Control of Live Oak in South Texas[1]

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Highlight

Aerial applications of herbicides were made in May, July and November, for control of live oak (*Quercus virginiana* Mill.) in South Texas. Single or repeated applications of (2,4,5-trichlorophenoxy)acetic acid (2,4,5-T) at 2 lb/acre did not satisfactorily control live oak. However, 4-amino-3,5,6-trichloropicolinic acid (picloram) at 1 or 2 lb/acre applied in May 1964 and retreated in May 1965 effectively controlled live oak (93 and 98%, respectively). Single applications of picloram at 2 and 4 lb/acre and a mixture of picloram + 2,4,5-T at 2+2 lb/acre were effective when applied in November 1965. Summer applications of picloram and picloram + 2,4,5-T required a repeat treatment for best results.

Live oak (*Quercus virginiana* Mill.) is an evergreen tree or shrub that is rapidly encroaching on pasture and rangelands on the Gulf Coast Prairie in Texas. Heavy infestations cause low forage production, and attempts to control the species by burning, mowing, or broadcast spray applications of (2,4,5-trichlorophenoxy)acetic acid (2,4,5-T) have been only moderately successful.

Mechanical methods of controlling live oak in Texas includes chaining, dozing, and root-plowing. The method selected depends upon stand density and growth habit of the live oak plants. Goats are frequently used in dense stands after chaining to eat regrowth. Treatments to the base of stems with 2,4,5-T can be made to kill scattered trees (Rechenthin et al., 1964). These methods, however, are sometimes expensive and control is often temporary. Darrow and Haas (1961) obtained effective control of live oak with broadcast applications of 6 to 9 lb/acre of 1,1-dimethyl-3-phenylurea (fenuron) to the soil. Bovey and Lehman (1967) reported successful control of live oak with 4-amino-3,5,6-trichloropicolinic acid (picloram) and 5-bromo-3-*sec*-butyl-6-methyluracil (bromacil) applied as a spray or in pelleted formulations.

This report summarizes the results of a study to control live oak by aerial application of the most promising herbicides available.

Material and Methods

Spring application—Herbicidal treatments were made on May 14, 1964, on native stands of live oak near Nursery, Texas. The shrub type of growth was fully foliated and averaged 12 to 15 ft in height. Herbicides were applied to 5-acre plots (160 by 1,320 ft) in four 40-ft swaths by a Snow Model A[3] airplane calibrated to deliver a spray volume of 7 gallons per acre (gpa). Herbicides applied included the 2-ethylhexyl esters of 2-(2,4-dichlorophenoxy)propionic acid (dichlorprop), 2-(2,4,5-tricholorphenoxy)propionic acid (silvex), 2,4,5-T, and the potassium salt of picloram. Phenoxy herbicides were applied in approximately 1:7 oil:water emulsions, and picloram was applied in water.

The number of plants killed were determined 1 year after treatment by counting live and dead stems in ten 28.3-sq ft areas, along a transect line across the width of the plot. Two lines were counted at opposite ends in each plot (20 subsamples). Defoliation was estimated visually, at that time, at each sampling site.

On May 28, 1965, after these evaluations, we retreated the plots. In 1966, one year after herbicidal retreatment, we evaluated all plots as in 1965.

Summer application—Herbicide treatments were applied on July 27, 1965 to mixed stands of shrub and tree type live oak near Victoria, Texas. Herbicides were applied to 5-acre plots (200 by 1,089 ft) in five 40-ft swaths by a Gruman "Ag.Cat."[3] Spray volume was 4.3 gpa. The herbicides were picloram at 1, 2 and 4 lb/acre, 2,4,5-T at 2 lb/acre and a combination of picloram + 2,4,5-T at 2+2 lb/acre. The 2,4,5-T spray was applied in a 1:2 oil:water emulsion, and all other herbicides were applied in water carriers. We used a randomized block design with two replications.

Treated plants were evaluated one year after treatment by determining defoliation of approximately 50 to 100 trees in each plot along two 100-ft transect lines in each plot. Percentage of dead plants was also determined. Response of yaupon (*Ilex vomitoria* Art.) was evaluated in each plot as described for live oak. Additional control evaluations were made on 120 live oak trees in each plot two years after treatment before retreatments were made. Plots originally sprayed with picloram at 1 and 2 lb/acre and picloram + 2,4,5-T at 2+2 lb/acre were resprayed with the same herbicides on July 29, 1967. Final evaluations were made by visually estimating percentage canopy reduction of live oak in each plot in July 1968.

Fall applications—Herbicides were applied by airplane on November 1, 1965 similar to those described for the summer (July) treatment. Retreatments were not made. Herbicidal evaluation methods have been described under summer applications. Bovey et al., (1967) described the climate, soils, and vegetation of the treated areas.

Results

Spring application—Effective killing of plants was not obtained with a single application of any

[1] Cooperative research of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture and Texas A&M University. Received November 26, 1968. Accepted for publication April 17, 1969.

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[3] Mention of trademark name or a proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or Texas A&M University, and does not imply its approval to the exclusion of other products that may also be suitable.

