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Abstract

A comparison of terbuthylazine and atrazine rates alone and in combination with other herbicides in corn was conducted. All herbicides controlled Russian thistle and common sunflower by 90% or more. Preemergence control of green foxtail required a tank mixture of mesotrione (Stalwart C, Stalwart 3W, SA-0070128, and SA-0070129) with terbuthylazine or atrazine to be effective. Both terbuthylazine and atrazine alone provided similar kochia control, but control tended to increase with the addition of mesotrione. Palmer amaranth control was similar among terbuthylazine rates early in the season, but increased as atrazine rate increased. Crabgrass control increased as terbuthylazine rate increased early in the season and with both terbuthylazine and atrazine rates later in the year. Despite differences in weed control, no differences occurred among herbicides for corn yield.

Keywords

residual weed control, triazine

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Comparisons of Terbuthylazine and Atrazine Rates and Tank Mixtures in Irrigated Corn

R.S. Currie and P.W. Geier

Summary

A comparison of terbuthylazine and atrazine rates alone and in combination with other herbicides in corn was conducted. All herbicides controlled Russian thistle and common sunflower by 90% or more. Preemergence control of green foxtail required a tank mixture of mesotrione (Stalwart C, Stalwart 3W, SA-0070128, and SA-0070129) with terbuthylazine or atrazine to be effective. Both terbuthylazine and atrazine alone provided similar kochia control, but control tended to increase with the addition of mesotrione. Palmer amaranth control was similar among terbuthylazine rates early in the season, but increased as atrazine rate increased. Crabgrass control increased as terbuthylazine rate increased early in the season and with both terbuthylazine and atrazine rates later in the year. Despite differences in weed control, no differences occurred among herbicides for corn yield.

Introduction

Terbuthylazine is a triazine herbicide, similar to atrazine, which controls susceptible weeds by inhibiting photosynthesis. It has become a widely used herbicide in countries that restrict atrazine use, such as those in the European Union. Terbuthylazine is currently not marketed in the United States as an agricultural herbicide, but may have utility in corn and sorghum growing regions. The objective of this study was to compare terbuthylazine and atrazine rates alone and in combination with other herbicides in corn.

Experimental Procedures

An experiment conducted at the Kansas State University Southwest Research-Extension Center near Garden City, KS, compared terbuthylazine and atrazine rates applied preemergence for weed control in corn. Herbicides were applied using a tractor-mounted, compressed CO_2 sprayer delivering 19.4 GPA at 4.1 mph and 30 psi. All preemergence (PRE) herbicides were followed by glyphosate at 22 oz/a plus ammonium sulfate at 1.0% late postemergence (POST). Application, environmental, weeds, and crop information is given in Table 1. Natural weed populations were supplemented by overseeding the experimental area with domesticated sunflower (to simulate common sunflower) and domesticated crabgrass (to simulate large crabgrass). Plots were 10 × 35 feet and arranged in a randomized complete block design replicated four times. Soil was a Beeler silt loam with 2.4% organic matter and pH of 7.6. Residual weed con-

trol of the preemergence treatments was visually estimated on June 13, 2018, which was 40 days after the preemergence applications (40 DA-A). Late season weed control following the postemergence treatments was determined on August 13, 2018, 56 days after the glyphosate application (56 DA-B). Yields were determined on October 4, 2018, by mechanically harvesting the center two rows of each plot and adjusting weights to 15.5% moisture.

