Seasonal Response of Macartney Rose and Huisache to Herbicides

R. E. MEYER, R. W. BOVEY, T. E. RILEY, AND T. O. FLYNT

Highlight: Picloram granules and sprays were applied to Macartnev rose (Rosa bracteata Wendl.) and huisache (Acacia farnesiana (L.) Willd.) in the claypan area of Texas. Monthly granule applications to Macartney rose were generally least effective in the summer. Rates of 1, 2, and 3 lb/acre of picloram as granules reduced the canopy 53, 68, and 86% and killed 14, 32, and 57% of the plants, respectively. Foliar sprays of picloram were about equally effective as granules. Huisache was not as highly responsive to picloram as to either granules or soil sprays at rates up to 4 lb/acre. However, picloram at 2 lb/acre as a foliage spray in May or September killed 90% or more of the plants. A 1 lb/acre foliage spray of picloram combined with a 1 lb/acre spray of 2,4,5-T, dicamba, or picloram in the soil also killed 53% or more of the huisache plants. Macartney rose (*Rosa bracteata* Wendl.) is a troublesome woody plant that grows on about 0.5 million acres of potentially productive rangeland in Texas. It is presently controlled by either mowing or spraying with 2,4-D [(2,4-dichlorophenoxy) acetic acid] (Hoffman et al., 1964; Lehman et al., 1966), but many plants sprout and recover a few months after treatment. Haas et al. (1970) found that sprays of picloram (4-amino-3,5,6-trichloropicolinic acid) were more effective in late April and early May than in late May and early June, but the reverse was true for 2,4-D. Mixtures of the two herbicides were effective from April through early June. Lehman et al. (1966) found that spring treatments with picloram and 2,4-D were more effective than fall treatments at Greenlake, Tex. A 2 lb/acre April treatment of picloram reduced the canopy 94% and killed 63% of the plants.

Bovey et al. (1972a) applied sprays of picloram + 2,4,5-T [(2,4,5-trichlorophenoxy) acetic acid] at 0.25 + 0.25 and 0.5 + 0.5 lb/acre from late June through October on Macartney rose. The September and October treatments were more effective than those applied in June through August. Meyer and Bovey (1973) found that sprays of picloram and picloram + 2,4-D or 2,4,5-T were about equally effective in May, August, and November. Bovey et al. (1972b) found that a spray of picloram alone at 2 lb/acre on Macartney rose was

Authors are plant physiologist, agronomist, agricultural research technician, and agricultural research technician, respectively, U.S. Department of Agriculture, Agricultural Research Service, Department of Range Science, Texas A&M University, College Station 77843.

Contribution from the U.S. Dep. Agr., Agr. Res. Serv. and the Texas Agricultural Experiment Station, College Station 77843. This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation of this product by the U.S. Dep. Agr.

equally effective in June and October. Several formulations of picloram as granules at 2 lb/acre also reduced the plant canopy by 77% or more, whereas almost all plants were killed (99.8% canopy reduction) by 4 lb/acre of picloram as granules. Although picloram is generally effective for spring or fall applications, the variation in control of Macartney rose reported depended on climate, timing of herbicide treatment, size of plants, and stage of growth (Bovey et al., 1972a; Bovey et al., 1972b; Lehman et al., 1966; Meyer and Bovey 1973).

Huisache (Acacia farnesiana (L.) Willd.) is an undesirable, thorny woody plant growing on about 1.5 million acres of Texas rangeland. Bovey et al. (1967) showed that huisache was sensitive to picloram as either foliar or soil applications in greenhouse experiments. Meyer and Bovey (1973) at Bryan, Tex., found that June and October applications of picloram at 2 lb/acre as a spray reduced by only 54% the canopy of huisache growing on a heavy clay soil. At Refugio, Tex., on a neutral Papalote fine sandy loam soil, Bovey et al. (1970) found that 2 lb/acre of picloram sprayed on huisache in May, June, July, or October gave good control. In contrast, an application in April before the leaves had fully expanded resulted in poor control. Bovey et al. (1969) applied picloram as granules on huisache at Refugio and Campbellton, Tex. At Refugio, 2 lb/acre of picloram reduced the canopy 75, 55, and 93% when applied in April, May, and November, respectively. At Campbellton, on a calcareous Monteola clay soil, an April application of picloram at 2 lb/acre killed all plants, and a November application reduced the canopy 87% after 1 year. The 4 lb/acre rate killed all plants at Campbellton and caused 92% or more canopy reduction at Refugio.