Table 1. Live and dead stems/sq rod in May 1965 and 1966 after aerial treatment of live oak with 14 herbicides in May 1964 and retreatment in 1965.

Herbicide	lb/A	1965 Live stems	1965 Dead stems	1965 New shoots	1966 Live stems
Silvex	1	256	59	151	128
Silvex	2	212	13	89	132
Silvex	8	199	38	211	241
Dichlorprop	1	236	35	105	174
Dichlorprop	2	245	13	178	315
Dichlorprop	8	182	33	173	178
2,4,5-T	1	124	6	115	117
2,4,5-T	2	102	7	111	133
2,4,5-T	8	145	47	154	120
2,4,5-T+ dichlorprop	½+½	185	13	228	302
2,4,5-T+ dichlorprop	1+1	119	13	213	220
2,4,5-T+ dichlorprop	4+4	106	11	106	84
Picloram	1	121	13	109	35
Picloram	2	62	29	99	15
Check	-	198	0	22	236

1/ Plots were retreated in May 1965 except for the 8 lb/A rates. Dichlorprop at 1 and 2 lb/A was retreated with 2,4,5-T at 1 and 2 lb/A, respectively, at Nursery, Texas.

Table 2. Percentage canopy reduction of live oak 1 and 2 years after aerial treatments of herbicides in May 1964 and 1965, Nursery, Texas.

Herbicide	lb/A	1965 1 year after treatment	1966 1 year after retreatment
Picloram	1	74	93
Picloram	2	79	98
Silvex	1	32	45
Silvex	2	45	50
Silvex	8	71	50
Dichlorprop	1	36	43
Dichlorprop	2	47	50
Dichlorprop	8	67	58
2,4,5-T	1	65	65
2,4,5-T	2	54	67
2,4,5-T	8	61	60
2,4,5-T + dichlorprop	½+½	56	58
2,4,5-T + dichlorprop	1+1	70	68
2,4,5-T + dichlorprop	4+4	66	50

1/ Retreated in 1965 except for the 8 lb/A rates. Dichlorprop at 1 and 2 lb/A was retreated with 2,4,5-T at 1 and 2 lb/A.

herbicide in 1965 (Table 1). New shoot growth was abundant. Retreatment of picloram in 1965 at 1 and 2 lb/acre most effectively reduced the number of live stems in 1966. If the plants showed any indications of regrowth (leaves or leaf primordia) they were considered alive. Most effective control (suppression of regrowth) was obtained with picloram at 1 and 2 lb/acre (Table 2). Retreatment of live oak with phenoxy herbicides in 1966 at 1 and 2 lb/acre was no more effective than a single application in 1965. However, repeated treatments of picloram increased control. Single applications of silvex, 2,4,5-T, and 2,4,5-T + dichlorprop at 8 lb/acre were not effective in controlling live oak and were sometimes no more effective than lower rates of these same herbicides. Picloram at 1 lb/acre was more effective than the phenoxy herbicides at 8 lb/acre from single or repeated application.

Summer application—Picloram at 4 lb/acre, the most effective herbicidal treatment, defoliated 92% and killed 40% of the live oak (Table 3). Effectiveness decreased with time, and some plots showed considerable regrowth 2 years after treatment. Subsequently, July treatments of picloram at 1 and 2 lb/acre and the picloram:2,4,5-T mixture were resprayed in 1967. Retreatment markedly improved control as determined by evaluations 1 year later. Control of live oak with two applications of picloram at 2 lb/acre was as effective as a single application of picloram at 4 lb/acre. Repeated application of picloram at 1 lb/acre was not effective. The July treatment of picloram at 4 lb/acre was also the only effective defoliant on yaupon (Table 4).

Fall treatments—The fall aerial treatments on live oak were more effective than the spring or summer treatments, consequently, retreatments were not applied (Table 3). Percent control of live oak 3 years after treatment from a single applica-

Table 3. Percentage canopy reduction and kill of live oak after aerial treatment with 5 herbicides in July and November 1965, Victoria, Texas.

Herbicide	lb/A	1966 1 year after treatment % defol.	1966 1 year after treatment % killed	1967 2 years after treatment % Control	1968 3 years after treatment % Control
July treatment					
Picloram	1	75	4	31 1/	40
Picloram	2	89	32	59 1/	90
Picloram	4	92	40	75	90
Picloram + 2,4,5-T	2+2	83	14	52 1/	93
2,4,5-T	2	75	7	46	28
November treatment					
Picloram	1	62	4	31	55
Picloram	2	94	53	79	85
Picloram	4	98	82	96	75
Picloram + 2,4,5-T	2+2	94	54	87	90
2,4,5-T	2	43	0	40	50

1/ Plots were retreated in July 1967.

Table 4. Percentage of yaupon canopy reduction and kill 1 year (1966) after aerial treatment of herbicides in July and November 1965 at Victoria, Texas.

