Response of Subterranean and Berseem Clovers to Postemergence Herbicides

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Summary

Seven herbicides were applied postemergence to Clare subterranean and Bigbee berseem clovers 48 days after planting. Treatments were 2,4- D amine 0.75 and 1.50 lbs a.i./A, Butyrac 1.0 and 2.0 lbs a.i./A, Basagran 0.75 and 1.50 lbs a.i./A, Kerb 1.50 and 3.0 lbs a.i./A, Rhonox 0.50 and 1.0 lbs a.i./A, Pursuit 0.06 lbs a.i./A and Tough 0.9 lbs a.i./A. Pursuit and the high rates of 2,4-D amine, Basagran, and Kerb reduced subterranean clover yields only at the first harvest. There was no yield reduction for the second harvest or in total production due to herbicide treatments. Bigbee berseem clover was more sensitive to herbicides than Clare subterranean clover. Early season forage production was reduced by all treatments except Tough and the low rate of Basagran and Kerb. The high rates of 2,4-D, Basagran and Rhonox significantly reduced total forage yields.

Introduction

Clovers are mainly used in mixtures with grasses for grazing livestock. Producer concern about weed problems in clover-grass pastures usually does not occur until the weeds have emerged and compete for moisture, nutrients, and light. However, most of the postemergence herbicides cleared for use on pastures and rangeland are toxic to clovers (Smith 1975; Conrad and Stritzke 1980; Smith 1986). Kerb (Pronamide), Rhonox (MCPA), and Butyrac (2,4-DB) are postemergence herbicides cleared for use on forage legumes. However, they have not been fully evaluated on new cool season annual clovers. Studies by Evers (1983) indicate that other herbicides cleared for soybeans and peanuts could also be used on clover.

Bigbee berseem (*Trifolium alexandrinum* L.) clover was released in 1985. It is being used primarily on black alkaline soils and riverbottoms in the eastern half of Texas. Little is known about berseem clover's tolerance to herbicides cleared for forage legumes. Herbicide research was begun at the Yoakum Agricultural Research Station in 1986 on new annual clovers (Grichar et al. 1987). Postemergence herbicides evaluated include those cleared for forage legumes and some not cleared that have shown potential in other studies.

Procedure

The test site was a Mabank fine sandy loam with a soil pH 7.8 which was fertilized with 70 lbs of phosphorus per acre before planting. Bigbee berseem and Clare subterranean (*Trifolium subterraneum* L.) clovers were seeded at 12 lbs of seed per acre on October 21, 1987 into a prepared seedbed using a John Deere grain drill equipped with a Tye seedbox for small seed. Soil moisture at planting was fair with 0.32 and 0.45 inches of rain recorded on October 24 and 25, respectively. The next rainfall was 1.88 inches on November 9.

Two rates of 2,4-D amine, Butyrac, Basagran (bentazon), Kerb (pronamide), and Rhonox and one rate of Pursuit (imazethapyr) and Tough (pyridate) were applied on December 16, 48 days after planting. A small plot, compressed air, bicycle sprayer equipped with three SS 11002 nozzles was used to apply the herbicides in 20 gallons of water per acre at 24 psi pressure. Soil moisture at time of application was good. Henbit (*Lamium amplexicaule* L.) was 0.5 to 2 inches tall when herbicides were applied. Experimental design was a randomized complete block, replicated three times with a plot size of 6.3 x 26 ft. Phytotoxic effects to the clover and henbit were rated on January 22 and February 26, 37, and 72 days after treatment (DAT), respectively. Plots were harvested with a flail mower on March 1, April 7, and May 20. Two 1-ft square subsamples were taken from each plot immediately before harvest and hand separated to determine percent clover.

