

# Control of Huisache and Associated Woody Species in South Texas<sup>1</sup>

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## Highlight

Picloram effectively controlled huisache (*Acacia farnesiana* (L.) Willd.) when applied in May, June, July and October. It was more effective than several other herbicides at comparable dosages. Mixtures of picloram + 2,4,5-T were effective on huisache in spring and fall applications. Picloram rates could be reduced by adding comparable amounts of 2,4,5-T. Several herbicides, including 2,4,5-T, effectively controlled mesquite in April, May and June. Herbicides applied at other dates were usually ineffective. Aerial applications of picloram and mixtures of picloram + 2,4,5-T in the fall controlled huisache, blackbrush (*Acacia rigidula* Benth.), and several other woody species, but were ineffective on such species as Texas persimmon (*Diospyros texana* Scheele), wolfberry (*Lycium berlandieri* Dunal), and algerita (*Berberis trifoliolata* Moric.).

Huisache (*Acacia farnesiana* (L.) Willd.) is a widespread woody species in tropical and semi-tropical areas of North and South America (Vines, 1960). In Texas, huisache infests over 2½ million acres of pasture and rangeland and its rate of growth and spread is of major concern to Texas ranchers (Smith and Rechenhain, 1964). Mechanical methods of control include bulldozing, grubbing, and root plowing (Rechenhain, 1964). Treatment of the base of the trunk with (2,4,5-trichlorophenoxy) acetic acid (2,4,5-T) at 8 pounds per 100 gallons of kerosene or diesel oil kills individual trees (Hoffman and Ragsdale, 1966). These control methods, however, are sometimes expensive. Darrow (1960) defoliated huisache by aerial treatments of 2,4,5-T but killed few plants. Bovey (1966) found that 4-amino-3,5,6-trichloropicolinic acid (picloram) showed promise for huisache control and several associated woody plants.

This study was conducted to determine the most effective herbicides, rates, and time of application

for control of huisache from foliar-broadcast applications in Texas.

## Materials and Methods

*Truck applications.*—We treated native stands of huisache and honey mesquite (*Prosopis juliflora* (Swartz) DC. var. *glandulosa* (Torr.) Cockerell), near Refugio, Texas. Huisache was the more abundant species. Both species ranged from 5 to 15 ft in height. Bovey et al. (1967), described the climate, soils and vegetation of the experimental site. We used a truck-mounted sprayer described by Meyers et al. (1967), and applied herbicides on October 3, 1963; April 13, May 12, July 13, and October 29, 1964; May 29, 1965 and June 15, 1966. We retreated, 1 year later, selected plots in the October, 1963 and May, 1964 treatments. Herbicides included: 3,6-dichloro-*o*-anisic acid (dicamba), 6,7-dihydrodipyrido(1,2-*a*:2',1'-*c*)pyrazinedium salts (diquat), 2,3,6-trichlorobenzoic acid (2,3,6-TBA), S,S,S-tributyl phosphorotrithioate (DEF), 5-bromo-3-isopropyl-6-methyluracil (isocil), 5-bromo-3-*sec*-butyl-6-methyluracil (bromacil), 1,1'-dimethyl-4,4'-bipyridinium salts (paraquat), the potassium salt of picloram, 2-ethylhexyl esters of (2,4-dichlorophenoxy) acetic acid (2,4-D), and 2,4,5-T. Surfactant alkylaryl polyethylene glycols, free fatty acids, and isopropanol (X-77)<sup>4</sup> were added at 0.5% of the total spray volume. Herbicides were applied at 10 gallons per acre (gpa) except bromacil which was applied at 20 gpa. The treatment area (50 acres) was fenced from livestock, divided into blocks, and roadways bulldozed for passage of the spray truck. Plots treated were 22 by 200 ft in a randomized block of two replications. We visually estimated percent of huisache and mesquite canopy reduction in each plot, 1, 2 and 3 years after treatment.