The main objective of this study was to evaluate the seasonal response of Macartney rose and huisache to monthly applications of picloram granules, particularly on heavy clay soils where sensitive crops are grown nearby. However, picloram sprays were also included as a comparison with granules.

Materials and Methods

Macartney rose was treated on two sites in Texas. From March 1971 through January 1972, treatments were applied to a dense stand of Macartney rose (3 to 6 feet tall) near Montgomery, Tex. The soil type there was a medium soil grading between a Kipling fine sandy loam and a Houston black clay. The study was completed from February 1972 through February 1973 on a similar site near Millican, Tex., on a Wilson clay loam soil. Plots at both sites were established as a factorial design with two replications. Each plot was 20 by 65 feet with 10 to 25 plants. The potassium salt of picloram was applied either as the 2% granule at the rate of 1, 2, and 3 lb/acre or as a spray at the rate of 1 or 2 lb/acre. Granules were distributed by hand. Sprays were applied at 10 gallons per acre with a tractor having a compressed air sprayer attached to a boom 10 feet long. Sprays could not be applied in October because of wind. Control ratings were made May 28, 1974.

An area having almost a complete canopy of huisache 3 to 10 feet tall on a Houston black clay soil was selected near Washington, Tex. Picloram was applied as the potassium salt in 2% granules at the rates of 1, 2, and 4 lb/acre. Two plots 20 by 65 feet, each having 15 to 25 plants, were used for each granule treatment. Granules were applied monthly from March 1971 through February 1973. Control ratings were made October 8, 1973.

Foliar sprays were applied to huisache in May and September 1971. These experiments were not in the same plot layout as those for the granule treatments, but were in the same field at the same time. They serve as a comparison of the two methods of application. On May 27, 1971, seven chemical treatments at 2 lb/acre were applied with a tractor-mounted boom sprayer each to two plots 65 by 200 feet having huisache 6 to 9 feet tall. The treatments included the potassium salt of picloram, the propylene glycol butyl ether ester of 2,4,5-T, and the dimethyl amine salt of dicamba (3,6-dichloro-o-anisic acid) alone and in three mixtures. One treatment consisted of the triethylamine salts of 2,4,5-T and picloram. The plants were rated on May 22, 1972.

On September 13, 1971, 10 treatments were applied to huisache 3 to 5 feet tall each on two replicates 20 by 65 feet. The potassium salt of picloram and the propylene glycol butyl ether esters of 2,4-D and 2,4,5-T were applied at a rate of 10 gallons per acre with a tractor sprayer. Some treatments were sprayed on the foliage with a boom 10 feet long; soil treatments were applied in rows at 4 feet intervals, about 6 inches deep, with a nozzle mounted behind a chisel. The plants were rated on September 18, 1973.

Table 1. Control of Macartney rose with three rates of picloram granules applied at monthly intervals from March 1971 through February 1973 at Millican and Montgomery, Tex.¹

	1		2		3		Mean	
Month applied ²	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)
March	56	22	73	35	96	72	75 ab	43 a
April	57	17	78	42	86	60	74 ab	40 ab
May	51	12	74	38	88	52	71 abc	34 abc
June	38	5	70	38	91	60	66 abc	34 abc
July	36	0	46	5	89	52	57 c	19 c
August	45	12	58	20	76	38	60 bc	23 bc
September	49	11	70	32	82	48	67 abc	30 abc
October	58	24	76	40	88	60	74 ab	41 ab
November	72	28	75	40	91	65	79 a	44 a
December	66	10	66	30	92	68	75 ab	36 abc
January	57	18	72	35	73	50	67 abc	34 abc
February	47	10	60	25	78	60	62 bc	32 abc
Mean	53 p	14 x	68 a	32 v	86 r	57 z		

¹ Values for means in columns or rows for canopy reduction or dead plants followed by the same letter do not differ significantly at the 5% level by Duncan's multiple range test.

² Granules were applied March 1971 through January 1972 at Montgomery and February 1972 through February 1973 at Millican. Treatments were evaluated on May 28, 1974.

	1 1b/a	icre	2 lb/a	cre	Mean		
Month applied ²	Canopy reduction (%)	Dcad plants (%)	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)	
March	58	32	77	40	68 ab	36 ab	
April	69	38	86	52	77 a	45 a	
Mav	64	10	81	45	73 ab	28 ab	
June	40	5	64	12	52 cd	9 cd	
July	37	2	51	5	44 d	4 d	
August	21	0	37	5	29 е	2 d	
September	35	2	67	45	51 cd	24 bc	
November	46	10	72	42	59 bcd	26 bc	
December	53	12	82	55	68 ab	34 ab	
January	40	2	86	50	63 abc	26 bc	
February	44	0	74	40	59 bcd	20 b cd	
Mean	46 x	10 m	71 у	36 n			

Table 2. Control of Macartney rose with two rates of picloram sprays applied at monthly intervals from March 1971 through February 1973 at Millican and Montgomery, Tex.¹

¹ Values in columns followed by the same letter do not differ significantly at the 5% level by Duncan's multiple range test.

