CONTROLLING DENSE INFESTATIONS OF *PROSOPIS PALLIDA*

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Summary Queensland's rangelands are under threat from mesquite (*Prosopis* spp.), a thorny shrub or small tree that has the potential to form dense thickets which out-compete natural vegetation, interfere with mustering, injure livestock and damage property vehicles. The control of isolated infestations of mesquite should be a high priority if further spread is to be prevented. Preliminary findings from an experiment being conducted on dense infestations of *Prosopis pallida* (Humb. & Bonpl. ex Wild.) Kunth showed that mechanical methods of single pulling, double pulling and bulldozing reduced initial plant densities by 60, 80 and 99% respectively. While bulldozing was equally effective on all tree sizes, pulling was most effective on larger trees. Secondary treatments (fire, chemicals and single pulling) will be tested for control of plants that survived the initial treatments and any seedlings that emerge from soil seed reserves. Recommendations will then be made on the most economical combinations of primary and secondary treatments that effectively control *P. pallida.*

INTRODUCTION

Since being introduced as a shade tree in the early 1900s mesquite (*Prosopis* spp.) has formed dense isolated patches in areas of Queensland (Jones 1992). These dense thickets of mesquite out-compete natural vegetation, interfere with mustering, injure livestock and cause damage to property vehicles (March 1995). Fortunately the area currently infested is relatively small when compared with its potential distribution which includes much of northern Australia. Thus, control of these isolated infestations now will save more expensive eradication costs in the future.

This paper presents preliminary findings from an experiment currently being conducted to develop cost effective management strategies for the control of dense stands of *P. pallida*. This research is part of a new Strategic Weed Eradication and Education Program (SWEEP) initiated by the Queensland Government.

MATERIALS AND METHODS

The experimental site was located at Hughenden (20° 51'S, 144° 12'E) on a loam soil covered with a dense stand of *P. pallida* (average density of 2070 plants ha^{-1}) of varying size. A split plot design was incorporated with primary control strategies allocated to main plots and secondary control strategies to sub-plots. Each treatment was replicated four times, with sub-plots 50 × 100 m in size and surrounded by a 5 m wide border.

Main plot treatments were implemented in October 1995 before the start of the wet season and involved either bulldozing (BD), single pulling (SP), double pulling (DP) or no treatment (NT). Both the bulldozing and pulling treatments were imposed using two D9 bulldozers. Pulling involving dragging a large chain between the two bulldozers. Double pulling involved two runs with the chain, with the second run done in the opposite direction to the first.

Sub-plot treatments will be applied before regrowth becomes reproductive and has the opportunity to replenish the soil seed reserves. Treatments to be tested include chemical (CH), fire (F), single pulling (SP) and no treatment (NT). For this paper only results on the effectiveness of the primary control strategies will be presented.

Treatment effects were determined by monitoring 100 tagged trees in each plot. These trees were randomly selected from within a 10 m strip running longitudinally through the middle of the plot. The height and basal diameter of these tagged trees were recorded one month before treatments were applied. Four months after treatment application they were checked again for survival and their basal area measured if still alive. The time taken for treatments to be implemented was also recorded, thereby allowing a cost per unit are to be calculated.

The number of surviving trees and the total basal area of these trees following treatment are expressed in the results as percentages of the original densities and basal areas respectively. These data were transformed using arcsine transformation and then subjected to analysis of variance. Results are presented as back transformed means.

RESULTS

Basal area All mechanical treatments significantly reduced the basal area of *P. pallida* (Figure 1). After four months, the basal area of *P. pallida* in control plots had increased by 9%, and decreased by 65, 89 and 99% in single pulled, double pulled and bulldozed plots respectively.

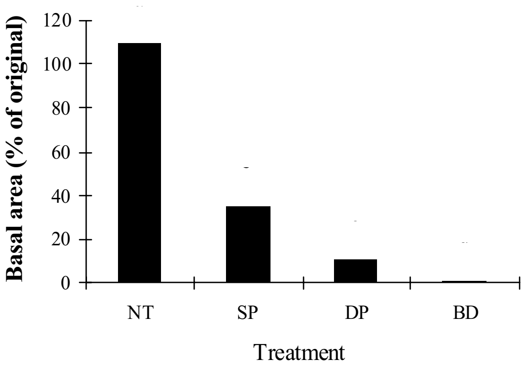

Figure 1. Effect of mechanical treatments on the basal area of *P. pallida*. Bars with the same letter are not significantly different (P>0.05).

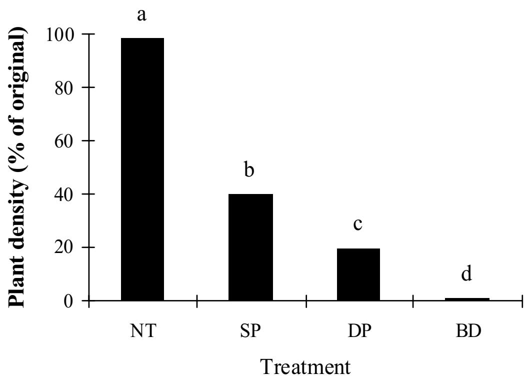

Figure 2. Effect of mechanical treatments on the density of *P. pallida*. Bars with the same letter are not significantly different (P>0.05).

Plant density The decreased basal area in mechanically treated plots was associated with mortality of plants with the more severe treatments reducing the density of *P. pallida* the most (Figure 2). While control plots remained relatively unchanged, plant density was decreased by 60, 80 and 99% in single pulled, double pulled and bulldozed plots respectively. Bulldozing was effective in controlling all tree sizes, whereas pulling was most effective on larger trees.

Control costs Bulldozing was by far the most expensive mechanical treatment with the cost of control increasing proportionally with tree density (Figure 3). Single and double pulling cost \$A25 ha^{-1} and \$A54 ha^{-1} respectively, irrespective of tree density.

DISCUSSION

These preliminary results have highlighted the effectiveness of some mechanical treatments in reducing the density of original infestations of *P. pallida* in rangelands. However, follow up treatments are essential to control plants that survive these primary treatments and/or any new seedlings that emerge from soil seed reserves. Therefore, interpretation of these preliminary results with regards management implications should be delayed until secondary treatments are applied and the best combination of primary and secondary strategies determined. Even though bulldozing was the most effective primary treatment it was very expensive and would be unlikely to be adopted by graziers for large scale clearing purposes. Pulling on the other hand could be a feasible option if conducted in combination with an economical and effective secondary control strategy.

The timing of secondary treatments will largely depend on the prevailing environmental conditions, which will influence the density and growth rate of the regrowth. They should however be implemented before the regrowth has an opportunity to set seed and replenish the soil seed bank.

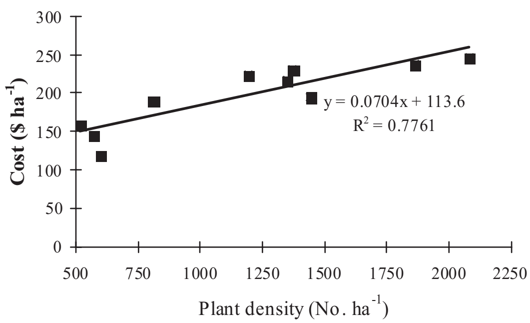

Figure 3. Relationship between cost of bulldozing and plant density of *P. pallida*.

ACKNOWLEDGMENTS

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