Comparative Susceptibility of Honey Mesquite to Dicamba and 2,4,5-T[1]

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Highlight

Applications of dicamba controlled about the same percentage of honey mesquite (*Prosopis glandulosa* Torr., var. *glandulosa*) as equivalent rates of 2,4,5-T in the Rolling Plains, Coastal Prairie, and South Texas Plains. Combinations of 2,4,5-T and dicamba controlled no more honey mesquite than either herbicide alone. Honey mesquite control was governed by total herbicide applied rather than relative proportions of 2,4,5-T and dicamba in combination. Dicamba was effectively substituted for 2,4,5-T in combinations with picloram. Three-way combinations were no more effective than mixtures of dicamba and picloram or 2,4,5-T and picloram.

Aerial application of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) is used for control of honey mesquite (*Prosopis glandulosa* Torr., var. *glandulosa*) infesting large acreages of rangeland. Benefits of honey mesquite control have been reflected in increased cow and calf-weight gains (Robison et al., 1970). However, variability of control exists within and among 2,4,5-T applications. Control is apparently dependent upon interrelations of site, climate, and honey mesquite phenology (Dahl et al., 1971). Usually, more honey mesquite is controlled when a combination of equal amounts of 2,4,5-T and 4-amino-3,5,6-trichloropicolinic acid (picloram) is applied than when either herbicide is applied alone (Bovey et al., 1968). Performance of the combination is attributed to increased foliar uptake and transport of picloram in the presence of 2,4,5-T (Davis et al., 1968). The apparent synergism does not decrease the variability of honey mesquite response and picloram presently is not registered for use on rangeland. The need for more effective honey mesquite control provides impetus for testing other herbicides and herbicide combinations.

Dicamba, 3,6-dichloro-*o*-anisic acid, is a member of a different chemical family than 2,4,5-T but is an effective growth regulator (Whitworth and Tolman, 1968). Dicamba controls several species of herbaceous weeds on pastures and rangelands (Feldman et al., 1968; Scifres et al., 1971). Even though dicamba is degraded by microorganisms, it is more persistent in the soil (Friesen, 1965) than phenoxy herbicides such as 2,4-dichlorophenoxyacetic acid (2,4-D). However, dicamba persists no longer than 2,4-D or 2,4,5-T in silver beardgrass (*Andropogon saccharoides* Swartz), little bluestem (*A. scoparius* Michx.) and dallisgrass (*Paspalum dilatatum* Poir.) (Morton et al., 1969).

The objectives of this study were to evaluate 1) effectiveness of dicamba for honey mesquite control and 2) reaction of honey mesquite to dicamba applied in combination with other herbicides.

Materials and Methods

One experimental area was located in the Rolling Plains of northwest Texas (Gould, 1962). Honey mesquite dominated the woody vegetation in association with lotebush condalia (*Condalia obtusifolia* (Hook.) Weberb.), plains pricklypear (*Opuntia polycantha* Haw.), and tasajillo (*O. leptocaulis* DC.). The grass cover was dominated by buffalograss (*Buchloe dactyloides* (Nutt.) Engelm.) in association with tobosa (*Hilaria mutica* (Buckl.) Benth.), sideoats grama (*Bouteloua curtipendula* (Michx.) Torr.), and blue grama (*B. gracilis* (Willd. *ex* H. B. K.) Lag. *ex* Griffiths). The Carey sandy loam soil had a pH of 6.4 and about 1.5% organic matter in the surface inch.

Herbicides were applied in an oil:water emulsion (1:4) at 12 gal/acre with a truck-mounted sprayer on July 12, 1968. Treatments included the dimethylamine (DMA) salt of dicamba, propylene glycol butyl ether (PGBE) esters of 2,4,5-T, and the two herbicides in combination at rates of 0.125, 0.25, and 0.5 lb./acre. Dicamba and 2,4,5-T as field mixes or commercial formulations were applied at 1:1, 1:2, 2:1, 1:4, and 4:1 ratios at rates of 0.5, 0.625, and 0.75 lb./acre total herbicide. In addition, a formulated combination of dicamba, picloram, and 2,4,5-T (1:1:2 ratio) was compared to field mixes of the DMA salt of dicamba, the potassium salt of picloram, and PGBE ester of 2,4,5-T. Each treatment was applied to 20 by 150-ft plots and replicated four times in completely random design.

Defoliation of honey mesquite was evaluated 30 days after herbicide application. The number of completely defoliated honey mesquite plants and the presence or absence of basal sprouts were recorded a year after treatment. The term "top-killed" is used by some workers to describe plants completely defoliated but resprouting. The term "root-killed" is sometimes used for that percentage of the population completely defoliated and not resprouting.

