# TIMING- THE KEY TO HERBICIDAL CONTROL OF MESQUITE[1]

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Mesquite control has been practiced in Texas and the Southwest for more than 50 years, yet the degree and longevity of control continue to be a problem for ranchers. Control methods have ranged from hand treatments such as grubbing, chopping, and frilling (or girdling) to mechanical and chemical treatments. Hand treatments are labor intensive and, consequently, quite expensive. Likewise, mechanical treatments are time consuming and expensive. Often the grass cover is damaged and reseeding is required, thus increasing the cost of renovating rangeland. Consequently, herbicides have been a popular method of controlling mesquite since cost per acre has been relatively low and a large number of acres can be quickly treated.

Mesquite is well adapted to the Texas and Southwest climate. Mesquite can grow with less available soil water than many

other plants, especially cultivated crops. Lateral roots, concentrated in the surface 30 inches, extract moisture from a wide area, so it can readily use relatively small rains. The deep taproot provides moisture and nutrients to the plant during extended dry periods when shallow moisture is unavailable. Consequently, soil water is not as important as some other factors when planning a spray program, assuming that the trees are not truly moisture stressed.

Numerous herbicides, formulations, and rates have been studied. Types of aircraft and application equipment as well as total spray volume and swath width have received a great deal of attention. Yet the average root-kill remains consistently 20 to 25% statewide with a longevity of the treatment averaging less than 7 years. In most research, scientists have neglected to study the plant and its interrelationship with the environment as related to herbicide response. Although few herbicides are used to control mesquite, we found that when one herbicide is effective, usually others are effective and vice versa. Admittedly, some herbicides are more effective than others and some are not effective on mesquite at all, but the effectiveness of all herbicides seems to be governed by the same conditions.

Timing of herbicide application is the factor which is most influential in herbicidal control of mesquite. Control programs should begin with budbreak in the spring. Budbreak of west Texas mesquite generally occurs after the last frost of spring. We do not know when the last frost will occur, but we have developed an equation that will accurately predict when mesquite will break dormancy. The ability to predict budbreak as early as February or March provides ranchers and aerial applicators 4 to 6 weeks lead time in planning mesquite control. Budbreak in west Texas is closely correlated to daily minimum winter air temperatures, which can be obtained easily from newspapers, radio, or personal thermometers. Budbreak is unrelated to winter maximum or average air temperatures or soil temperature. The more consecutive days

with minimums below 30°F during January 15 to February 15, the earlier budbreak occurs (Table 1).

Table 1. Expected date of budbreak as determined from the number of consecutive days between January 15 and February 15 with minimum air temperature less than 30° F (Rolling and High Plains).

| No. of consecutive days with minimum air temperature below 30°F | Date of expected budbreak |
|---|---|
| 1 | May 5 |
| 2 | 3 |
| 3 | 1 |
| 4 | April 29 |
| 5 | 27 |
| 6 | 25 |
| 7 | 22 |
| 8 | 20 |
| 9 | 18 |
| 10 | 16 |

| | |
|---|---|
| 11 | 14 |
| 12 | 11 |
| 13 | 9 |
| 14 | 7 |
| 15 | 5 |
| 16 | 2 |
| 17 | March 31 |
| 18 | 29 |
| 19 | 27 |
| 20 | 24 |
| 21 | 22 |
| 22 | 20 |
| 23 | 18 |
| 24 | 15 |
| 25 | 13 |

Once budbreak occurs, further plant development is regulated by daylength. The use and replenishment of root carbohydrates follow a definite pattern (Figure 1). Herbicides are translocated in the same way as carbohydrates. From this information we can estimate the translocation pattern that will ultimately distribute the herbicide throughout the plant

after spraying. The greatest amount of root-kill is obtained when carbohydrates are translocated to the root and basal bud zone. There are 2 major periods when this translocation occurs to the root and basal bud zone: 1) 42 to 63 days, and 2) 72 to 84 days after budbreak. These time periods are only slightly altered by climate and reproductive potential of the trees. For a period of about 2 weeks in early summer (60 to 72 days after budbreak) the trees are not translocating to the roots; therefore, root-kill is low and only top-kill is achieved.