Results and Discussion

The amount of subterranean clover injury from the herbicides was very low (Table 1). There was a slight increase in percent injury for all treatments from the 37 to 72 DAT. Applying the herbicides in early winter may have reduced the phytotoxic effects to the clover. Rhonox at 1 lb/A and 2,4-D at 1.5 lbs/A were the only treatments that caused significant injury at 72 DAT. Butyrac did cause clover leaf deformation. Henbit control ranged from 59 to 100 percent. Rhonox, Pursuit, Tough, and the high rates of Basagran and Kerb provided the best henbit control. Pursuit, and the high rate of 2,4-D amine, Basagran and Kerb significantly reduced subterranean clover yields at the first harvest (Table 2). There was no yield difference between any herbicide treatment at the second harvest or for total yield.

Bigbee berseem clover was more sensitive than Clare subterranean clover to the various postemergence herbicides (Table 3). Rhonox, 2,4-D and Butyrac caused significant injury at the 37 and 72 DAT rating. Tough and the high rate of Kerb resulted in injury at 72 DAT. Henbit control ranged from 63 to 100 percent. Basagran, Pursuit, and the low rate of Kerb caused only slight clover injury. Tough and the low rates of Basagran and Kerb were the only treatments which did not cause a significant yield reduction from the control at the first harvest (Table 4). First harvest yields were reduced by 50 percent or more when going from the low to high rate

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for the five herbicides where two rates were used. Only the high rate of 2,4-D significantly reduced yields at the second harvest and there were no differences at the third harvest. Only the high rate of 2,4-D and Rhonox significantly reduced total berseem clover yields for the season.

None of the herbicide treatments tested killed either Clare subterranean or Bigbee berseem clovers. However, there were significant clover yield reductions during the first part of the growing season for some treatments. If herbicides had been applied during more favorable climatic conditions for clover growth (late fall or early spring), the phytotoxic effects might have been greater. If the weed infestation is severe enough, any of the herbicide treatments would improve clover yield. Only Butyrac, Kerb, and Rhonox are approved by the EPA for use on forage legumes. The herbicide 2,4-D amine is approved for pastures so it could be used in clover-grass pastures. Butyrac, 2,4-D amine, Basagran, Rhonox, and Tough control broadleaf weeds while Kerb and Pursuit control broadleaf and grassy weeds.

Literature Cited

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TABLE 1. VISUAL RATINGS OF PHYTOTOXIC EFFECTS TO CLARE SUBTERRANEAN CLOVER AND HENBIT

Treatment	Rate lbs a.I./A	Percent injury or control			
		37 DAT		72 DAT	
		Clover	Henbit	Clover	Henbit
Check	--	0 c[1]	0 g	0 b	0 g
2,4-D Amine	0.75	2 c	57 f	3 b	77 bcdef
2,4-D Amine	1.50	17 a	67 def	30 a	60 f
Butyrac 200	1.0	0 c	70 def	7 ab	72 def
Butyrac 200	2.0	2 bc	63 ef	3 b	67 ef
Basagran 4E+CO[2]	0.75	2 bc	75 cde	15 ab	73 cdef
Basagran 4E+CO	1.50	0 c	82 bcd	8 ab	83 abcde
Kerb 50W	1.50	5 abc	83 abcd	12 ab	75 cdef
Kerb 50W	3.00	5 abc	77 cde	17 ab	88 abcd
Rhonox	0.50	5 abc	95 ab	20 ab	91 abc
Rhonox	1.00	8 abc	79 bcde	30 a	90 abc
Pursuit 2 AS	0.06	13 ab	90 abc	22 ab	93 ab
Tough	0.90	2 bc	100 a	8 ab	96 a

[1]Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
[2]CO=crop oil (Agridex at 1 qt/A).

