergence herbicides	**per 1000 ft^2**
A. Dimension® dithiopyr (12.7%)	**1½ ozs**
B. Pendulum WDG® pendimethalin (60%)	**1¼ ozs**
C. Barricade WG® prodiamine (65%)	**1½ ozs**
D. Untreated	
Postemergence herbicides	
1. Untreated check	**-**
2. Homeowner Trimec (OSH) 2, 4-D (5.67%) MCPP (2.67%) dicamba (0.63%)	**1½ oz**
3. Professional Trimec 992 2, 4-D (30.56%) MCPP (16.34%) dicamba (2.77%)	**1½**
4. Homeowner Trimec Plus (Bayer) 2,4-D (3.18%) MCPP (1.60%) dicamba (0.79%) & MSMA (9.81%)	**1½**
5. Professional Trimec Plus 2, 4-D (5.83%) MCPP (2.93%) dicamba (1.46%) & MSMA (18.0%)	**1½**
6. Speedzone Southern (carfentrazone) 2,4-D ester (10.49%) MCPP (2.66%) dicamba (.67%) carfentrazone (.54%)	**1½**
7. Spotlight fluroxypyr (26.2%)	**½**

Table 2: Weed Control Ratings with Pre- and Postemergence Herbicide Applications in Winter and Summer Experiments (Visual rating scale 1-10. 1=no control, 10 = excellent control)

	Weed Control Ratings							
	WINTER Experiment 2003-04				SUMMER Experiment 2005			
	Oxalis				Oxalis		Crabgrass	
Preemergence	**9-Dec**		**30-Apr**	**12-Aug**	**9-Jun**	**5-Nov**	**9-Jun**	**5-Nov**
Check	1.5		5.3	1.5	5.4	1.8	2.9	1.8
Dimension	5.0		9.4	9.0	6.1	7.5	5.4	7.5
Pendulum	5.0		9.4	8.6	6.1	5.0	2.8	5.0
Barricade	5.0		9.3	8.8	6.3	9.0	5.1	9.0
LSD (0.05)	**0.2**		**0.2**	**0.5**	**NS**	**0.6**	**0.5**	**1.5**
							Grassy weeds	
Postemergence	**9-Dec**	**20-Feb**	**30-Apr**		**9-Jun**	**5-Nov**	**9-Jun**	
Check	1.4	5.3	5.3		1.8	5.6	1.9	
Trimec HOME	3.5	8.0	9.7		4.7	7.3	2.9	
Trimec PRO	5.0	9.4	9.8		7.8	8.8	3.9	
Tri Plus HOME	3.1	8.8	9.9		6.3	7.4	5.6	
Tri Plus PRO	3.3	8.8	9.8		7.1	8.0	6.4	
Speedzone	6.1	8.3	9.4		5.5	8.1	3.4	
Spotlight	7.9	9.3	9.9		8.8	9.1	4.2	
LSD (0.05)	**0.4**	**0.5**	**0.3**		**0.6**	**0.8**	**0.7**	
CV %	24.6	16.8	8.2	15.5	34	32.8	54.8	15.8

Figure 1: Percent Weed and Turfgrass Cover After Application of Postemergence Herbicides for Oxalis Control

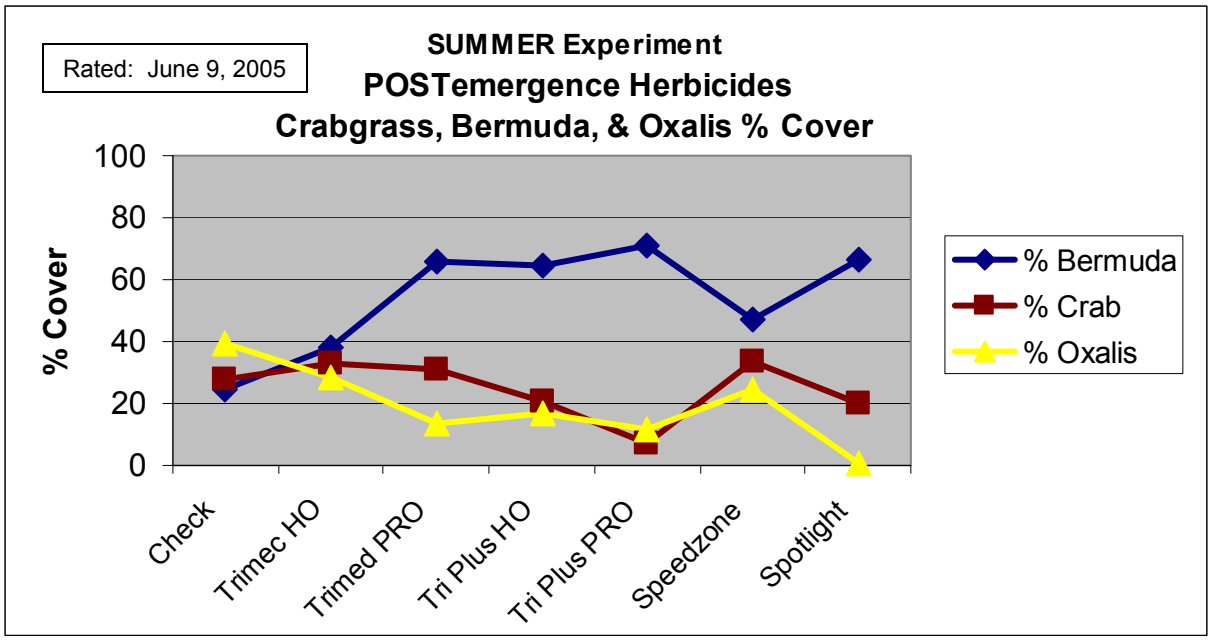

Figure 2. Percent Weed and Turfgrass Cover After Application of Preemergence Herbicides for Oxalis Control