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Sequential and Tank-Mixed Dimension (Dithiopyr) and MSMA Treatments for Large Crabgrass Control in Bermudagrass Turf[1]

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Abstract

A field experiment was conducted during 1995 and 1996 in Georgia to determine the influence of Dimension (dithiopyr) and MSMA applied as sequential and tank-mixed treatments on large crabgrass [*Digitaria sanguinalis* (L.) Scop.] control in common bermudagrass [*Cynodon dactylon* (L.) Pers.]. Large crabgrass control by late August was equal to or higher when Dimension and MSMA were applied in a single tank-mixed application after weeds emerged in early May than when Dimension was applied as preemergence late February followed by MSMA as postemergence early June. Full season control ranged from ≥73% for tank-mixes of Dimension plus MSMA at 0.14 + 1.1 kg/ha (0.12 + 1.0 lb/A) to ≥93% when applied at 0.28 + 2.2 kg/ha (0.25 + 2.0 lb/A). The injury to common bermudagrass was due to MSMA and not related to Dimension. MSMA applied in May caused only slight discoloration but injury in June ranged from from ≤42% in 1995 and ≤25% in 1996. The higher injury in 1995 was related to higher air temperature following treatments. When injury was observed, recovery occurred within 2 to 3 weeks.

Index words: Cynodon dactylon, preemergence, postemergence, turfgrass injury, weed control.

Herbicides used in this study: Dimension (dithiopyr), *S,S*-dimethyl 2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridinedicarbothioate and MSMA, monosodium methanearsonate.

Significance to the Nursery Industry

Full season large crabgrass control was obtained in common bermudagrass turf from tank-mixes of Dimension (dithiopyr) and MSMA applied in early spring when large crabgrass had 2 to 4 leaves. The control was ≥93% by late August when Dimension was applied at 0.28 kg/ha (0.25 lb/A) with MSMA at 2.2 kg/ha (2.0 lb/A). When rate of either herbicide was reduced, the control was either not as good or not as consistent in both years of the study. These treatments are for turfgrass only and not for nursery crops.

Introduction

Crabgrass species (*Digitaria* spp.) continues to be a major weed in most turfgrasses throughout the United States. However, timely applications of preemergence (1, 9, 11, 14) and postemergence (3, 10, 12) herbicides provide effective control. Acceptable (≥80%) control can also be obtained from preemergence and postemergence herbicides applied as sequential treatments in two applications (4, 6) and as tank-mixed treatments in a single application (2, 5, 7).

When large and smooth crabgrass [*Digitaria ischaemum* (Schreb. ex Schweig.) Schreb. ex Muhl] emerge in the spring, combinations of preemergence and postemergence herbicides have provided better control than when postemergence herbicides were applied alone (2, 5, 7). Tank-mixes of Dimension and MSMA at 0.28 + 2.2 kg/ha (0.25 + 2.0 lb/A) controlled ≥72% large crabgrass for 10 to 16 weeks in common bermudagrass in Georgia (5, 7). However, the control was 63% at 7 weeks after treatment with Dimension + MSMA at 0.43 + 1.12 kg/ha (0.38 + 1.0 lb/A) in Pennsylvania (2).

It is desirable to obtain effective crabgrass control with postemergence herbicides for a period of 10 weeks or longer with low rates and a minimum number of applications. This is important because of the increasing public concerns about pesticide use. Lower herbicide rates would also reduce the total weed control cost for the turfgrass manager. Dimension and MSMA have generally controlled large crabgrass consistently in common bermudagrass when applied at 0.28 + 2.2 kg/ha (0.25 + 2.0 lb/A) (4, 5, 7). However, information on the efficiency of sequential and tank-mixed treatments of lower rates of Dimension and MSMA for consistent full season large crabgrass control is needed.

Materials and Methods

Dimension and MSMA were applied as sequential and tank-mixed treatments for large crabgrass control in common bermudagrass at the Georgia Station, Griffin, GA, during 1995 and 1996. Sequential treatments were made on February 23 ± 1 day for Dimension and on June 2 ± 4 days for MSMA. Tank-mixed Dimension and MSMA treatments were made May 2 ± 2 weeks. Treatments applied in May and June were made when large crabgrass had 2 to 3 leaves. The Dimension and MSMA rates were 0.14 + 1.1 kg/ha (0.12 + 1.0 lb/A), 0.14 + 2.2 kg/ha (0.12 + 2.0 lb/A), 0.28 + 1.1 kg/ha (0.25 + 1.0 lb/A), and 0.28 + 2.2 kg/ha (0.25 + 2.0 lb/A) respectively. Rates shown for Dimension represent one-fourth [0.14 kg/ha (0.12 lb/A)] and one-half [0.28 kg/ha (0.25 lb/A)] the manufacturer's recommended rate. For MSMA, 1.1 kg/ha (1.0 lb/A) is one-half recommended and 2.2 kg/ha (2.0 lb/A) is the manufacturer's recommended rate. Treatments were applied to different plots each year.