*Effective control of mesquite growing on a clay loam site. The pasture was sprayed June 27, 1969. Appearance of the pasture in 1983.*

If budbreak in most trees in a pasture occurs on April 15, then the best spray time would be during June 3 to June 17 and June 28 to July 7. In an exceptionally dry year, the first optimum spray period might be 1 week earlier. If the trees produce only a few flowers rather than many flowers, the second optimum spray period might be 1 week earlier (Figure 2).

Not only must the plant be in the proper physiological stage, but the environmental conditions, primarily soil temperature, must be appropriate for maximum control. Soil temperature in the active rooting zone (12 to 24-inch depth) should exceed 75°F. If soil temperature is less than 75°F, root-kill is less than 10% regardless of the physiological stage. However, if soil temperature is over 75°F (preferably 80°F or higher), root-kill exceeding 50 to 75 % often can be obtained if the above timing principles are observed.

*Clay loam or bottomland site with heavy infestation of mesquite, typically characterized by cool soil (less than 75o F).*

Often the soil temperature is less than 75°F, especially on heavy textured soils and wet sites, during the first period when sugars are translocated to the roots and basal bud zone. Control will be poor if the trees are sprayed then. Even so, many ranchers must spray during this time period, or even before, because of the proximity of susceptible crops. If one

must spray during this suboptimal period, less root-kill should be expected. We have consistently obtained more than 50% and often more than 75% root-kill when herbicide applications were properly timed within the physiological stage of mesquite and environmental conditions. When the trees are damaged by insects, water stress; etc., spraying should be postponed until another year. Our data indicates, however, that a dry spring usually will not stress mesquite unduly, since deep moisture is generally available. Rather, temperature of the dry soil rises earlier, often allowing one to spray during the first susceptibility period. Normally the soil temperature on finer textured and heavily shaded soils will be less than 75°F during this period. We have found sandy soils, dry soils, and upland sites warm more quickly in the spring while clay soils, bottom sites, sites with dense shade, and wet sites warm up more slowly.

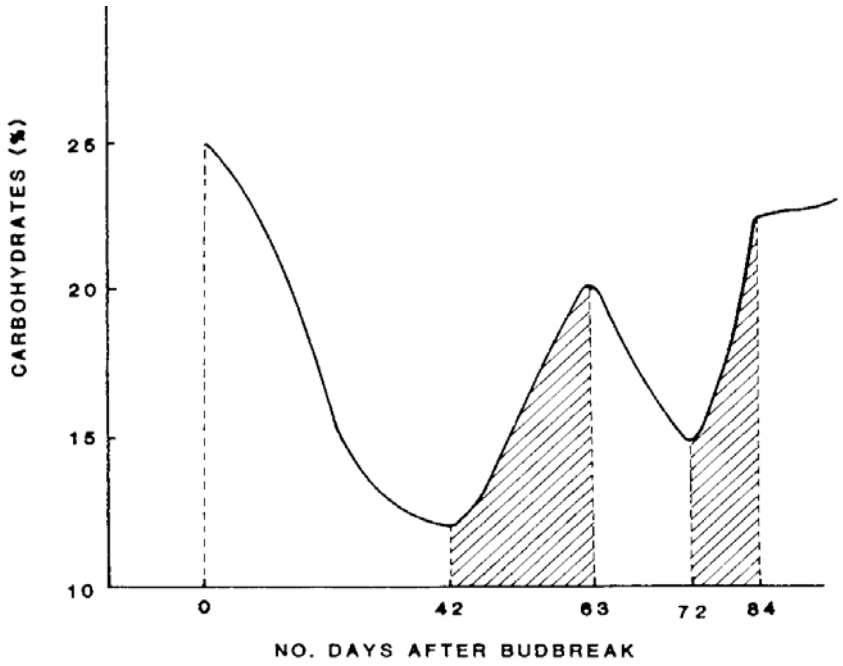


*Figure 1 General curve representing carbohydrate trends in roots and basal crown of mesquite from budbreak (Day 0) through about July 10 in west Texas. (Hatched areas represent optimum times to spray mesquite.)*

