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LEAF GROWTH OF BRIGALOW (*ACACIA HARPOPHYLLA*)
SUCKERS IN RELATION TO SEASONAL CONDITIONS

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SUMMARY

Leaf growth of brigalow suckers commenced after winter in 1962 when the mean minimum temperature rose to over 50°F. The duration of this growth and subsequent summer growth were related to prevailing soil moisture conditions. The brigalow grew until the first frost in 1963, this late growth being attributed to the very wet preceding summer. Vigorous regrowth occurred after complete defoliation by fire in late 1963.

Decline in leaf area was due to insect damage, leaf loss and leaf-tip dieback. Insect damage was most severe on succulent new growth, while leaf loss and leaf-tip dieback were more prevalent after frosting and the development of dry conditions.

Introduction

The effect of various control measures on brigalow (*Acacia harpophylla* F. Muell.) has been related to many factors, the more apparent of these being type of scrub, soil type, age of the aboveground parts, time of year, rainfall, prevailing soil moisture conditions, and whether the brigalow is producing new leaves or not (Isbell 1962; Johnson 1962, 1964). The relationships of these factors to the internal mechanisms of brigalow that are responsible for its resilience and survival are unknown, but it is postulated that carbohydrate metabolism and translocation are key factors (Johnson 1964).

This paper describes the seasonal growth of brigalow suckers, using total leaf area as the growth index.

Methods

The datum area was located 1 mile from the Post Office at Emerald, in Central Queensland, and contained brigalow suckers that had regenerated from an open brigalow/yellowwood (*Terminalia oblongata* F. Muell.) forest area which was pulled in January 1961 and allowed to grass naturally. The resultant pasture was dominated by Queensland blue grass (*Dichanthium sericeum*) and *Panicum decompositum*, with brigalow grasses (species of *Chloris* and *Paspalidium*), nardoo (species of *Marsilea*), spring grass (species of *Eriochloa*) and nut-grasses (species of *Cyperus*) in smaller quantities. The topography was flat, and the soil was a deep grey cracking clay with incipient gilgai development. Brigalow sucker density in the trial area was approximately 800 suckers per acre.

Twenty small brigalow suckers were selected and their total leaf area was measured by comparing each leaf with a set of leaf standards arranged in a logarithmic scale of areas, as in the method outlined by Williams (1954). The leaf standards were prepared from dyeline prints of collected brigalow leaves, and because of variation in the length/breadth ratio of the leaves, three standards for each size class were employed.