Herbicide	lb/A	Month of treatment, 1965			
		July		November	
		% defol.	% killed	% defol.	% killed
Picloram	1	39	0	69	8
Picloram	2	32	11	94	59
Picloram	4	91	17	94	54
Picloram + 2,4,5-T	2+2	--	--	97	77
2,4,5-T	2	38	0	32	0

tion of picloram at 2 and 4 lb/acre was 85 and 75%, respectively. Picloram + 2,4,5-T was also effective. Picloram and picloram:2,4,5-T were more effective on yaupon applied in the fall than in the summer (Table 4).

Discussion

These investigations show that effective control of live oak can be obtained by aerial application in the fall when susceptible crops such as cotton, are not grown. Serious crop damage may result from drift if herbicides are applied earlier in the season. A heavy understory of American beautyberry (*Callicarpa americana* L.) and numerous herbaceous weeds were effectively controlled by picloram applied in July and November treatments. Effective weed control was obtained in the May treatment but American beautyberry was not present. American beautyberry was not effectively controlled by 2,4,5-T.

Much of the treated area was virtually useless for grazing before treatment, but grasses were released from competition soon after treatment. Growth was markedly increased (Fig. 1). Predominant grass species included little bluestem (*Andropogon scoparius* Michx.), brownseed paspalum (*Paspalum plicatulum* Michx.), Indiangrass (*Sorghastrum nutans* (L.) Nash), threeawn (*Aristida* spp.), lovegrass (*Eragrostis* spp.), and knotroot bristlegrass (*Setaria grisebachii* Fourn.).

The addition of 2,4,5-T to picloram did not increase the control of live oak when applied aerially in July. However, fall applications of picloram: 2,4,5-T were slightly more effective on live oak than picloram alone at comparable rates. Picloram:2,4,5-T mixtures are effective on many woody plants, and 2,4,5-T can sometimes be used to reduce the amount of the more persistant picloram in the mixture (Bovey et al., 1968). The fall application of picloram:2,4,5-T was the most effective herbicide for control of yaupon.

The phenoxy herbicides such as silvex and 2,4,5-T were not very effective in controlling live oak even when retreatments were made or when high dosages were applied (8 lb/acre).

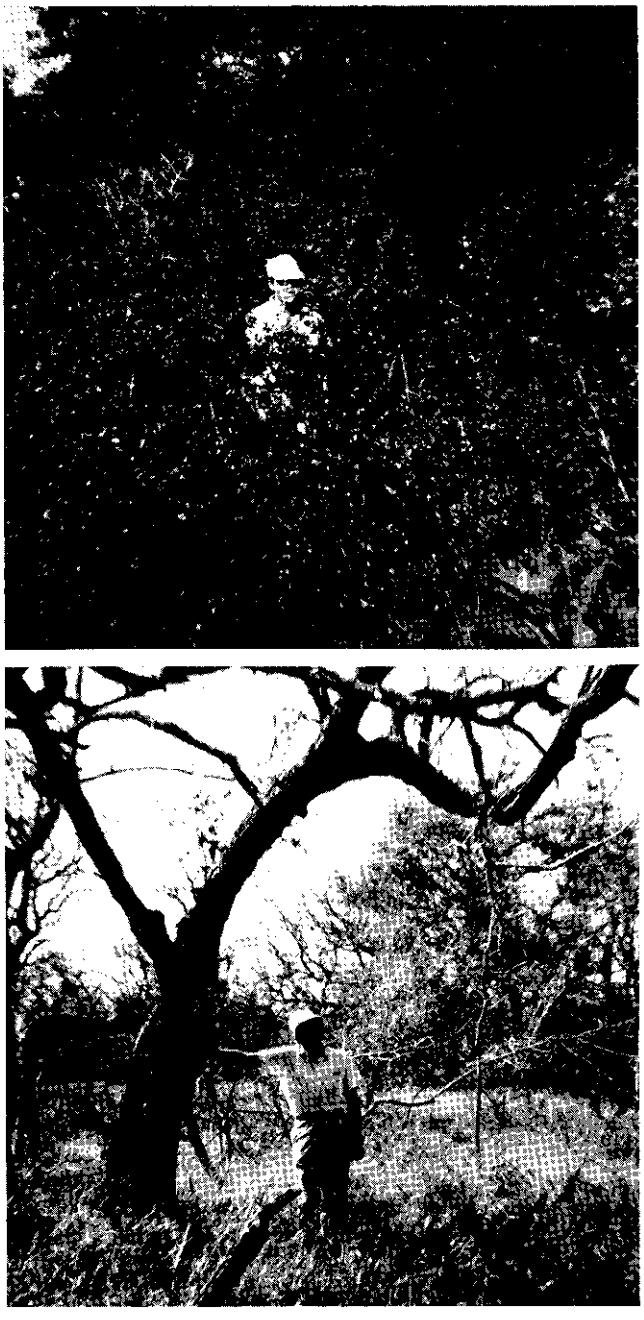

FIG. 1. *Top*—Untreated live oak infestation near Victoria, Texas, July 18, 1968. *Bottom*—Control of live oak by an application of a mixture of picloram + 2,4,5-T at 2+2 lb/acre in November 1965; photographed July 1968. Note luxuriant growth of residual native grasses.

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