Large crabgrass was seeded in January for two consecutive years before the experiments were initiated. By late August, the density of large crabgrass in untreated plots was 96% in 1995 and 52% in 1996. The soil type was a Cecil

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Table 1. Effect of Dimension (dithiopyr) and MSMA treatments on large crabgrass control in common bermudagrass, Griffin, GA.

Treatments[z]				Large crabgrass control[y]					
		Rate		June 16		July 17		August 28	
Herbicide	Application timing	kgai/ha	lbai/A	1995	1996	1995	1996	1995	1996
				%					
Dimension (dithiopyr)	PRE	0.28	0.25	94	64	92	62	87	55
	POST	0.28	0.25	96	73	84	62	66	47
MSMA	POST	2.2	2.0	27	76	9	89	10	82
Dimension + MSMA	Sequential	0.14 + 1.1	0.12 + 1.0	93	19	85	58	64	62
	Tank-mixes	0.14 + 1.1	0.12 + 1.0	97	87	88	95	73	91
Dimension + MSMA	Sequential	0.14 + 2.2	0.12 + 2.0	98	80	96	84	83	85
	Tank-mixes	0.14 + 2.2	0.12 + 2.0	97	90	92	87	86	75
Dimension + MSMA	Sequential	0.28 + 1.1	0.25 + 1.0	98	86	95	90	92	82
	Tank-mixes	0.28 + 1.1	0.25 + 1.0	97	89	96	83	91	82
Dimension + MSMA	Sequential	0.28 + 2.2	0.25 + 2.0	99	90	98	93	96	91
	Tank-mixes	0.28 + 2.2	0.25 + 2.0	100	100	97	98	93	94
LSD @ 0.05				12	15	13	18	14	22

[z]PRE (preemergence) applied February 23 ± 1d, POST (postemergence) applied May 2 ± 2WK, sequential applications of Dimension on February 23 ± 1d, and MSMA on June 2 ± 4d, and tank-mixes of Dimension and MSMA on May 2 ± 2WK. The POST and tank-mixes were applied as early postemergence when large crabgrass had 2 to 3 leaves.

[y]Large crabgrass control ratings were based on 0 to 100 where 0 = no control, <80 = commercially unacceptable, and 100 = complete control.

sandy loam (clayey, Kaolinitic Thermic Typic Kanhapludult). Soil pH was 5.7 and organic matter content was 2.0%.

Actively growing common bermudagrass was mowed with a reel mower at a height of 2 to 2.5 cm (0.75 to 1.0 in.) three times per week, and clippings were returned to the plots. The turfgrass was irrigated to prevent drought stress. In both years, the turfgrass was fertilized with 50N–22P–42K kg/ha (45N–20P–38K lb/A) during early April and early September. An additional 50 kg N/ha (45 lb/A) was applied during late May or early June.

Visual estimates of turfgrass injury and weed control ratings were made during 1995 and 1996. Turf injury was based on 0 to 100 where 0 = no injury, 1 to 15% = minor leaf discoloration, 16 to 30% = moderate leaf discoloration with some plant necrosis, >30% = moderate to severe leaf discoloration and plant necrosis, and 100 = complete kill. Injury ratings were made in late April and at weekly intervals thereafter until the turfgrass fully recovered. Large crabgrass control ratings were based on 0 to 100, where 0 = no control, and 100 = complete control. On this scale, <80% would be unacceptable.

The experimental design was a randomized complete block with four replications. Plot size was 1.5 by 3 m (5 by 10 ft). The data were analyzed (ANOVA) within and across years using the General Linear Models procedure (13). All means were compared by LSD at P = 0.05.

Results and Discussion

There were year by herbicide treatment interactions and means are reported for each year.