*Aerial applications.*—We applied herbicides to a mixed stand of brush on October 14, 1965 at Campbellton, Texas. A Model C Snow<sup>4</sup> aircraft was used to spray plots 200 by 840 ft in a randomized block design with two replications per treatment. Herbicides were applied in water at a spray volume of 7½ gpa. Herbicides included picloram at 1, 2 and 3 lb/acre, 2,4,5-T at 2 lb/acre, and a mixture of picloram + 2,4,5-T at 1+1 lb/acre. Rainfall, 2 weeks before treatment, produced excellent foliar growth. Predominant species were huisache and blackbrush (*Acacia rigidula* Benth.) with scattered plants of catclaw (*Acacia greggii* A. Gray), Texas persimmon (*Diospyros texana* Scheele), wolfberry (*Lycium berlandieri* Dunal), algerita (*Berberis trifoliolata* Moric.), yucca (*Yucca* spp.), lotebush (*Condalia* spp.), spiny hackberry (*Celtis pallida* Torr.), pricklypear (*Opuntia lindheimeri* Engelm.), hogplum (*Colubrina texensis* (Torr. & Gray) Gray), tasajillo (*Opuntia leptocaulis* DC.), kidneywood (*Eysenhardtia texana* Scheele), and honey mesquite. We visually estimated percentage canopy reduction of each species along two 100-ft transect lines in each plot, 1 and 2 years after treatment.

## Results and Discussion

*Truck applications.*—Picloram at 2 and 4 lb/acre, bromacil at 10 lb/acre, isocil at 5 lb/acre, and

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<sup>4</sup> 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. Percentage canopy reduction of huisache treated with 29 herbicidal treatments on October 4, 1963 at Refugio, Texas.**

Herbicide	lb/acre applied	Years after treatment			Mean <sup>2</sup>
		1	2	3	
Dicamba	4 <sup>1</sup>	65	65	55	62b
Dicamba	8	70	30	50	50bc
Dicamba	12	93	50	48	63b
Paraquat	2 <sup>1</sup>	40	0	5	15defg
Paraquat	4	30	15	0	15defg
Paraquat	8	70	30	0	33cd
Paraquat + dicamba	4+4	60	20	5	28de
2,3,6-TBA	12	60	10	0	23defg
Picloram	2 <sup>1</sup>	90	100	98	96a
Picloram	4	100	100	100	100a
Picloram + 2,4-D	0.2+0.8	50	15	0	22defg
Picloram + 2,4-D	0.4+1.6	60	15	0	25def
Picloram + 2,4-D	0.8+3.2	75	40	73	63b
2,4,5-T	4	50	0	5	18defg
2,4,5-T	8	40	25	0	22defg
2,4,5-T	12	30	15	0	15defg
2,4,5-T + dicamba	4+4	80	25	0	35cd
2,4,5-T + paraquat	4+4	40	10	0	17defg
2,4,5-T + NH <sub>4</sub> SCN	4+0.5	20	0	0	7fg
2,4-D	4	15	0	5	7efg
2,4-D	8	25	5	0	10efg
2,4-D	12	35	0	0	12fg
2,4,5-T + DEF	4+8	25	25	25	25def
DEF	8	25	5	0	10efg
Bromacil	2 <sup>1/2</sup>	55	15	0	23defg
Bromacil	5	45	25	0	23defg
Bromacil + paraquat	5+4 <sup>1</sup>	95	95	98	96a
Bromacil	10	98	100	90	96a
Isocil	5	93	93	100	95a
Check	—	10	0	0	3g
Mean <sup>2</sup>		55a	31b	25c	

<sup>1</sup>Retreated in October 1964 using same treatments as in 1963 except rates of dicamba and paraquat + bromacil were reduced by one-half.

