

Herbicide Residue Damage to Sod-Seeded Clovers

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Summary

Herbicide formulations containing picloram and dicamba were evaluated for residue effects on sod-seeded clovers. Picloram + 2,4-D and dicamba + 2,4-D were applied to bermudagrass sod at 1, 2, and 4 pints/A in June, July, August, and September prior to clover planting in October. No permanent damage was noted on any clover tested due to dicamba residue. Picloram, at low rates, applied at least 90 days before clover planting, caused little permanent damage to arrowleaf, crimson, or white clover. Damage and stand reduction of subterranean clover by picloram residue increased with rate and later application dates.

Introduction

Both chemical weed control and sod-seeding with cool-season legumes on warm season perennial grass sods are sound management techniques. Using both techniques in combination is often difficult because forage legumes are often susceptible to herbicides used for summer weed control in grass sods. The objective of this research was to determine optimum application dates and rates of picloram + 2,4-D (1:4) and dicamba + 2,4-D (1:3) applied to bermudagrass sod for establishment and production of sod-seeded clovers.

KEYWORDS: Picloram/dicamba/application rates/application dates/residue damage/clovers.

Procedure

This experiment was conducted on a Sawtown fine sandy loam soil at Overton. Picloram + 2,4-D (1:4) was applied at 0.31, 0.62, and 1.25 lb a.i./A and dicamba + 2,4-D (1:3) was applied at 0.5, 1.0, and 2.0 lb a.i./A, equivalent to 1, 2, and 4 pints/A of each herbicide formulation. The herbicide treatments were applied to 'Coastal' bermudagrass sod 120, 90, 60, and 30 days prior to clover planting on October 12, 1984. Clovers planted were 'Yuchi' arrowleaf, 'Chief' crimson, 'Mt. Barker' subterranean (sub), and 'La. S-1' white clover. Clover seeding rates and inoculants used are summarized in Table 1. A small plot drill was used to sod-seed the clover at a one-half inch depth. Soil pH (0-6 inches) was 4.7, and 2.0 T lime/A was applied in August. Prior to planting, the bermudagrass was mowed to 2 inches, and 470 lb 0-20-20/A was applied.

Stand and damage notes were taken 14, 50, and 170 days after planting.

TABLE 1. CLOVER SEEDING RATES AND RHIZOBIUM INOCULANTS

Clover	Seeding Rate lbs/A	Inoculant Type ¹
Arrowleaf	14.2	O
Crimson	19.6	R
Subterranean	19.6	WR
White	3.5	B

¹Supplied by the Nitragin Co., Milwaukee, WI. Inoculant was applied at the rate of 1 oz per pound of seed with Pelgel solution used as an adhesive.

Results and Discussion

Each clover species responded differently to the herbicide-rate-application date treatments, but several general trends can be noted. Picloram caused more damage and stand reduction than dicamba, but early application of low rates of picloram resulted in only minor damage to arrowleaf and white clover. Rate effects were clear, with higher rates causing more damage and stand reduction. Herbicide application date effects were confounded by rainfall. Heavy rain (>2.0 inches) within 10 days after the 90-day application date reduced damage and stand loss relative to the 120-day date. Lack of rain following the 60-day application date seemed to intensify the herbicide effects, particularly picloram. The arrowleaf, crimson, and white clover data were very similar. Therefore, only arrowleaf and sub clover data are presented. Rainfall data are shown in Figure 1.

Arrowleaf, crimson, and white clover

No stand reduction or appreciable damage was noted on arrowleaf, crimson, or white clover due to dicamba residue. All plots had full stands 14 days after planting, but picloram damage on these clovers was evident, and ranged from minor to severe depending on interaction of date and rate (Table 2). Fifty days after planting, picloram damage was still evident for the later application dates

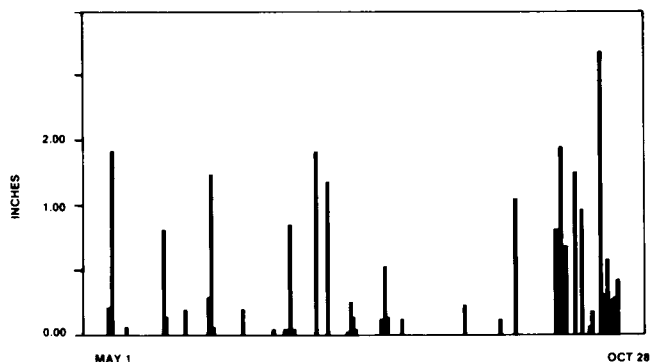


Figure 1. Daily rainfall for May to October, 1985. (* = herbicide application, # = clover planting date)

and highly dependent on rate. Stand losses ranged from 0 to 80 percent for the picloram treatments (Table 4). These clovers did not recover from the most severe picloram damage. Stand losses as great as 70 percent for arrowleaf and 95 percent for white clover were evident at 170 days after planting (Table 6). Picloram + 2,4-D (1:4) at rates as high as 0.61 lb a.i./A caused little permanent damage or stand loss to arrowleaf, crimson, or white clover when applied to sod at least 90 days before clover planting.