Large crabgrass control. The control of large crabgrass in common bermudagrass in 1995 was similar whether Dimension was applied in February at 0.14 kg/ha (0.12 lb/A) and followed by MSMA at 1.1 kg/ha (1.0 lb/A) in early June or when the herbicides were tank-mixed and applied at the same rates in early May (Table 1). The control was acceptable (≥85%) through mid-July, but reduced to an unacceptable level (≤73%) by late August. In 1996, tank-mixes of Dimension and MSMA at 0.14 + 1.1 kg/ha (0.12 + 1.0 lb/A) applied in May controlled a higher percentage of large crabgrass than when the herbicides were applied in split applications. The control from tank-mixed treatments ranged from 87% mid-June to 91% late August compared with 19 to 62% with sequential treatments during the same period. The lower control from sequential applications than tank-mixed application was probably related to the dissipation of Dimension in the soil from late February application and poor postemergence control with MSMA in early June.

When rates of Dimension and MSMA were applied at 0.14 + 2.2 kg/ha (0.12 + 2.0 lb/A), 0.28 + 1.1 kg/ha (0.25 + 1.0 lb/A) or 0.28 + 2.2 kg/ha (0.25 + 2.0 lb/A), respectively, there was no difference in large crabgrass whether the herbicides were applied sequentially in two applications or tank-mixed and applied in a single application (Table 1). However, the control was influenced by rates of herbicide applications.

Large crabgrass control from sequential Dimension and MSMA at 0.14 + 2.2 kg/ha (0.12 + 2.0 lb/A) was ≥80% throughout the summer (Table 1). The control was equally as good from tank-mixed treatments at the same rate with the exception of late August 1996. Although the control was

Table 2. Tolerance of common bermudagrass to MSMA and Dimension, when applied alone, sequentially, and tank-mix, Griffin, GA.

Treatments[z]					
Application timing	Herbicide	Rate kgai/ha	Rate lbai/A	Turfgrass injury[y] 1995	Turfgrass injury[y] 1996
				%	
		Tank-mixed applications			
May 2 ± 2WK	Untreated	—	—	0	0
	MSMA	2.2	2.0	5	11
	Dimension (dithiopyr)	0.28	0.25	2	0
	Dimension + MSMA	0.14 + 1.1	0.12 + 1.0	2	9
		0.14 + 2.2	0.12 + 2.0	11	17
		0.28 + 1.1	0.25 + 1.0	4	13
		0.28 + 2.2	0.25 + 2.0	4	14
	LSD @ 0.05			NS	7
		Sequential applications			
Jun 2 ± 4d	Untreated	—	—	0	0
	Dimension + MSMA	0.14 + 1.1	0.12 + 1.0	29	19
		0.14 + 2.2	0.12 + 2.0	42	22
		0.28 + 1.1	0.25 + 1.0	32	11
		0.28 + 2.2	0.25 + 2.0	33	25
	LSD @ 0.05			7	7

[z]Postemergence herbicides were applied when large crabgrass had 2 to 3 leaves. This was on May 2 when MSMA was applied alone or tank-mixed with Dimension and on June 2 when MSMA was applied to plots previously treated with Dimension on February 23.

[y]Turfgrass injury ratings were made one week after MSMA treatments and based on 0 to 100 where 0 = no injury and 100 = complete kill.

not significantly different at this date, the 85% control from sequential treatments would probably be more acceptable for high quality turfs such as fairways than the 75% control from tank-mixed treatments.

Large crabgrass control was consistently high (≥91%) during 1995 and 1996 when Dimension at 0.28 kg/ha (0.25 lb/A) was applied with MSMA at ≤2.2 kg/ha (≤2.0 lb/A) either sequentially or as tank-mixes (Table 1). There are advantages from each method of treatment. When Dimension was applied as preemergence in February with no application of MSMA, control was acceptable by late 1995 (87%), but not in 1996 (55%). Therefore, no postemergence treatment was required in 1995, but one was needed in 1996 since Dimension applied alone did not provide full-season control. Although the sequential application of Dimension in February and MSMA in June effectively controlled large crabgrass both years, MSMA was needed only in 1 of 2 years. Thus, the primary advantage of a sequential, low rate preemergence and postemergence program is that in some years only the preemergence herbicide application is needed. Timely scouting of the turfgrass area should be done to determine if a postemergence herbicide application is needed. The main advantage of tank-mix treatments is that the need and expense of a second application is eliminated. Additionally, tank-mixed treatments can utilize lower than manufacturer's recommended rates for Dimension and MSMA and still provide acceptable control. For the tank-mixed treatments to be highly effective, they should be applied when large crabgrass plants are small. This would be especially true when herbicides are applied at less than manufacturer's recommended rates. Regardless of method of application, Dimension at 0.14 to 0.28 kg/ha (0.12 to 0.25 lb/A) and MSMA at 2.2 kg/ha (2.0 lb/A) effectively controlled large crabgrass throughout the summer and the control was consistently higher both years than when either herbicide was applied alone.