<sup>2</sup>Numbers followed by the same letter do not differ significantly at the 5% level using Duncan's multiple range test.

bromacil + paraquat at 5+4 lb/acre controlled huisache (Table 1). Dicamba at 12 lb/acre was effective 1 year after application but was not after 2 years. Dicamba, paraquat, 2,3,6-TBA, 2,4,5-T, 2,4-D, and various mixtures of these materials did not control huisache 3 years after treatment at all dosages. We retreated picloram, 2 lb/acre; paraquat, 2 lb/acre; dicamba, 4 lb/acre; and the bromacil + paraquat plots in October 1964. Dicamba and paraquat were ineffective.

**Table 2. Canopy reduction (%) of huisache treated with paraquat, picloram, 2,4,5-T, and dicamba on May 12, 1964 at Refugio, Texas.<sup>1</sup>**

Herbicide	lb/acre applied	Years after treatment			Mean <sup>2</sup>
		1	2	3	
Paraquat	1	0	10	18	9de
Paraquat	4	15	15	38	23de
Picloram	1	45	55	45	48bc
Picloram	4	99	98	93	96a
2,4,5-T	1	15	10	15	13de
2,4,5-T	4	35	25	30	30cd
Dicamba	1	40	20	25	28cd
Dicamba	4	65	45	68	59b
Check	—	0	0	5	2e
Mean <sup>2</sup>		35a	31a	37a	

<sup>1</sup>All plots retreated in June 1965 using same treatment except picloram at 4 lb/acre.

<sup>2</sup>Numbers followed by the same letter do not differ significantly at the 5% level using Duncan's multiple range test.

Bromacil at 10 lb/acre killed all huisache, but also killed most of the herbaceous vegetation. Curly mesquite (*Hilaria belangeri* (Stend.) Nash) was the first grass to encroach on treated areas 1 and 2 years after treatment. Bromacil did not kill pricklypear and mesquite. Paraquat and the mixtures of bromacil:paraquat also damaged herbaceous vegetation; other herbicides were less injurious.

Picloram applied at 4 lb/acre in May 1964, like fall treatments, killed huisache (Table 2). However, picloram, 1 lb/acre; paraquat, dicamba and 2,4,5-T, 1 and 4 lb/acre applied in May, 1964, and retreated in June 1965, were ineffective.

Date of herbicide treatments in 1964 was critically important. Treatments in April killed a low percentage of huisache (Table 3). At the time of treatment, huisache was in full bloom but leaves were not fully expanded. Picloram at 4 lb/acre, 3 years after treatment (not shown in

**Table 3. Canopy reduction (%) of huisache treated with picloram, 2,4,5-T and a mixture of picloram + 2,4,5-T at five dates of application at Refugio, Texas.**

Herbicide	lb/acre applied	Years after treatment	Date of application				
			Apr. 1964	July 1964	Oct. 1964	May 1965	June 1966
Picloram	2	1	15	85	95	95	95
		2	0	85	93	85	84
		3	5	78	25	85	—
2,4,5-T	2	1	20	35	40	25	68
		2	25	10	35	20	25
		3	40	10	25	5	—
Picloram + 2,4,5-T	1+1	1	—	—	—	93	93
		2	—	—	—	88	90
		3	—	—	—	73	—

**Table 4.** Herbicide treatments and dates of application that produced 85% canopy reduction or more on mesquite at Refugio, Texas.

Treatment date	Herbicide	Rate lb/acre	Years after treatment	Percent reduction
Oct. 1963	Paraquat + dicamba	4+4	2	90
	Paraquat + bromacil	4+5	2	90
April 1964	Paraquat	4	3	85
	Paraquat	8	3	100
	Paraquat + bromacil	4+5	3	90
	Paraquat + 2,4,5-T	4+4	3	100
	Paraquat + picloram	4+4	3	93
May 1964	2,4,5-T	2	3	95
	Paraquat	2	3	85
May 1965	Picloram	4	3	90
	Picloram	2	3	90
June 1965	2,4,5-T	2	1½	95

Table 3) killed only 40 percent of the huisache. Picloram at 2 lb/acre killed little or none. Apparently, at this early date, assimilates are moving from the roots to leaves. Under these conditions, translocation of foliar-applied herbicides may be slight. However, picloram applied in July 1964, October 1964, May 1965, and June 1966, killed a high percentage of huisache. Comparable rates of 2,4,5-T were not effective at any date of application. Mixtures of picloram + 2,4,5-T at 1+1 lb/acre were as effective as picloram alone at 2 lb/acre. The results suggest that 2,4,5-T can be used to reduce picloram rates in mixtures of picloram: 2,4,5-T by adding comparable amounts of 2,4,5-T.