² Sprays were applied March 1971 through January 1972 at Montgomery and February 1972 through February 1973 at Millican. No treatments were made in October. Treatments were evaluated May 28, 1974.

Control ratings consisted of evaluating 10 plants at random through the middle of the plot for percent canopy reduction. Plants showing no living foliage or sprouts were considered dead.

Results and Discussion

Control of Macartney rose with picloram granules did not significantly differ between years, so the data are combined in Table 1. There also was no significant interaction between month of application and rate of treatment. Increasing rates of picloram granules progressively increased Macartney rose canopy reduction and percentage of plants killed. However, the highest rate (3 lb/acre) did not kill more than 72% of the Macartney rose plants in any one month. Picloram granules controlled Macartney rose about equally well in all months except in July and August. Apparently the high temperatures and hot-dry conditions (photo-degradation) of summer reduced the effectiveness of the herbicide.

Table 4. Control of huisache with seven herbicide formulations sprayed on May 27, 1971, at Washington, Tex.¹

Herbicide treatment	Rate (lb/acre)	Canopy reduction (%)	Dead plants (%)
Picloram, K salt	2	99 a	90 a
2,4,5-T ester	2	21 c	0 c
Dicamba	2	53 b	3 c
Picloram, K salt + 2,4,5-T ester	1 + 1	92 a	53 b
Picloram + 2,4,5-T $amines^2$	1+1	97 a	77 a
Picloram, K salt + dicamba	1 + 1	90 a	53 b
Dicamba + 2,4,5-T ester	1 + 1	64 b	0 c
Untreated		0 d	0 c

¹Values in columns followed by the same letter do not differ significantly at the 5% level by Duncan's multiple range test. Treatments were rated on May 22, 1972.

² Triethylamine salts.

Sprays of picloram were about as effective as granules (Table 1 and 2). Canopy reductions at the 1 and 2 lb/acre rates were 53 and 68% for granules and 46 and 71% for sprays, respectively. The sprays were generally most effective for reducing the canopy and killing the plants in winter and spring. The sprays were least effective in August. At individual rates by month, sprays killing 32% or more of the plants were statistically more effective than those killing a lower percentage. Consequently, the 1 lb/acre spray killed the most plants in March and April during the period of most rapid new stem elongation.

Control by granules and sprays was less than desired at the sites treated. We desire that a treatment kill at least 70% of the plants. However, this level of control was attained only once with 3 lb/acre in granules. Canopies were reduced 75% or more a number of times with the 2 lb/acre rate either as sprays or granules and at all months with the 3 lb/acre rate as granules. This level of control will open the area of grazing and increased forage production for at least 2 years.

Huisache was more difficult to control than Macartney rose on the heavy clay soil (Table 3). Increasing rates progressively increased the amount of canopy reduction. However, the 4 lb/acre rate reduced the canopy by only 35% and killed only 16% of the plants. Thus, picloram granules were ineffective for killing huisache on this heavy Houston clay soil. Treatments

Table 3. Control of huisache with three rates of picloram granules applied monthly from March 1971 through February 1973 at Washington, Tex.¹

	Rate of granules applied (lb/acre ae)							
Month applied	1		2		4		Mean	
	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)	Canopy reduction (%)	Dead plants (%)
March	10 bc	5	28 abc	15	24 abc	12	20 ab	11
April	13 abc	0	26 abc	10	24 abc	10	21 ab	7
May	19 abc	8	31 abc	5	38 abc	18	29 ab	10
June	23 abc	5	23 abc	5	35 abc	15	27 ab	8
July	6 c	0	8 bc	0	10 bc	0	8 b	0
August	13 abc	2	19 abc	8	22 ab c	5	18 ab	5
September	13 abc	0	16 abc	2	36 ab c	12	22 ab	5
October	12 abc	0	29 abc	8	48 ab	20	29 ab	9
November	8 bc	2	14 abc	2	51 a	30	24 ab	11
December	5 c	2	37 ab c	15	52 a	28	32 a	15
January	12 abc	5	22 ab c	5	43 abc	22	26 ab	11
February	3 c	0	9 bc	0	32 abc	14	14 ab	5
Mean	11 p	2 x	22 q	6 x	35 r	16 y		

¹ Values in columns for treatments, columns for mean, or rows for mean for canopy reduction or dead plants followed by the same letter do not differ significantly at the 5% level by Duncan's multiple range test. Treatments were evaluated on October 8, 1973.