A second set of studies was conducted in the Coastal Prairie of Texas near Refugio. The average annual rainfall in the Coastal Prairie is about 30 inches and the growing season averages about 300 days. In contrast, the Rolling Plains usually receives less than 22 inches and the growing season is about 200 days. The clay loam study site in the Coastal Prairie supported tall and mid-bunchgrasses such as sideoats grama, little bluestem, and knotroot bristlegrass (*Setaria geniculata* (Lam.) Beauv.). Herbicides were

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Table 1. Honey mesquite population (%) completely defoliated a year after application (1970) of various rates (lb./acre) of dicamba and 2,4,5-T alone and as field mixes in combination in the Rolling Plains of Texas.

Application rate		Population completely defoliated	
Dicamba	2,4,5-T	Total	Without sprouts[1]
0	0	0	0a
0	0.125	8	4ab
0	0.25	31	12abc
0	0.5	40	17bc
0.125	0	13	3ab
0.25	0	29	11abc
0.5	0	48	18bc
0.125	0.125	15	3ab
0.25	0.25	53	19c
0.5	0.5	97	31d

[1]Plants without basal sprouts a year after treatment are referred to as "root-killed" by some workers. Means within this column followed by the same letter are not significantly different at the 5% level.

aerially applied in 5 gal/acre of an oil:water (1:4) emulsion to 15 or 20-acre plots in May 1967 and 1968. The K salt of picloram was applied with DMA salt of dicamba or PGBE ester of 2,4,5-T in 1:1 ratios. Total herbicide in each combination was 0.5, 1 and 2 lb./acre. Honey mesquite response was evaluated by recording the number of plants completely defoliated and not resprouting ("root-killed") from a selected area in each plot a year after treatment.

The third study site, near La Pryor, Texas in the South Texas Plains, supported sideoats grama, Arizona cottontop (*Trichachne californica* (Benth.) Chase) and plains bristlegrass (*Setaria macrostachya* H. B. K.). Thirteen to 27-acre plots were aerially treated in May 1968 and 1969 with herbicides at 5 gal/acre of an oil:water (1:4) emulsion. DMA salt of dicamba combined with PGBE esters of 2,4,5-T (1:2 ratio) and 2,4,5-T with K salt of picloram (2:1) were applied in 1968. The triisopropanolamine salts of picloram and 2,4,5-T were applied at 1 lb./acre in a 1:1 ratio in 1969. Also, dicamba was applied with 2,4,5-T (1:1 ratio) and with 2,4,5-T and picloram (1:1:1) at 1.5 lb./acre total herbicide in 1969. The number of honey mesquite plants completely defoliated and not resprouting ("root-killed") were estimated in a selected area in each plot a year following treatment.

Results and Discussion

Over 85% canopy reduction was estimated 30 days after application of at least 0.25 lb./acre of dicamba, 2,4,5-T, and picloram alone or in combination at all locations. Defoliation of honey mesquite the season of treatment does not necessarily indicate herbicide efficiency. However, some producers feel defoliation increases ease of livestock handling and reduces first-season production costs.

Table 2. Honey mesquite population (%) completely defoliated a year after application (1970) of various rates (lb./acre) dicamba and 2,4,5-T combined in field mixes at various rates and ratios in the Rolling Plains of Texas.

Total rate	Dicamba: 2,4,5-T ratio	Population completely defoliated	
		Total	Without sprouts[1]
0.75	1 : 2	59	19a
0.625	1 : 4	58	19a
0.75	2 : 1	69	18a
0.625	4 : 1	42	14a

[1]Plants without basal sprouts a year after treatment are referred to as "root-killed" by some workers. Means within this column followed by the same letter are not significantly different at the 5% level.

In some cases, reduction of the honey mesquite canopy increases grass production the year of treatment. However, reduction in number of live plants cannot be evaluated for at least a growing season following herbicide application.

Honey mesquite control was the same from equivalent rates of dicamba or 2,4,5-T a year after treatment in the Rolling Plains (Table 1). Less than 0.25 lb./acre of either herbicide was ineffective. Combinations of equivalent amounts of dicamba and 2,4,5-T controlled no more honey mesquite than either herbicide applied alone. These results were similar to those of Meadors et al. (1970). Honey mesquite control increased as total herbicide applied increased regardless of combinations (Table 1). Over 30% of the honey mesquite was completely defoliated and without basal sprouts a year after the application of 0.5 lb./acre of each herbicide. Varying the proportions of 2,4,5-T or dicamba in combinations with application rates of 0.625 and 0.75 lb./acre was less effective than applying equivalent concentrations at 0.5 lb./acre (Tables 1 and 2).

