Response of Honey Mesquite to Method of Top Removal

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Highlight: *Shredding stimulates regrowth of honey mesquite in the Rolling Plains of Texas compared to spraying the foliage with 2,4,5-T, burning, and basal application of diesel or diesel + 2,4,5-T. Regrowth of shredded trees was 4.7 times greater than that of trees sprayed with 2,4,5-T and 6.6 times greater than that of trees previously burned. This information should aid ranchers in choosing initial control practices for honey mesquite which will maximize the time period before follow-up treatments will be necessary.*

Mechanical and chemical control of honey mesquite (*Prosopis glandulosa* Torr. var. *glandulosa*) on southwestern rangeland is often considered unsatisfactory because an inadequate percentage of the population is killed, because of high costs, or because the treatment must be repeated in a few years. Aerially spraying honey mesquite in the Rolling Plains of Texas with 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid) usually results in only 20 to 25% of the plants being "root killed" and is considered effective for only 3 to 5 years (Fisher, 1950; Fisher et al., 1972). Honey mesquite plants are very difficult to kill with prescribed burning unless they are very young or the aerial parts have been killed by previous treatment (Wright, 1972). Shredding results in little or no mortality of honey mesquite, while chaining is relatively ineffective on trees less than 13 cm in diameter (Weddle and Wright, 1970). Since top kill is the major effect of many of the conventional honey mesquite control practices, and since it is inevitable that follow-up practices will be necessary to control resprouts, it would be advantageous to know the relative influence of control treatments on the rate of resprout growth. This study was undertaken to determine if honey mesquite regrowth responds differently to different methods of top removal.

Top killing of honey mesquite releases dormant buds on the stem base or root crown from apical dominance, and these buds rapidly produce new leaves and stems (Meyer et al., 1971), resulting in prolific growth of multiple-stemmed, shrubby growth that often presents more difficult problems in management and control than the original single-stemmed, tree-type infestation (Scifres et al., 1974; Sosebee, 1974). Scifres and Hahn (1971) reported that 60% of the 7-day old honey mesquite seedlings tested survived and produced new branches after top removal above the cotyledons. Foliar area was produced more rapidly on clipped honey mesquite seedlings than on unclipped seedlings in the greenhouse. Wright and Stinson (1970) found that cutting honey mesquite trees at ground level at all seasons of the year reduced production of new leaves and stems at least 75% compared to uncut trees. Cutting in May, after the leaves had reached full size, reduced production more than at any other season. Scifres et al. (1974) found that range site and grazing systems affected rate of honey mesquite regrowth after aerial application of 2,4,5-T. Weddle and Wright (1970) and Sosebee (1974) have studied methods of control of honey mesquite resprouts following aerial spraying and shredding.

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Procedures

The study was conducted on the Dalby Ranch, 16 km south of Post, Texas, in Garza County, using single-stemmed honey mesquite trees growing in a heavy clay soil. The dominant plants in the study area were honey mesquite and tobosagrass (*Hilaria mutica* (Buckl.) Benth.). The climate of the area is semiarid with a mean annual precipitation of 48 cm, about 70% of which falls between April and September.

Honey mesquite trees on the study area were mostly 2 to 3 m in height and 7 to 12 cm in diameter. Six treatments, including: (1) aerial spraying with the propylene glycol butyl ether esters of 2,4,5-T; (2) basal treatment of mesquite stems with diesel oil + 2,4,5-T; (3) basal treatment of mesquite stems with diesel oil; (4) burning with a diesel torch (simulated range fire); (5) felling at ground level with a chain saw (simulated shredding); and (6) girdling with a chain saw near the ground, were each applied to randomly selected groups of 10 trees in late June, 1970. The basal diameter of each tree was recorded, and all trees were permanently marked for future reference. At the end of the second growing season following application of treatments (October, 1971), all honey mesquite regrowth from each tree was clipped at ground level, oven-dried in a forced-draft drying room at 70°C, separated into leaf and stem components, and weighed to the nearest gram. Leaf:stem ratios were calculated based on dry weight. The data were analyzed as a completely randomized design with covariance to determine differences between treatments for (1) total regrowth; (2) leaf biomass; (3) stem biomass; and (4) leaf:stem ratios. Basal tree diameters were used as the covariant in the analysis to eliminate variation due to tree size. Duncan's multiple range test (LeClerg, 1957) was used where appropriate to separate treatment means.