Results and Discussion

No differences between herbicides occurred for Russian thistle control (90% or more) and common sunflower (93% or more) regardless of rating date (data not shown). Only the treatments containing mesotrione controlled green foxtail more than 88% at 40 DA-A, but foxtail control exceeded 97% regardless of treatment by 56 DA-B (data not shown). Kochia control at 40 DA-A exceeded 90% with all herbicides except terbuthylazine at 22 oz/a and atrazine at 16 oz/a (Table 2). By 56 DA-B, terbuthylazine alone at 15.5, 23, 31 oz/a and atrazine at any rate alone provided less kochia control than treatments with the best kochia control (100%). Terbuthylazine at 15.5 oz/a alone and atrazine at 24 oz/a alone controlled Palmer amaranth 83–85% at 40 DA-A. However, only plots receiving atrazine alone at 16 or 32 oz/a PRE provided less than 90% Palmer amaranth control at 56 DA-B. Crabgrass control at 40 DA-A was 85% or less with terbuthylazine at 15.5, 23, and 31 oz/a and atrazine at any rate alone PRE, and crabgrass control remained less than 85% for these treatments at 56 DA-B. Differences among herbicides in weed control did not translate into grain yield differences in this study. Herbicide-treated plots yielded 160–171 bu/a, and did not differ from the nontreated plots (148 bu/a) (data not shown).

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Table 1. Application information

Application timing	Preemergence	Postemergence
Application date	May 4, 2018	June 18, 2018
Air temperature (°F)	54	77
Relative humidity (%)	59	58
Soil temperature (°F)	53	72
Wind speed (mph)	4 to 6	6 to 9
Wind direction	West	West-southwest
Soil moisture	Good	Good
Corn		
Height (inch)	---	18 to 24
Leaves (number)	0	5 to 7
Palmer amaranth		
Height (inch)	---	6 to 9
Density (plants/10 feet^2)	0	0.5
Kochia		
Height (inch)	---	3 to 9
Density (plants/10 feet^2)	0	0.3
Russian thistle		
Height (inch)	---	4 to 10
Density (plants/10 feet^2)	0	0.3
Common sunflower		
Height (inch)	---	3 to 6
Density (plants/10 feet^2)	0	0.1
Green foxtail		
Height (inch)	---	2 to 6
Density (plants/10 feet^2)	0	0.3
Crabgrass		
Height (inch)	---	2 to 4
Density (plants/10 feet^2)	0	0.2

Table 2. Terbuthylazine comparisons in corn

			Kochia		Palmer amaranth		Crabgrass	
Treatment[a]	Rate	Timing[b]	40 DA-A[c]	56 DA-B[d]	40 DA-A	56 DA-B	40 DA-A	56 DA-B
	per acre		% Visual					
Terbuthylazine	15.5 oz	PRE	91	83	83	90	80	73
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Terbuthylazine	23 oz	PRE	90	86	95	90	85	78
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Terbuthylazine	31 oz	PRE	94	88	95	95	83	80
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Terbuthylazine	46 oz	PRE	93	93	90	95	93	83
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Terbuthylazine	23 oz	PRE	99	95	99	100	99	89
Stalwart C	27 oz	PRE						
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Atrazine	16 oz	PRE	85	83	88	83	86	70
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Atrazine	24 oz	PRE	93	83	85	94	85	80
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Atrazine	32 oz	PRE	98	88	93	85	80	78
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Atrazine	48 oz	PRE	97	90	100	97	79	80
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Atrazine	24 oz	PRE	96	92	100	100	97	88
Stalwart C	27 oz	PRE						
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
Stalwart 3W	3.0 qt	PRE	100	99	100	98	100	94
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
SA-0070128	3.0 qt	PRE	100	100	100	94	99	91
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
SA-0070129	3.0 qt	PRE	100	100	100	96	99	94
Glyphosate	22 oz	POST						
AMS	1.0%	POST						
LSD (0.05)			9	9	12	10	11	7

[a]AMS = ammonium sulfate.
[b]PRE = preemergence. POST = postemergence.
[c]DA-A = days after the preemergence applications
[d]DA-B = days after the postemergence applications.

Figure 1. Untreated control.

Figure 2. Terbuthylazine 15.5 oz/a applied preemergence, picture taken 40 days after preemergence application.

Figure 3. Terbuthylazine 46 oz/a applied preemergence, picture taken 40 days after preemergence application.

Figure 4. Atrazine 16 oz/a applied preemergence, picture taken 40 days after preemergence application.

Figure 5. Atrazine 48 oz/a applied preemergence, picture taken 40 days after preemergence application.