RESPONSE OF MORMON-TEA TO BURNING[2]

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ABSTRACT

Mormon-tea (Ephedra antisyphilitica C. A. Mey) is a beneficial , evergreen browse plant for livestock and wildlife. On 25 February 1986, a 60-acre unit of the Texas Tech Experimental Ranch, Garza County, Texas, was subjected to a prescribed burn to determine survival and response of Mormon-tea. Ninety-six percent of burned plants and 100% of control (unburned) plants survived. Burned plants produced more ($\underline{P}$ < 0.01) basal sprout biomass than control plants.

Key words: Mormon-tea, Ephedra, prescribed fire, browse

INTRODUCTION

Forty species of Ephedra are distributed over the desert or semidesert regions of Asia, northern Africa, and North America. Mormon-tea (E. antisyphilitica C. A. Mey) is found from extreme southwestern Colorado, through Arizona, New Mexico, western Texas, and northern Mexico (Correll and Johnston 1970). This species is a drought-tolerant, densely branching shrub with jointed photosynthetic stems and branches and persistent scale- like leaves. Mormon-tea is often grazed heavily by livestock and is the primary source of green browse for wildlife during winter months in certain areas (USDA Forest Service 1937, Cumbie 1952, Correll and Johnston 1970).

Although fire kills longleaf Ephedra (E. trifurca) (Thornber 1907), its effect on Mormon-tea is not documented. Our objectives were to determine the survival of Mormon-tea following a winter prescribed burn and to evaluate the subsequent response of surviving plants.

STUDY SITE

This study was conducted on a 60-acre range site on the Texas Tech Experimental Ranch, 6 miles southeast of Justiceburg, Garza County, Texas. About 75% of the average annual precipitation (19 in) occurs from May to October (Richardson et al. 1965).

MATERIALS AND METHODS

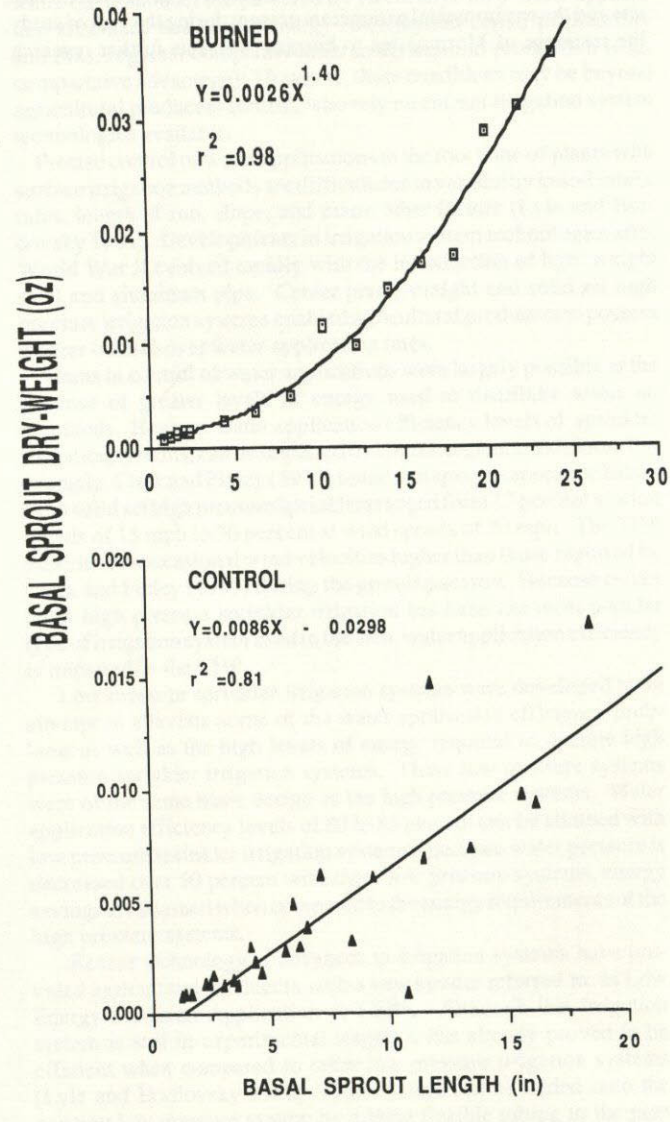
Preciptation was recorded throughout the study using a standard rain gauge. Twenty-eight Mormon-tea plants were randomly selected and marked with metal, fire-resistant stakes before burning the study site. Twenty-nine control plants were marked in unburned areas adjacent to the burned site. Sample size was restricted by available time and plants.