Combinations of 2,4,5-T and picloram (Table 3), and 2,4,5-T and dicamba (Table 1) at the same rates resulted in equivalent honey mesquite control. Dicamba, 2,4,5-T, and picloram (1:2:1) applied at 0.5 lb./acre did not increase honey mesquite control when compared to 2,4,5-T and picloram (1:1) at the same rate. At 1 lb./acre, the 1:2:1 ratio was not as effective as the dual combination (1:1).

Honey mesquite control in the Rolling Plains with commercially-formulated dicamba/2,4,5-T combinations or field mixes did not differ. Tank mixes were well agitated before and during application and appeared adequately stable in the carrier emulsion. However, formulations improving relative solubilities would reduce the probability of herbicide separation in bulk quantities.

Table 3. Honey mesquite population (%) completely defoliated a year after application (1970) of various rates (lb./acre) of formulated combinations of dicamba with 2,4,5-T and picloram in the Rolling Plains of Texas.

Application rate			Population completely defoliated	
Dicamba	2,4,5-T	Picloram	Total	Without sprouts[1]
0	0.25	0.25	46	17ab
0.125	0.25	0.125	47	13a
0	0.5	0.5	94	32c
0.25	0.5	0.25	65	22b

[1] Plants without basal sprouts a year after treatment are referred to as "root-killed" by some workers. Means within this column followed by the same letter are not significantly different at the 5% level.

Table 5. Percentage of honey mesquite population completely defoliated and not resprouting a year after aerial application of various rates (lb./acre) and ratios of herbicides (dicamba : 2,4,5-T : picloram) in combination near La Pryor, Texas.

Treatments		Control (%)[1]
Rate	Ratio	
1[2]	0 : 1 : 1	87
1.5[2]	1 : 1 : 0	54
	1 : 1 : 1	42
3[3]	1 : 2 : 0	35
3[3]	0 : 2 : 1	90

[1] Percentage of population completely defoliated and not resprouting is referred to as "root-killed" by some workers.
[2] Application made in 1969.
[3] Application made in 1968.

Several undesirable, woody species were associated with honey mesquite in the Coastal Prairie. When dicamba was substituted for 2,4,5-T in mixtures with picloram, honey mesquite control was usually not influenced regardless of rate or year (Table 4). However, a year after treatment, dicamba combined with picloram at 0.25 lb./acre of each herbicide appeared slightly more effective than the same rates of 2,4,5-T and picloram. Picloram and dicamba at 0.5 lb./acre or more of each herbicide controlled granjeno (*Celtis pallido* Torr.) and huisache (*Acacia farnesiana* (L.) Willd.) as effectively as the same rates of 2,4,5-T and picloram. However, 0.25 lb./acre of dicamba and picloram in combination was more effective in controlling pricklypear (*Opuntia* spp.) than the same rates of 2,4,5-T with picloram.

A 1:1 combination of 2,4,5-T and picloram at 1 lb./acre was as effective as 2 lb./acre of 2,4,5-T combined with 1 lb./acre of picloram for control of honey mesquite in the South Texas Plains (Table 5). The 1:1 ratio was more effective than higher rates with unequal amounts of 2,4,5-T and picloram. Similar responses were noted in studies of Bovey et al. (1968). A 1:1 ratio of 2,4,5-T and dicamba at 1.5 lb./acre was less effective than 1 lb./acre of 2,4,5-T and picloram. The three-way combination was the least effective treatment probably due to reduction in the relative amount of picloram.

Based on visual observations, dicamba alone or in combination with other herbicides did not reduce grass growth. All treatments with dicamba or picloram controlled many of the forbs. Grazing deferment following these treatments expedited range improvement when compared to adjacent, untreated rangeland with deferment.

Assuming economic feasibility, these data indicate that dicamba is comparable to 2,4,5-T in effectiveness for honey mesquite control. In most cases, there is no apparent advantage to combining 2,4,5-T and dicamba. Results from these studies indicate that dicamba may be substituted for 2,4,5-T in a 1:1 ratio with picloram for honey mesquite control. The advantage of such a combination might be reflected in increased control of associated species. The value of substituting dicamba for all or a portion of the picloram in combination with 2,4,5-T is not clear and requires additional research.

Table 4. Honey mesquite population (%) completely defoliated and not resprouting a year after aerial application of various rates (lb./acre) of dicamba or 2,4,5-T combined in equal ratios with picloram near Refugio, Texas.[1]

Location[2]	Total rate	Picloram applied in equal amounts with	
		Dicamba	2,4,5-T
1	2	86	87
2	0.5	54	40
2	1	65	68
2	2	74	80

[1] Honey mesquite plants completely defoliated and not resprouting a year after treatment are referred to as "root-killed" by some workers.
[2] The first location was treated in 1967, the second in 1968.

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