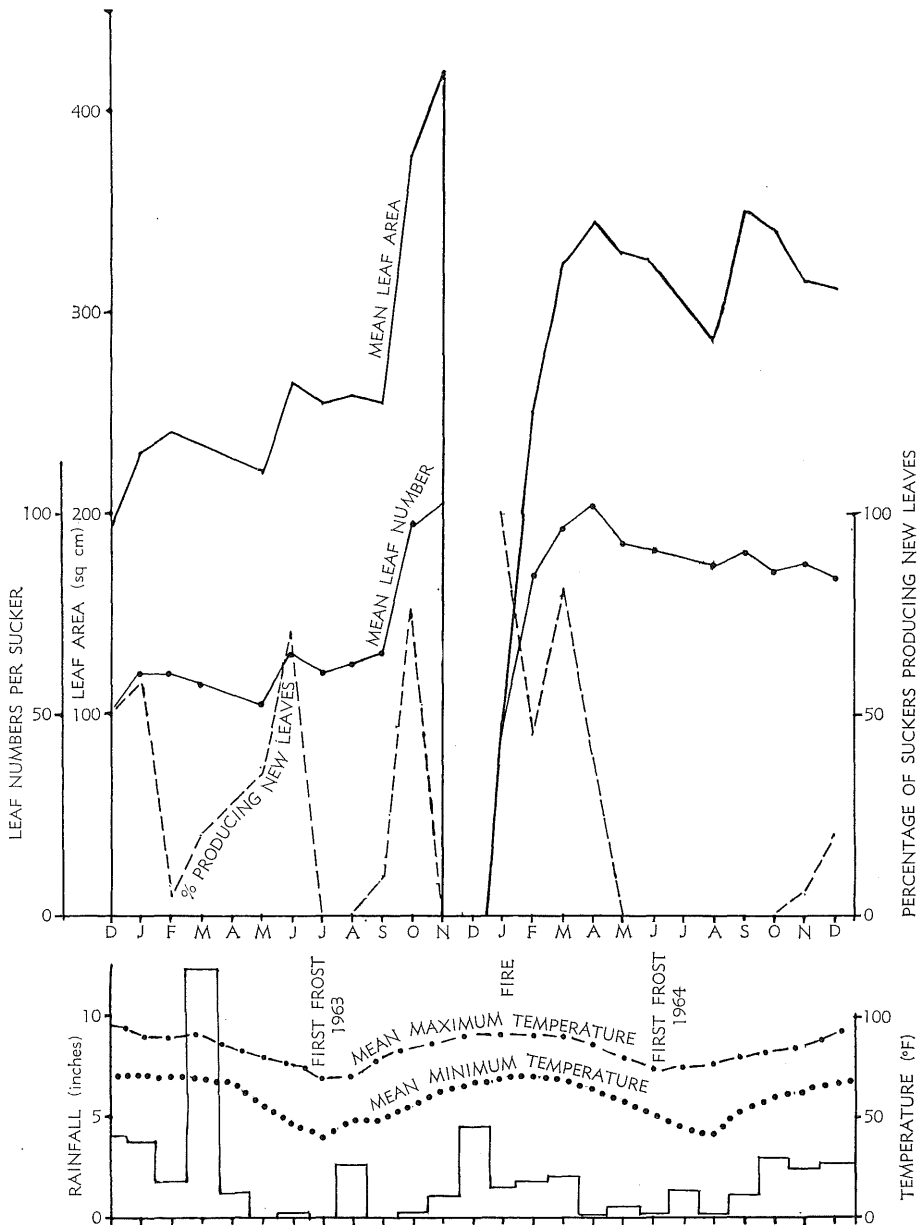


Fig. 1.—Leaf growth of brigalow suckers, with corresponding meteorological data.

Measurements were commenced in mid December 1962 and were repeated monthly until the trial was terminated due to cultivation of the paddock in December 1964. The trial site was burned in late November 1963, killing all top-growth, so in the second half of the trial the regrowth from the original suckers was measured.

The climatic data used were recorded by the meteorological station at the Emerald Post Office.

Results and Discussion

The mean leaf area per sucker, the mean leaf number per sucker, and the percentage of suckers producing new leaves are presented in Figure 1, together with corresponding climatic data. Growth data are based on the number of suckers living at the time of observation.

Large variations in the time and amount of growth of different suckers occurred. Increases in mean sucker leaf area were associated with increases in sucker leaf number and the number of suckers producing new leaves. The general displacement of the leaf area curve relative to those of the other two parameters suggests that expansion of leaves contributes to leaf area increase after the cessation of new leaf differentiation, while the initial production of small new leaves has negligible effect on total leaf area. The sudden increase in leaf area recorded in September 1964 was due almost entirely to expansion of existing leaves.

Flushes of growth were measured in summer 1962-63, early winter 1963, spring 1963, summer in early 1964 after complete defoliation by burning in the preceding November, and spring 1964.

Spring increases in leaf area, although occurring in a different month in each year, corresponded with a rise in the mean daily minimum temperature to above 50°F for the preceding month in both years. Johnson (1964) found a correlation between the commencement of growth after winter and a rise in the daily maximum temperature to above 75°F for brigalow seedlings growing in Brisbane, but found no correlation for minimum temperature. Daily mean maximum temperatures did not seem to be related to the commencement of growth after winter in this trial, and it is felt that maximum temperature is not important in the Emerald environment, as daily maxima of over 75°F are common throughout winter and on one day a maximum of over 80°F was recorded after an early-morning frost.

The lower growth rate in the dry spring conditions of 1964 compared with that during the moister conditions of the 1963 spring suggests that after the initiation of spring growth the amount, duration and subsequent summer growth are dependent largely on soil moisture conditions. This confirms an observation made by Johnson (1964).

It is not known whether the summer growth of 1962-63 was an uninterrupted continuation of the spring growth for 1962, but Johnson (1964) observed that regardless of the amount of spring rain a period of relative dormancy appears to follow the first burst of growth in spring. The leaf growth in early winter of 1963 was presumably initiated by the heavy falls of rain of the preceding March.

The long delay between the rain and a recorded increase in leaf area could be due partly to the dormancy phenomenon and partly to the attacks by the larvae of leaf-eating insects. It was only after the advent of cooler weather, when insect activity was reduced, that an increase in leaf area was measured.

Johnson (1964) observed brigalow to continue growth as late as June. The lower temperatures recorded during this early winter growth period than at the resumption of growth after winter suggest that soil temperature, which is higher in the autumn, could also be a determining factor. Early winter growth was terminated by frost and no growth was observed during periods of frost.

The mean leaf area in summer 1963-64 after complete defoliation by fire in late November 1963 attained almost the same level as that before burning. This demonstrates the vigor with which brigalow can regenerate after this type of treatment.

Decreases in mean leaf area per sucker were due to attacks by larvae of leaf-eating insects, leaf loss and leaf-tip dieback. Attacks by leaf-eating insects were confined to periods when leaves were relatively soft and succulent during and after periods of new leaf production, while leaf loss and leaf-tip dieback, although seemingly occurring at any time, were more prevalent after frost and the development of dry conditions.

The decline in leaf area after the growth flush of early 1963 was due mainly to insect damage, while the slight decline after the growth flush in early winter of the same year was due mainly to leaf loss after frost, the insect population having disappeared. The larger declines in leaf area after the growth flushes of 1964 were due mainly to leaf loss in the extremely dry conditions then prevailing. Insect damage was far less in 1964.

Except at the early stage of emergence of new suckers after burning, not all the visible suckers grew at any one time. This is in agreement with the observations of Johnson (1964).

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