Subterranean clover

Damage to subterranean (sub) clover was noted for both herbicides at 14 days after planting, with the picloram damage much more severe (Table 3). No stand reductions were observed for dicamba or picloram at day 14, but by 50 days post-planting, significant stand reductions were noted for picloram at all rates applied 60 and 30 days before planting and at the high rate applied 120 days before planting (Table 5). Picloram damage to sub clover observed at 50 days post-planting was permanent, resulting in major stand losses recorded at day 170 (Table 7).

Under the conditions of this experiment, sub clover was sensitive to residue of both dicamba and picloram. However, dicamba + 2,4-D (1:3) applied as late as 30 days before planting at rates as high as 2.0 lb a.i./A resulted in no permanent damage or stand reduction of sub clover. Damage and stand reduction of sub clover by picloram + 2,4-D (1:4) increased as the rate increased and when applied later in the summer. Low rates of picloram applied early caused much less damage and stand loss. Also, weather patterns immediately following picloram application determined the relative residue effect on sub clover.

TABLE 2. STAND AND DAMAGE TO ARROWLEAF CLOVER AT 14 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	0.2	100	0.0	100	0.0	100	0.2	98
	1.0	1.0	96	0.0	100	0.2	93	0.5	95
	2.0	0.7	90	0.2	100	2.0	93	0.5	95
Picloram + 2,4-D (1:4)	0.3	2.0	100	1.0	98	6.5	93	6.2	100
	0.6	3.7	96	2.7	96	7.0	97	7.7	97
	1.2	7.5	100	5.0	100	8.7	90	8.7	85

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.

TABLE 3. STAND AND DAMAGE TO SUBTERRANEAN CLOVER 14 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	1.2	100	2.5	100	1.2	100	1.2	100
	1.0	1.5	100	1.7	100	1.2	100	1.2	100
	2.0	1.2	100	1.0	100	4.5	100	1.2	100
Picloram + 2,4-D (1:4)	0.3	5.2	100	3.0	77	8.5	100	8.5	100
	0.6	7.7	100	7.7	100	8.7	100	8.5	100
	1.2	8.7	100	7.2	100	9.7	95	8.5	97

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.

TABLE 4. STAND AND DAMAGE TO ARROWLEAF CLOVER 50 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	0.0	100	0.0	97	0.0	95	0.0	93
	1.0	0.0	96	0.0	95	0.2	98	0.0	96
	2.0	0.0	97	0.2	93	0.5	95	0.0	92
Picloram + 2,4-D (1:4)	0.3	0.0	98	0.0	98	3.0	82	1.7	87
	0.6	0.5	90	1.0	87	5.7	47	3.5	76
	1.2	3.5	82	1.0	98	8.0	22	7.5	35

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.

TABLE 5. STAND AND DAMAGE TO SUBTERRANEAN CLOVER 50 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	0.7	97	0.7	96	0.7	98	0.5	94
	1.0	0.5	95	0.5	98	0.5	97	0.5	100
	2.0	0.2	96	0.7	98	2.2	93	0.5	93
Picloram + 2,4-D (1:4)	0.3	2.0	97	0.5	96	7.2	66	5.7	71
	0.6	2.7	95	3.7	87	9.0	6	7.2	37
	1.2	8.5	53	2.7	97	9.0	2	9.0	8

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.

TABLE 6. STAND AND DAMAGE TO ARROWLEAF CLOVER 170 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	0.0	93	0.0	97	0.0	97	0.0	97
	1.0	0.0	95	0.2	97	0.0	97	0.0	97
	2.0	0.0	98	0.0	100	0.0	94	0.0	95
Picloram + 2,4-D (1:4)	0.3	0.2	100	0.0	97	1.5	91	0.5	96
	0.6	1.2	95	1.0	97	4.5	87	1.0	93
	1.2	2.5	96	0.5	100	7.7	32	5.7	58

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.

TABLE 7. STAND AND DAMAGE TO SUBTERRANEAN CLOVER 170 DAYS AFTER PLANTING INTO HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand	Damage	Stand	Damage	Stand	Damage	Stand
	lb a.i./A		%		%		%		%
Dicamba + 2,4-D (1:3)	0.5	0.0	94	0.0	100	0.0	95	0.0	97
	1.0	0.0	96	0.0	95	0.0	98	0.0	98
	2.0	0.0	100	0.0	97	0.5	97	0.0	98
Picloram + 2,4-D (1:4)	0.3	2.0	90	0.0	100	4.2	65	1.0	92
	0.6	3.0	82	1.2	92	9.0	2	4.2	52
	1.2	7.5	13	1.5	91	9.0	1	9.0	5

¹Damage rating: 0=no damage observed, 9=plants severely stunted, almost dead.