The same herbicide treatments were applied to mesquite as huisache. However, a few plots contained little or no mesquite; and some evaluations could not be made, since many leaves were lost by natural defoliation in the fall months. Incomplete data prevented statistical analysis, but the more effective treatments are shown in Table 4. Summer and fall treatments were usually not effective except as indicated. Paraquat, 2,4,5-T, and picloram were effective when applied at some dates in the spring. Combinations of paraquat with bromacil, 2,4,5-T or picloram were also effective.

*Aerial applications.*—Treatment of large areas of huisache and associated woody species in South Texas may require aerial application after harvest in fall months where susceptible crops are grown. Herbicides were selected for aerial application in a mixed stand of woody plants typical of South Texas. Picloram killed huisache at 1, 2

**Table 5.** Canopy reduction (%) of several woody plant species 2 years after aerial treatment with picloram, 2,4,5-T, and picloram + 2,4,5-T on October 14, 1965 at Campbellton, Texas.

Species	2,4,5-T at 2 lb/acre	Picloram			Picloram +2,4,5-T at 1+1 lb/acre
		1 lb/acre	2 lb/acre	3 lb/acre	
Huisache	68	95	93	100	100
Blackbrush	58	65	84	100	91
Persimmon	33	14	21	38	26
Wolfberry	15	22	18	42	24
Agarito	10	15	10	63	10
Whitebrush	43	95	99	100	95
Lotebush	10	20	39	40	31
Spiny hackberry	55	95	95	—	95

and 3 lb/acre. Equally effective was the mixture of picloram + 2,4,5-T at 1+1 lb/acre. Blackbrush reacted similarly to huisache, except that slightly higher picloram dosages were required. Other species controlled by picloram or picloram + 2,4,5-T were catclaw, whitebrush, spiny hackberry, hogplum, pricklypear, and tasajillo. Texas persimmon, wolfberry, agarito, yucca, lotebush and mesquite were resistant to these herbicides. Spring and summer applications may give different responses. Most species included in the study were moderately resistant to 2,4,5-T.

### General Discussion

Picloram killed much huisache when applications were made in May, June, July, and October. It was more effective than any other herbicide included in the study at equal dosages. Bromacil produced excellent control of huisache at high rates (10 lb/acre) but was not effective on pricklypear and mesquite. It severely damaged herbaceous vegetation. Isocil was effective at 5 lb/acre in controlling huisache when applied in October. A mixture of paraquat + bromacil was effective on huisache but damaged grasses. A mixture of picloram + 2,4,5-T was effective in spring and fall treatments on huisache. Picloram rates could be reduced by adding 2,4,5-T without significantly reducing effectiveness on huisache.

Early spring applications (April) were not effective on huisache regardless of the herbicide used. However, most of these treatments were effective on mesquite. Picloram, applied in May, controlled both huisache and mesquite. Mesquite was usually only controlled by spring applications of herbicides.

Residue levels of picloram must persist in soils and plants for several months after treatment to kill huisache. If these residues are not present, the woody species recover from regenerative tissue. Percentage of brush reduction by all herbicides included in this study declined 1 year, or

sooner after treatment; and woody plants showed varying degrees of regrowth, depending on the effectiveness and persistence of the herbicide.

Ground and aerial herbicide applications appear promising for control of brush in South Texas, especially in the fall after susceptible crops are harvested.

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