Response of Mesquite to Season of Top Removal[1]

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Highlight

Top removal reduced yields of mesquite at least 75% during all seasons of the year. May yields were the lowest. This information may be helpful for planning shredding operations, but not for planning burns.

Fire shows the potential to kill young mesquite (Glendening and Paulsen, 1955; Fisher, 1947) and in some cases old mesquite (Glendening and Paulsen, 1955; Stinson and Wright, 1969), but it usually only top-kills them. Since top-kill is the major effect of fire on large mesquite trees, it would be advantageous to know if mesquite has a most vulnerable season of growth. This study was undertaken to see if mesquite responds differently to season of top removal throughout a 12-month period, although realizing that cutting mesquite at ground line as in this study may have a different impact than burning.

Some research has been done on the physiology of mesquite in relation to season but not for a 12-month period. Fisher et al. (1959) found that roots of mesquite contained the lowest total carbohydrate content on May 15. This study followed changes in carbohydrate level from March 1 to August 15 from 1953 to 1956 at Spur, Texas. The low point in root reserves, May 15, occurred when the mesquite leaves reached full development.

A low point in root reserves at time of full leaf development for mesquite correlates with the findings for other shrubs. McConnell and Garrison (1966) found that the lowest levels of carbohydrates in bitterbrush (*Purshia tridentata*) correlated with the termination of twig growth. Similarly, Wright (1970) showed that three-tip sagebrush (*Artemisia tripartita*) and big sagebrush (*Artemisia tridentata*) were harmed most seriously by clipping when flower stalk and twig growth terminated.

Glendening and Paulsen (1955) studied the response of mesquite to burning during different seasons. They burned triplicate ¼ acre plots during February, June and November. Mortality of mesquite was two to three times higher during June than during the other months. In a follow-up study burning trials were conducted at monthly intervals from April to July and no differences were found between the spring and early summer burns.

Methods

This study was conducted on the Couch Ranch, 15 miles east of Lubbock, Texas. All trees for the study were on a sandy loam site of approximately 3 acres. Elevation is 3200 ft and annual rainfall is 19 inches.

Two hundred and forty mesquite (*Prosopis glandulosa* var *glandulosa*) trees growing on a poor-condition mixed prairie range were selected for treatment. These plants varied in height from 4 to 12 ft and were randomly divided into 24 groups of 10 plants each. One group was assigned for cutting at ground level in each 2-week period from April 12, 1967, through January 3, 1968, and in each 4-week period thereafter until March 27, 1968. One group was reserved as a check.

Before treatment relative production for different sized trees was estimated for all plants on April 11, 1967. These estimates served as covariants for actual weight of plants one growing season after treatment.

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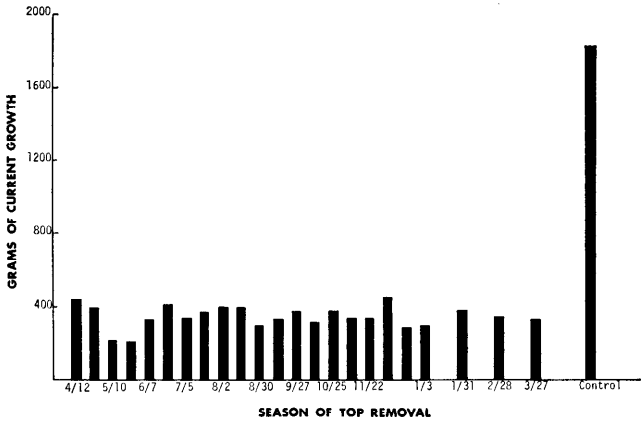

FIG. 1. Average yield of mesquite one growing season after top removal at soil surface.

In August, 1968, one growing season after treatment, all of the current growth (growth during 1968) from each individual tree was clipped, oven-dried for 72 hours at 70 C, and weighed. To facilitate interpretation of these data, phenological observations were recorded on the control plants in 1967 from the time leaf buds opened until the leaves turned yellow.

Results and Discussion

Top removal reduced yields of mesquite at least 75% during all seasons of the year (Fig. 1). During May, however, yields following treatment were the lowest. This was the only month in which top removal of mesquite was more critical than for other months. This finding supports the work of Fisher et al. (1959), but it also indicates that the yield of regrowth following treatment may not be in direct proportion to the total carbohydrate supply in the roots. According to Fisher et al., carbohydrates accumulate more or less continuously from May 15 to August 15, whereas our work shows that regrowth following treatments levels off after June 20. This suggests that something other than root reserves limits regrowth after a certain level of carbohydrates are restored.

The most detrimental time to top removal correlates with the termination of leaf growth (Table 1). This stage of phenology is also related to a low accumulation of carbohydrates as shown by Fisher et al. (1959).

As for practical application, these results only tell us that top-kill damages mesquite and that it is damaged most in May. But since the grass in west Texas is usually high in moisture in May, we cannot burn during this month, and this period of susceptibility to mesquite is not very helpful. Therefore, we plan to continue most of our burning when we can get hot fires that may damage mesquite and when grasses are most tolerant of hot fires—March.

Another point of interest is that since consumption of water and plant nutrients by mesquite is probably related to yield, three-fourths of the water that formerly was used by mesquite should be available for forage production.

For ranchers who are interested in using shredding as a brush control method, May appears to be the month to shred. At this time of year the grasses have only made a portion of their growth and they would not be harmed much by a shredder. Thus a May shredding should favor grass competition over mesquite.

Table 1. Dates of phenological changes for mesquite.

Stage of phenology	Dates		
LEAVES			
Buds bursting	4/4		
Half expanded	4/16		
Full size	5/16		
Mature (hard shiny)	6/5		
Drying, yellowing	10/26		
FLOWERS			
Flower buds bursting	4/25	6/21	7/16
Flowers full bloom	5/10	7/5	8/1
Flowers gone	5/24	7/20	8/15
PODS			
Forming	6/2	8/1	8/30
Full length, but not filled (half mature)	6/20	8/20	9/13
Mature, drying (seeds hard)	7/5	9/4	9/27
Falling	7/20	9/20	10/10

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