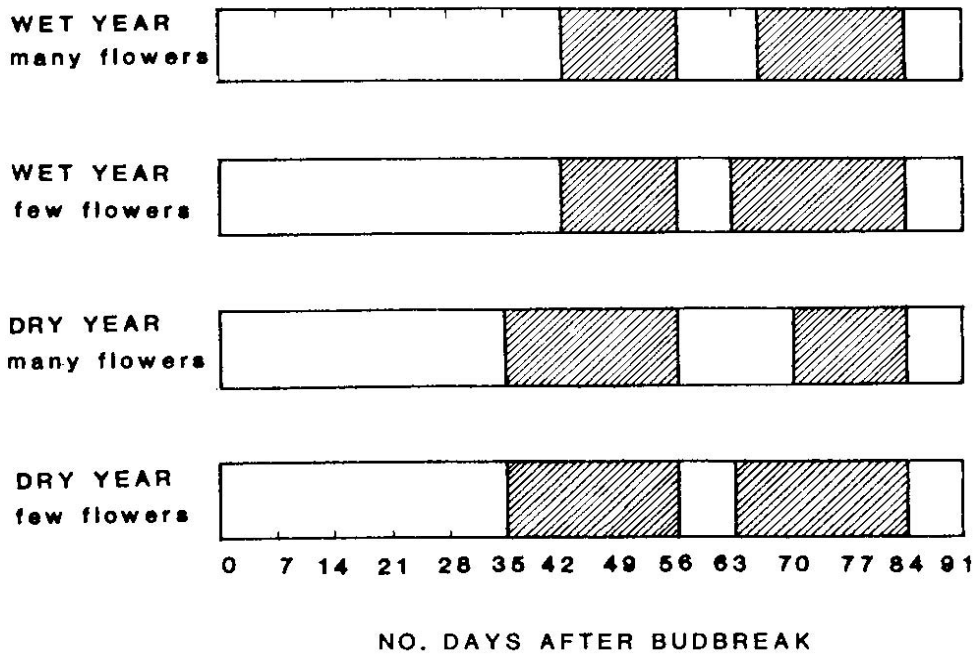


*Figure 2 Optimum time to spray mesquite (hatched areas) in west Texas according to the climatic conditions and reproductive capacity of the trees.*

## Summary

Recommended steps to successful mesquite control in west Texas.

1. Keep a record of the consecutive number of days that minimum air temperatures are less than 30°F between January 15 and February 15.

2. Calculate the estimated date of budbreak and begin planning your spray program for the forthcoming season.

3. Note the exact date that the majority of the trees break bud in the pasture(s) that are scheduled to be sprayed.

4. Calculate the 2 periods when maximum control can be expected, assuming the soil temperature is also optimal.

5. About 3 weeks after budbreak, begin measuring soil temperatures at 12 and18-inch depths on those sites that constitute the greatest acreages in the pastures to be sprayed, or those sites on which the control program is targeted. Soil temperatures can be measured by driving a 3/8-inch steel shaft into the ground to the desired depths and then inserting a glass thermometer into the hole. Allow the thermometer to come to equilibrium with the soil temperature before reading it, which takes about 10 to 15 minutes. Read it quickly and in the shade because the direct sunlight will cause the temperature to rise rapidly. (Laboratory thermometers are inexpensive and may be bought from any laboratory supply source.)

*Sandy loam or upland site with a typical infestation of mesquite. This site is characteristically warmer than one with a fine-textured soil.*

6. If the soil temperature is less than 75°F during the period 40 to 60 days after budbreak, and if you must spray, expect no root-kill. If soil temperature is less than 75°F, then postpone spraying until the later susceptibility period.

7. If soil temperature is over 75°F (preferably near 80°F, or greater) during the period 72 to 84 days after budbreak, then spray. This is probably the most optimum time for controlling mesquite in west Texas. If soil temperature still is less than 75°F, postpone spraying until another year .

8. If trees are damaged by insects, etc. and not in full foliage during optimal periods for maximum control, postpone spraying.

9. As long as a herbicide is registered for use on mesquite, then the kind and formulation used is probably not as important as the time of application.

10. *Always* spray according to label specifications.

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