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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/acre 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.

OBJECTIVE

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.

PROCEDURE

This experiment was conducted on a Sawtown fine sandy loam soil at Overton, Texas. Picloram + 2,4-D (1:4) was applied at 0.31, 0.62, and 1.25 lbs a.i./acre and dicamba + 2,4-D (1:3) was applied at 0.5, 1.0, and 2.0 lbs a.i./acre, equivalent to 1, 2, and 4 pints/acre 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/ac was applied in August. Prior to planting, the bermudagrass was mowed to two inches, and 470 lbs 0-20-20/ac was applied.

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

RESULTS

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 ten 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 fourteen 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 and highly dependent on rate. Stand losses ranged from 0 to 80% for the picloram treatments (Table 4). These clovers did not recover from the most severe picloram damage. Stand losses as great as 70% for arrowleaf and 95% 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 lbs a.i./acre 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./acre 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 1. CLOVER SEEDING RATES AND RHIZOBIUM INOCULANTS

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

¹ Supplied 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.

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

Herbicide	Rate lbs a.i./ac	Days to clover planting at herbicide application									
		120		90		60		30			
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %		
Dicamba + 2,4-D (1:3)	0.5	0.2	100	0.0	100	0.0	100	0.0	100	0.2	98
	1.0	1.0	96	0.0	100	0.2	93	0.2	93	0.5	95
	2.0	0.7	90	0.2	100	2.0	93	0.5	93	0.5	95
Picloram + 2,4-D (1:4)	0.3	2.0	100	1.0	98	6.5	93	6.2	93	6.2	100
	0.6	3.7	96	2.7	96	7.0	97	7.7	97	7.7	97
	1.2	7.5	100	5.0	100	8.7	90	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 lbs a.i./ac	Days to clover planting at herbicide application									
		120		90		60		30			
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %		
Dicamba + 2,4-D (1:3)	0.5	1.2	100	2.5	100	1.2	100	1.2	100	1.2	100
	1.0	1.5	100	1.7	100	1.2	100	1.2	100	1.2	100
	2.0	1.2	100	1.0	100	4.5	100	1.2	100	1.2	100
Picloram + 2,4-D (1:4)	0.3	5.2	100	3.0	77	8.5	100	8.5	100	8.5	100
	0.6	7.7	100	7.7	100	8.7	100	8.5	100	8.5	100
	1.2	8.7	100	7.2	100	9.7	95	8.5	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 IN HERBICIDE TREATED BERMUDAGRASS SOD

Herbicide	Rate lbs a.i./ac	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %
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 lbs a.i./ac	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %
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 lbs a.i./ac	Days to clover planting at herbicide application									
		120		90		60		30			
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %		
Dicamba + 2,4-D (1:3)	0.5	0.0	93	0.0	97	0.0	97	0.0	97	0.0	97
	1.0	0.0	95	0.2	97	0.0	97	0.0	97	0.0	97
	2.0	0.0	98	0.0	100	0.0	94	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 lbs a.i./ac	Days to clover planting at herbicide application							
		120		90		60		30	
		Damage ¹	Stand %	Damage	Stand %	Damage	Stand %	Damage	Stand %
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

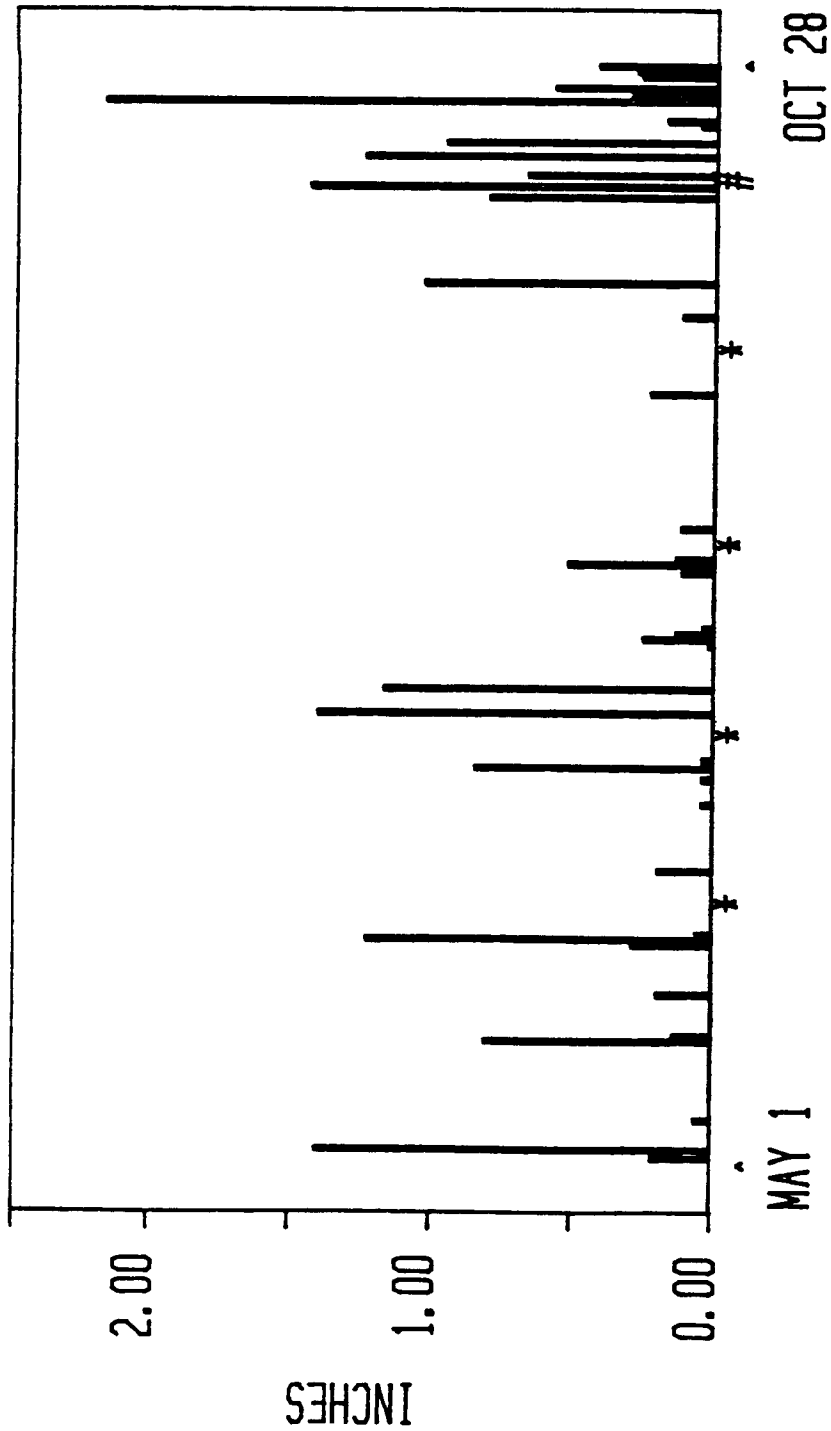


Figure 1. Daily rainfall for May-October, 1985. (* = herbicide application, # = clover planting date)