When Dimension was applied as early postemergence at 0.28 kg/ha (0.25 lb/A), the control was effective through mid-July 1995 (84%), but not in 1996 (≤73%) (Table 1). The control with MSMA alone was 82% by late August 1996, but only 10% at the same time in 1995.

These results show that Dimension and MSMA applied in early spring will effectively control large crabgrass in common bermudagrass. The control during the summer may be related to rate of Dimension when applied with MSMA. In the present study, large crabgrass control by late August ranged from 73 to 91% when rate for Dimension was 0.14 kg/ha (0.12 lb/A) compared to 82 to 96% when rate was 0.28 kg/ha (0.25 lb/A). When utilizing these herbicides, the turf manager can maintain optimum large crabgrass control in bermudagrass throughout the spring and summer with a single application.

Turfgrass injury. The injury to common bermudagrass was related to MSMA and not due to Dimension. MSMA applied alone or tank-mixed with Dimension in early May in both years caused only slight injury to common bermudagrass at one week after treatment (Table 2). However, when MSMA was applied in early June to plots previously treated with Dimension, the injury ranged from 29 to 42% in 1995 and 11 to 25% in 1996. The higher injury in June 1995 was related to temperature. The mean high air temperature for one week after treatment in June was 32C (90F) in 1995 compared to 28C (82F) during the same period in 1996. However, regardless of treatment date, the injury from MSMA was temporary and the turf recovered within 2 to 3 weeks (data not shown).

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Tank-Mixed Postemergence Herbicides for Postemergence Goosegrass Control in Bermudagrass Turf[1]

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Abstract

Goosegrass [*Eleusine indica* (L.) Gaertn.] continues to be a major weed problem in bermudagrass (*Cynodon spp.*) throughout the southern United States. A field experiment was conducted during 1995 and 1996 in Georgia to determine if tank-mixed postemergence herbicides would improve goosegrass control in common bermudagrass [*Cynodon dactylon* (L.) Pers.] turf. Illoxan (diclofop), MSMA plus Sencor (metribuzin), MSMA plus Sencor with Princep (simazine), and selected rates of Illoxan with Princep controlled goosegrass effectively (≥83%) for 8 weeks in 1995. However, the control was ineffective (<80%) for any treatment by 8 weeks in 1996. The higher control in 1995 was probably related to higher air temperature [mean high temperature was 35C (95F) for 14 days after treatment] compared to 1996 [32C (89F) during the same period]. Tank-mixes of Princep with MSMA did not improve goosegrass control compared with Illoxan alone. Addition of Princep to MSMA, MSMA plus Sencor, or Illoxan did not increase bermudagrass injury compared to these treatments applied without Princep.

Index words: *Cynodon dactylon*, postemergence, turfgrass injury, weed control.

Herbicides used in this study: Illoxan (diclofop), (±)-2[4-(2.4-dichlorophenoxy)phenoxy] propanoic acid, MSMA, monosodium methanearsonate, Princep (simazine), 6-chlor-*N*,*N*-diethyl-1,3,5-triazine-2,4-diamine, and Sencor (metribuzin), 4-amino-6(1,1-dimethylethyl)-3-methylthio)-1,2,4-triazin-5(4*H*)-one.]

Significance to the Nursery Industry

Tank-mixes of Princep (simazine) with MSMA did not improve goosegrass control in bermudagrass compared with Illoxan (diclofop) alone in a single application. The control at 8 weeks with Illoxan at 1.1 kg/ha (1.0 lb/A) was 83% in 1995, but only 48% in 1996. These treatments cannot be applied to cool-season grasses because of severe injury.

Introduction

Goosegrass continues to be a major weed problem in turfgrasses throughout the southeastern United States. When weeds are not controlled, turfgrass quality is reduced whether the grass is grown on golf courses, athletic fields, home lawns, industrial parks, or other turf areas. However, goosegrass can be controlled with timely use of preemergence (5, 6, 7) and postemergence (8, 9, 12) herbicides. Postemergence herbicides are used in areas not previously treated, or when the preemergence herbicides do not provide full season control.

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