TABLE 2. RESPONSE OF CLARE SUBTERRANEAN CLOVER TO POSTEMERGENCE HERBICIDES

Treatment	Rate lbs a.i./A	Yield		
		3/1/88	4/7/88	Total
		Clover	Clover	Clover
		pounds of dry weight per acre		
Check	--	836 ab[1]	946 a	1,782 a
2,4-D Amine	0.75	511 abc	1,078 a	1,589 a
2,4-D Amine	1.50	345 c	1,099 a	1,446 a
Butyrac 200	1.00	522 abc	1,178 a	1,700 a
Butyrac 200	2.00	861 a	1,151 a	2,012 a
Basagran 4E+CO[2]	0.75	581 abc	1,186 a	1,773 a
Basagran 4E+CO	1.50	341 c	1,259 a	1,600 a
Kerb 50W	1.50	405 bc	1,291 a	1,696 a
Kerb 50W	3.00	383 c	1,256 a	1,639 a
Rhonox	0.50	459 abc	1,256 a	1,715 a
Rhonox	1.00	543 abc	1,095 a	1,637 a
Pursuit 2 AS	0.06	308 c	1,107 a	1,415 a
Tough	0.90	456 abc	1,239 a	1,695 a

[1]Means within a column followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
[2]Crop oil at 1 qt/A.

TABLE 3. VISUAL RATINGS OF PHYTOTOXIC EFFECTS TO BIGBEE BERSEEM CLOVER AND HENBIT

Treatment	Rate lbs a.i./A	Percent injury or control			
		37 DAT		72 DAT	
		Clover	Henbit	Clover	Henbit
Check	--	0 f[1]	0 d	0 d	0 g
2,4-D Amine	0.75	33 bc	73 bc	45 b	70 ef
2,4-D Amine	1.50	87 a	67 c	83 a	63 f
Butyrac 200	1.0	30 bcd	77 bc	43 b	82 bcd
Butyrac 200	2.00	28 bcde	80 bc	57 b	70 ef
Basagran 4E+CO[2]	0.75	3 ef	75 bc	10 cd	73 def
Basagran 4E+CO	1.50	13 cdef	85 abc	13 cd	78 cde
Kerb 50W	1.50	0 f	88 ab	0 d	92 ab
Kerb 50W	3.00	5 def	85 abc	18 c	87 bc
Rhonox	0.50	40 b	91 ab	45 b	85 bc
Rhonox	1.00	87 a	100 a	85 a	92 ab
Pursuit 2 AS	0.06	2 f	88 ab	7 cd	98 a
Tough	0.90	13 cdef	100 a	17 c	99 a

[1]Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
[2]CO=crop oil (Agridex at 1 qt/A).

TABLE 4. RESPONSE OF BIGBEE BERSEEM CLOVER TO POSTEMERGENCE HERBICIDES

Treatment	Rate lbs a.i./A	Clover Yield			
		3/1/88	4/7/88	5/20/88	Total
		pounds of dry weight per acre			
Check	--	1,333 a[1]	2,189 ab	2,262 a	5,784 a
2,4-D Amine	0.75	434 cde	2,043 ab	2,749 a	5,226 ab
2,4-D Amine	1.50	76 e	1,297 c	2,558 a	3,931 c
Butyrac 200	1.0	801 bc	2,300 ab	2,663 a	5,764 a
Butyrac 200	2.0	426 cde	2,230 ab	2,489 a	5,145 ab
Basagran 4E+CO[2]	0.75	1,005 ab	2,197 ab	2,485 a	5,687 a
Basagran 4E+CO	1.50	527 cd	2,191 ab	2,507 a	5,225 b
Kerb 50W	1.50	1,321 a	2,277 ab	2,446 a	6,044 a
Kerb 50W	3.00	797 bc	2,390 a	2,578 a	5,765 a
Rhonox	0.50	395 cde	2,181 ab	2,515 a	5,091 ab
Rhonox	1.00	132 de	1,831 b	2,476 a	4,439 bc
Pursuit 2 AS	0.06	785 bc	2,169 ab	2,409 a	5,363 ab
Tough	0.90	1,017 ab	2,403 a	2,246 a	5,666 a

[1]Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
[2]Crop oil (1 qt/A).