PUBLICATIONS
1992

Forage Research in Texas, 1992

Response of Clovers to Postemergence Herbicides

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Summary

Five herbicides were applied postemergence to 'Hubam' sweetclover (*Melilotus alba* Medik), 'Dixie Crimson' clover (*Trifolium incarnatum* L.), 'Kenland Red' clover (*Trifolium pratense* L.), and 'Koala' subclover (*Trifolium brachycalycinum* Katzn. and Morley). Treatments were 2,4-D amine 0.75 and 1.50 lb active ingredient (ai)/A, Butyrac 200 (2,4-DB) 1.0 and 2.0 lb ai/A, Basagran (bentazon) 0.75 and 1.50 lb ai/A, Kerb (pronamide) 1.50 and 3.0 lb ai/A, and Rhonox 2E (MCPA) 0.50 and 1.0 lb ai/A. Hubam sweetclover was killed by 2,4-D amine, Butyrac, and Rhonox, but yields were not reduced with Basagran and Kerb although some initial injury occurred. Crimson clover was killed by 2,4-D, suffered moderate injury from Butyrac and Rhonox, and had essentially no injury from Basagran and Kerb. Red clover was severally injured by 2,4-D amine but showed slight to no yield reductions from the other herbicides. Koala subclover was the most tolerant legume, having only temporary injury from the high rate of 2,4-D amine.

Introduction

Clovers are used mainly in mixtures with grasses for livestock grazing. Producer concern about weed problems in clover-grass pastures often does not occur until the weeds have emerged and compete for moisture, nutrients, and light. However, most of the postemergence herbicides cleared for used on pastures and rangeland are toxic to clovers (Smith, 1975; Conrad and Stritzke, 1980; Smith, 1986; Grichar et al., 1991). Kerb (Pronanide) and Butyrac (2,4-DB) are postemergence broadleaf herbicides cleared for use on forage legumes. However, they have not been fully evaluated on cool-season annual clovers. Studies by Evers (1983) and Grichar et al. (1991) indicate that other herbicides cleared for soybeans and peanuts could also be used on clover without being phytotoxic to the clover.

Keywords: weed control / broadleaf herbicides / pastures.

Hubam sweetclover, a white-flowered annual, is best suited in a pasture mixture or for soil improvement on loam or clay alkaline soils. Dixie Crimson clover is one of the most widely adapted of all the clover species grown in the southeastern United States. It is grown on soil types ranging from sands to well-drained clay soils with pH from 5.5 to 7.8. Kenland red clover is well adapted to well-drained clay and clay loam soils with a pH of 6.5 or higher. Red clover is not as tolerant of close, continuous grazing as are some of the other clovers. Koala subclover is best adapted to soils ranging from a fine sandy loam to a clay with a pH from 6.5 to 8. Koala is a large-seeded, cool-season clover; therefore, it emerges quickly and has excellent seedling vigor (Evers, 1992).

Procedure

Two rates of 2,4-D amine, Butyrac 200, Basagran 4E, Kerb 50W, and Rhonox 2E were evaluated postemergence for phytotoxicity to Hubam sweetclover, Dixie Crimson clover, Kenland red clover, and Koala subclover. Henbit (*Lamium amplexicaule* L.) and cutleaf evening primrose (*Oenothera laciniate* Hill.) were the dominant weed species on the test site. Control of these weed species were rated where weed populations were uniform enough to warrant adequate evaluations.

The test site was established October 12, 1990, on a Denhawken-Elmendorf clay loam soil having a pH of 7.8, fertilized with 69 lb/A of phosphorus before planting. Clovers were seeded into a prepared seedbed at the rate of 12 lb/A with a John Deere grain drill equipped with a Tye seedbox for small seed.

Herbicides were applied to Dixie Crimson and Hubam sweetclover when seedlings were 2 to 3 in. tall on December 10, 59 days after planting (DAP), whereas 1.5-in. Koala subclover received herbicide sprays on December 19 (68 DAP). Kenland red clover was not sprayed till February 11 (122 DAP) because of severe cold weather around December 20, which froze back the clover, and because of heavy rains during the middle of January, which prevented entry into the field. Kenland red clover seedlings at time of treatment were 3 to 4 in. tall.