Chemical	Rate (Ib/acre)	Method of application ²	Canopy reduction (%)	Dead plants (%)
Picloram	2	Foliage	98 a	95 a
Picloram	1+1	Foliage + soil	92 a	80 a
Picloram	2	Soil	42 ъ	10 c
Picloram	4	Soil	60 b	40 b
2,4-D	2	Foliage	43 ъ	0 c
2,4-D	2	Soil	10 c	0 c
2,4-D	4	Foliage	54 b	10 c
2,4-D	4	Soil	15 c	0 c
2,4,5-T	2	Foliage	50 в	5 c
Untreated		-	0 c	0 c

Table 5. Control of huisache with nine herbicide treatments sprayed on September 13, 1971, at Washington, Tex.¹

¹Values in columns followed by the same letter do not differ significantly at the 5% level by Duncan's multiple range test. Treatments were rated on September 18, 1973.

² Foliage sprays were applied with a boom sprayer; soil sprays were applied at 4-foot intervals, 6 inches deep, with a nozzle mounted behind a chisel.

for all months were about equally effective for reducing the canopy, except in July when control was slightly less effective than in December.

On May 27, 1971, huisache was much more susceptible to foliar sprays with at least 1 lb/acre of picloram (Table 4) than to any soil treatment of picloram granules with up to 4 lb/acre (Table 3). A foliar spray of picloram was more effective than either 2,4,5-T or dicamba. The amine salt mixture of picloram + 2,4,5-T killed more plants than the salt + ester formulation in this one test.

In the September 13, 1971, experiment, huisache was highly susceptible to foliage sprays with at least 1 lb/acre of picloram but resistant to subsurface soil sprays (Table 5). Foliage sprays of 2,4-D and 2,4,5-T were ineffective. The soil sprays of 2,4-D reduced the canopy less than foliage sprays. Thus, spring and fall experiments indicated that foliar sprays of picloram either alone or combined with another herbicide were more effective than picloram applied either as a granule or as a soil spray. In summary, picloram sprays and granules were about equally effective for controlling Macartney rose. April and May were the most effective months for spraying, whereas granules were effective at almost any time other than the summer months. On heavy clay soils such as at Washington, picloram may be applied effectively as foliage sprays to huisache but not as soil treatments. Picloram appears to be less available in clay than sandy soils for root absorption by huisache. Thus, picloram granules can be used at Refugio on a neutral, fine sandy loam soil (Bovey et al., 1970) and at Cambellton on a crumbly, calcareous clay soil (Bovey et al., 1969), but not on a heavy neutral Houston black clay soil such as at Washington. A foliar spray of picloram on huisache was more effective than 2,4-D, 2,4,5-T, or dicamba.

Literature Cited

- Bovey, R. W., J. R. Baur, and H. L. Morton. 1970. Control of huisache and associated woody species in south Texas. J. Range Manage. 23:47-50.
- Bovey, R. W., F. S. Davis, and M. G. Merkle. 1967. Distribution of picloram in huisache after foliar and soil applications. Weeds 15:245-249.
- Bovey, R. W., R. H. Haas, and R. E. Meyer. 1972a. Daily and seasonal response of huisache and Macartney rose to herbicides. Weed Sci. 20:577-580.
- Bovey, R. W., R. E. Meyer, R. D. Baker, and J. R. Baur. 1972b. Evaluation of polymerized herbicides for brush control. Weed Sci. 20:332-335.
- Bovey, R. W., H. L. Morton, J. R. Baur, J. D. Diaz-Colon, C. C. Dowler, and S. K. Lehman. 1969. Granular herbicides for woody plant control. Weed Sci. 17:538-541.
- Haas, R. H., S. K. Lehman, and H. L. Morton. 1970. Influence of mowing and spraying dates on herbicidal control of Macartney rose. Weed Sci. 18:33-37.
- Hoffman, G. O., R. H. Haas, and B. E. Jeter. 1964. Macartney rose control in Texas. Tex. Agr. Ext. Misc. Pub. 745. 11 p.
- Lehman, S. K., R. H. Haas, and B. E. Jeter. 1966. The effectiveness of picloram for control of Macartney rose. Proc. 19th Annu. Southern Weed Conf., p. 281-286.
- Meyer, R. E., and R. W. Bovey. 1973. Control of woody plants with herbicide mixtures. Weed Sci. 21:423-426.