A prescribed burn was conducted on 25 February 1986. Relative humidity ranged from 20 to 40%, temperature rose from 63 to 84°F, and wind speed averaged 5 mph during the burn. Fine fuel, composed primarily of tobosagrass (Hilaria mutica [Buckl.] Benth.), averaged 1,500-2,500 lb/ac. Two months after the burn, surviving burned and control plants were counted. Plants were evaluated weekly for survival.

Weekly measurements of the number and length of basal sprouts on burned and control plants were recorded from 6 April to 21 June 1986 to evaluate the response of the plants to burning. Control plants exhibited basal sprouting, and secondary growth on aerial stems. Only new growth as basal sprouts was directly comparable between burned and control plants because burned plants were completely top-killed.

In early July, basal sprouts from burned and control plants were clipped to ground level and measured to the nearest 0.1 in. These basal sprouts were taken to the laboratory, freeze-dried, and weighed (dry-weight, oz).

Basal sprout dry-weight (dependent variable, Y) was regressed on basal sprout length (independent variable, X) for burned and control plants, and best-fit regression models were determined based on maximum coefficient of determination (r^2) values (Fig. 1). Regression models predicted basal sprout dry-weight given basal sprout length. Basal sprout dry-weight biomass of burned and control plants was determined 4 months after the burn using the regression models. Biomass of burned and control plants was compared using a Wilcoxon rank sum test (Hollander and Wolfe 1973).



BASAL SPROUT LENGTH (in)

Figure 1. Basal sprout day-weight regressed on basal sprout length to determine best-fit regression equation to allow calculation of basal sprout biomass of burned and control plants 4 months after burning.

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RESULTS AND DISCUSSION

The study site received 11.5 in of rainfall during the collection period, 23% above the 52-year mean. Above normal moisture after the burn and during the growing season may have positively influenced plant survival. Although there was 100% top-kill of burned plants, 96% (n=28) survived and initiated new basal sprout growth by 30 March 1986. All control plants (n=29) survived and produced basal sprouts and secondary growth from aerial stems.

Based on maximum r^2 values, the best-fit regression model for burned plants was $Y = 0.0026x^{1.40}$ ($r^2 = 0.98$), and for control plants was $Y = 0.0086x - 0.0298$ ($r^2 = 0.81$), where Y = predicted dry-weight (oz) of basal sprout at x = length (in).

Burned plants produced more ($\underline{P} < 0.01$) new basal sprout growth (mean $\pm$ SE = 0.24 $\pm$ 0.03 oz/plant) than control plants (0.001 $\pm$ 0.0004 oz/plant). Basal sprouts on burned plants were more accessible to browsers than those on control plants because there was no interference from crown stems.

Mormon-tea successfully survived burning and produced new growth as basal sprouts under the conditions of this study. Although control plants also produced basal sprouts, fewer resources were allocated to such production, perhaps due to allocating resources to new growth on aerial stems. Because this project was restricted to one site and the enviromental parameters present during the year of study, the response of Mormon-tea to burning warrants further research. However, this study indicated that ranch managers may successfully burn range sites in the winter to reduce litter buildup and undesirable brush species without killing a desirable, evergreen browse species such as Mormon-tea.

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