A small-plot, compressed-air bicycle sprayer equipped with three SS11002 nozzles spaced 18 in. apart was used to apply the herbicides in 20 gallons of water per acre at 28-psi pressure. Soil moisture at time of application was adequate for vigorous weed and clover growth. Weed size at time of application ranged from 2 to 8 in. tall. Experimental design was a randomized complete block for each clover species, replicated four times and a plot size of 6 x 30 ft. However, because of poor stands, Koala subclover data were collected from only two repetitions. Two 16-in. quadrates were taken from each plot to determine yield. These samples were hand-separated before drying to determine the clover percentage. Immediately after quadrates were cut, plots were mowed with a flail mower.

Results and Discussion

Temperatures as low as 19 °F for 4 to 5 days after December 20 caused freeze damage to existing clover foliage and slow regrowth during January. Hubam sweetclover was very sensitive to 2,4-D, Butyrac, and Rhonox (Table 1). These herbicides caused 86 to 100% clover injury when rated 65 days after treatment (DAT). Basagran caused slight injury at the low rate and considerable injury at the high rate. Henbit control ranged from 60 to 90%. Clover yields were reduced more than 50% when the low rate of Rhonox was compared with the untreated check. By the second harvest, the clover plots treated with the low rate of Rhonox had not recovered from initial herbicide injury.

Dixie Crimson clover was killed by 2,4-D and was moderately sensitive to Butyrac and Rhonox (Table 2). First harvest yields were most reduced by the high rate of Butyrac and Rhonox. There were no yield differences among treatments at the second harvest except for 2,4-D. Henbit control in these plots ranged from 58 to 90%.

Kenland red clover injury 30 DAT was greater than 40% for all herbicides except Basagran and Kerb (Table 3). Injury exceeded 89% for 2,4-D. Clover injury with Butyrac and Rhonox was approximately 50% of that with 2,4-D. Butyrac and Rhonox resulted in a 23 to 54% reduction in yield from the untreated check at the first harvest. By the second harvest, the Butyrac and Rhonox plots had completely recovered. Cutleaf evening primrose control was best with 2,4-D, Butyrac, and Rhonox, while control with Basagran and Kerb was ≤ 60%.

Koala subclover showed significant injury with 2,4-D at 1.5 lb/A when rated 65 days after treatment (Table 4). Basagran at 1.5 lb/A resulted in 40% injury, while 2,4-DB and Rhonox produced 10 to 25% injury. Although no significant differences in yield were noted, first harvest yields were reduced by more than 35% when going from the low to high rate of 2,4-D, Basagran, or Kerb.

Table 1. 'Hubam' sweetclover response to postemergence herbicides and henbit control.

Treatment	Rate lb ai/A	Injury or control† 65 DAT‡ Clover	Henbit	Clover yield (mo.-day-year) 3/12/91	4/15/91	Total
		%		lb dry wt/A		
Check	——	0 d*	0 e	869 ab	1937 a	2806 a
2,4-D Amine	0.75	100 a	85 abc	0 c	0 b	0 b
2,4-D Amine	1.50	100 a	96 a	0 c	0 b	0 b
Butyrac 200	1.00	86 ab	60 d	0 c	0 b	0 b
Butyrac 200	2.00	98 a	90 ab	0 c	0 b	0 b
Basagran 4E + Agridex	0.75 +1 qt	23 c	81 abc	826 ab	1994 a	2821 a
Basagran 4E + Agridex	1.50 +1 qt	80 b	84 abc	742 abc	1498 a	2240 a
Kerb 50W	1.50	0 d	80 abcd	953 ab	1657 a	2610 a
Kerb 50W	3.00	5 d	74 bcd	1436 a	1777 a	3213 a
Rhonox 2E	0.50	87 ab	64 cd	368 bc	0 b	368 b
Rhonox 2E	1.00	100 a	70 bcd	0 c	0 b	0 b

*Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
†Index: 0 = no control or injury; 100 = complete control or injury.
‡DAT = days after herbicide treatment.

Table 2. 'Dixie Crimson' response to postemergence herbicides and henbit control.