Results and Discussion

Method of top killing honey mesquite significantly influenced rate of regrowth and leaf:stem ratios. Basal

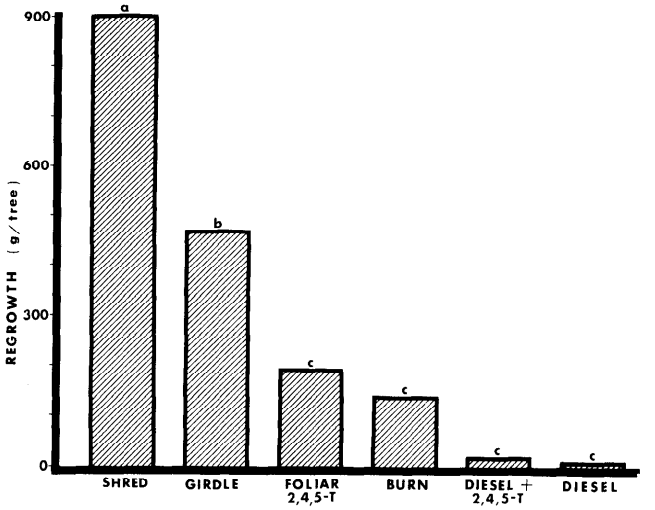

Fig. 1. *Regrowth of honey mesquite (g/tree) at the end of second growing season following top-removal by six methods. Mean values, indicated by bars, which have similar lower case letters are not significantly different (P < 0.10).*

treatments with diesel or diesel + 2,4,5-T resulted in 90% root kill, hence very low mean values for regrowth (Fig. 1). Burning and foliar application of 2,4,5-T did not result in effective root kill of mesquite, and all trees had resprouted by the end of the second growing season following treatment application. Regrowth from burned or sprayed trees was not significantly different from those trees that had received basal treatments of diesel or diesel + 2,4,5-T. The biomasses of regrowth produced by burned or sprayed trees were not significantly different. Girdling resulted in significantly more regrowth than spraying, burning, and basal treatments with diesel or diesel + 2,4,5-T, while shredding resulted in a much higher rate of regrowth than any of the other five treatments (Fig. 1).

Shredding, burning, or girdling resulted in significantly higher mean ratios of leaves to stems than basal applications of diesel or diesel + 2,4,5-T (Table 1). Regrowth on trees that were sprayed with 2,4,5-T had intermediate leaf:stem ratios.

These findings indicate that shredding in late June stimulates resprouting by basal buds of honey mesquite. Consequently, ranchers planning to use mechanical shredding as a honey mesquite control practice should expect to reapply maintenance control practices sooner, and perhaps more frequently, than if spraying with 2,4,5-T or burning are used. Wright and Stinson (1970) recommended shredding in mid-May in this area, when leaf growth of honey mesquite has terminated, to minimize the rate of honey mesquite regrowth. Ranchers should expect about the same rates of honey mesquite regrowth following spraying with 2,4,5-T and prescribed burning in March. Wright and Stinson (1970) reported that top removal of honey mesquite in March and late June results in equal rates of regrowth.

Brush control treatments that significantly reduce the total leaf biomass and leaf:stem ratios should also result in lower

Table 1. Mean leaf:stem ratios for regrowth of honey mesquite following top removal by six methods.

Treatments	Leaf:stem ratios[1]
Basal application of diesel + 2,4,5-T	0.017 a
Basal application of diesel	0.130 ab
Foliar application of 2,4,5-T	0.268 bc
Girdle near soil surface	0.313 c
Burn	0.316 c
Shredding	0.410 c

[1] Means followed by similar lower case letters are not significantly different ($P < 0.10$).

consumption of soil water by mesquite since transpiration rate and total water use by plants is proportional to total leaf biomass or leaf area. In this study, basal application of diesel or diesel + 2,4,5-T, burning, and spraying with 2,4,5-T resulted in significantly lower leaf production of honey mesquite than did shredding. Shredded trees produced over six times more leaf biomass than trees sprayed with 2,4,5-T and over eight times more than burned trees. This could be a very important factor in the grass-mesquite-soil water relationship, especially during years of below normal precipitation.

Girdling is not a recommended control practice for honey mesquite since this species resprouts from the root crown. Girdling was effective in top killing mesquite but resulted in no root kill. Girdled trees were expected to respond similarly to shredded trees but produced only about half as much total regrowth as shredded trees (significant at $P < 0.05$). Shredded trees produced 2.3 times more leaf biomass and 1.8 times more woody regrowth than girdled trees. Leaving the old mesquite trunk intact undoubtedly reduces the rate of regrowth from buds in the basal crown area.

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