Treatment	Rate lb ai/A	Injury or control† 65 DAT‡ Clover	Henbit	Clover yield (mo.-day-year) 3/12/91	4/15/91	Total
		%		lb dry wt/A		
Check	——	0 e*	0 c	2416 ab	3818 a	6234 a
2,4-D Amine	0.75	100 a	76 ab	0 d	0 b	0 b
2,4-D Amine	1.50	100 a	90 a	0 d	0 b	0 b
Butyrac 200	1.00	23 cde	66 ab	1380 abcd	3906 a	5283 a
Butyrac 200	2.00	35 bcd	73 ab	792 cd	4174 a	4966 a
Basagran 4E + Agridex	0.75 +1 qt	8 e	80 ab	1766 abc	4728 a	6493 a
Basagran 4E + Agridex	1.50 +1 qt	18 cde	84 ab	2753 a	3461 a	6214 a
Kerb 50W	1.50	0 e	68 ab	1804 abc	3537 a	5341 a
Kerb 50W	3.00	13 de	86 a	1557 abc	5046 a	6602 a
Rhonox 2E	0.50	40 bc	58 b	1924 abc	4481 a	6405 a
Rhonox 2E	1.00	52 b	81 ab	1158 bcd	4021 a	5179 a

*Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
†Index: 0 = no control or injury; 100 = complete control or injury.
‡DAT = days after herbicide treatment.

Table 3. 'Kenland red' clover response to postemergence herbicides and primrose control.

Treatment	Rate lb ai/A	Injury or control† 65 DAT‡ Clover	Primrose§	Clover yield (mo.-day-year) 3/12/91	4/15/91	Total
		%		lb dry wt/A		
Check	——	0 c*	0 c	487 a	2544 a	3031 a
2,4-D Amine	0.75	89 a	95 a	12 b	379 b	391 b
2,4-D Amine	1.50	95 a	96 a	18 b	196 b	215 b
Butyrac 200	1.00	45 b	91 a	307 ab	2744 a	3050 a
Butyrac 200	2.00	53 b	88 a	226 ab	2846 a	3072 a
Basagran 1E + Agridex	0.75 +1 qt	8 c	60 b	385 ab	1522 ab	1907 ab
Basagran 1E + Agridex	1.50 +1 qt	5 c	50 b	280 ab	1871 ab	2151 ab
Kerb 50W	1.50	3 c	40 b	560 a	2767 a	3327 a
Kerb 50W	3.00	8 c	43 b	553 a	1365 ab	1918 ab
Rhonox 2E	0.50	48 b	84 a	375 ab	2898 a	3273 a
Rhonox 2E	1.00	40 b	95 a	265 ab	1765 ab	2030 ab

*Means followed by the same letter are not significantly different at the 0.05 level of significance (Duncan's Multiple Range Test).
†Index: 0 = no control or injury; 100 = complete control or injury.
‡DAT = days after herbicide treatment.
§Primrose = cutleaf evening primrose.

In an overall comparison of all clovers, Koala subclover was more tolerant to 2,4-D, Butyrac, and Rhonox, while Hubam sweetclover was the most sensitive. However, Koala subclover and Hubam sweetclover were more sensitive to Basagran at 1.5 lb/A. The extremely cold weather in mid- to late December may have caused the clover species to show greater phytotoxic effects. Only Butyrac and Kerb are approved by the EPA for use on forage legumes.

Table 4. 'Koala' subclover response to postemergence herbicides and henbit control*.

Treatment	Rate lb ai/A	Injury or control† 65 DAT‡ Clover	Henbit	Clover yield (mo.-day-year) 3/12/91	4/15/91	Total
		%		lb dry wt/A		
Check	—	0	0	1183	2014	3196
2,4-D Amine	0.75	20	73	1481	3400	4880
2,4-D Amine	1.50	70	73	958	2378	3336
Butyrac 200	1.00	10	50	976	3427	4402
Butyrac 200	2.00	25	75	886	2516	3402
Basagran 4E + Agridex	0.75 +1 qt	0	70	2156	4306	6462
Basagran 4E + Agridex	1.50 +1 qt	40	80	1002	2344	3345
Kerb 50W	1.50	0	85	2024	3053	5077
Kerb 50W	3.00	5	80	1188	2833	4021
Rhonox 2E	0.50	15	70	1949	3305	5253
Rhonox 2E	1.00	23	85	2046	4264	6309

*Because of poor stands, only data from two repetitions was reported, and statistical means were not separated.
†Index: 0 = no control or injury; 100 = complete control or injury.
‡DAT = days after herbicide treatment.

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