EFFECT OF FIRE ON THREE SHRUB SPECIES IN A PREVIOUSLY DISTURBED *EUCALYPTUS POPULNEA* WOODLAND

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Summary. Budda or false sandalwood (*Eremophila mitchellii*), black wattle (*Acacia deanei*) and birdseye wattle (*Cassia nemophila*) in a previously cleared poplar box (*Eucalyptus populnea*) woodland in south-eastern Queensland were subjected to three burning regimes. Burning treatments were applied at three times of the year and the fuel consisted of either sown buffel grass (*Cenchrus ciliaris* cv Biloela) or native pasture. High percentage reductions of both the birdseye wattle and black wattle were obtained at each burning time, whilst false sandalwood showed some resistance to burning. Birdseye wattle and black wattle seedlings established after the fires; the importance of follow up burns and the inability of native pasture to provide the necessary fuel are emphasised.

INTRODUCTION

Poplar box grows on a wide variety of soils ranging from brown cracking clays to deep sands, but the most typical soils are the red-brown earths. Although there are extensive stands in which poplar box is the only tree present, it is frequently associated with a number of other tree species and shrubs. On the red earths of south-eastern Queensland the common shrub associates of poplar box are false sandalwood, black wattle and birdseye wattle. These shrubs are unpalatable to stock when mature and because of their dense stands create animal husbandry problems (Moore 1970). The reduction of tree densities and methods of controlling their regeneration on lands for grazing have been outlined by Moore (1972). Stem injection with chemicals has been shown by Robertson and Moore (1972) to be an effective way of thinning poplar box shrub woodlands, whilst Moore and Walker (1972) have shown that intermittent heavy grazing pressures by sheep, in conjunction with burning, greatly reduce shrub populations in a poplar box woodland previously thinned by chemicals.

This paper presents preliminary results from an experiment designed to investigate the effect of fire on these three shrubs which have increased greatly in number following mechanical pulling of a poplar box woodland.

MATERIALS AND METHODS

The studies were conducted on "Fairymount" station near Talwood in south-eastern Queensland (28° 30' S, 149° 30' E) in the centre of an extensive area of semi-arid shrub woodland (Moore and Perry 1970). Average rainfall of 500 mm per annum is predominantly in summer but has a significant winter component.

The experimental site was an area of poplar box shrub woodland that had been mechanically pulled and stickraked in 1973 leaving the area clear of logs and standing shrubs. The area was subdivided into blocks 400 by 100 m, some of which were sown to buffel grass at the rate of 2 kg ha^{-1} in September

1973, and some left as native pastures. The total area was grazed by sheep at normal station stocking rates until February 1977, by which time substantial shrub regrowth had occurred. Half of the area was fenced in February 1977 to exclude sheep and the area was used for this experiment.

Burning took place in 50 m by 50 m plots in August and December 1977 and March 1978; that is, mid-winter, mid-summer and late summer burns. Prior to each burn all shrubs within each of the 24 plots were counted and four 1 m^2 quadrats were harvested to measure fuel load.

From March to October 1978, a total of 280 mm of rainfall was recorded over the experimental area, providing adequate soil moisture for the survival and regrowth of shrubs and herbage. In October 1978, seven months after the March 1978 burns and 14 months after the first burn, surviving plants in each plot were counted and the death of shrubs originally in the plots calculated. Seedlings which emerged and had survivied 6 months after a fire were counted.

RESULTS

The effect of the three burning times in reducing false sandalwood, black wattle and birdseye wattle together with mean fuel load are given in Table 1.

Table 1. The effect of burning in three different seasons on false sandalwood, black wattle and birdseye wattle stands. Each season/pasture combination value is the mean of four plots.

Pasture type	Time of Burn	False sandalwood	Black wattle	Birdseye wattle	Fuel (g m^{-2})
		No. of plants counted initially			
		1297	2357	10 508	
		% reduction			
Native	Aug.	25	63	89	301
	Dec.	48	90	75	238
	Mar.	23	88	69	287
	Mean	35	80	78	-
Buffel	Aug.	52	85	63	457
	Dec.	49	94	67	336
	Mar.	20	68	62	433
	Mean	40	82	64	-
L.S.D. (P = .05) between times		11	18	14	-
L.S.D. (P = .05) between species mean values = 20					

Fuel loads were generally lower in ungrazed native pasture plots than in buffel grass plots but gave similar percent mortality. False sandalwood was the most resistant species to fire with mean percent reduction in the range 20 to 50% compared with black wattle and birdseye wattle which had values in the range 62 to 94%. More plants died after fires in December than after fires in other seasons; March fires generally had the lowest percent reduction.

Seedling regeneration and survival to 6 months for the three species

following the fires are given in Table 2.

Table 2. Seedling counts per 50 by 50 m plots 6 months after a fire. Each season/species combination is the mean of four plots.

Pasture type	Time of Burn	False sandalwood	Black wattle	Birdseye wattle
		No. of seedlings/plot		
Native	Aug.	0	1	6
	Dec.	1	62	98
	Mar.	1	5	20
	Mean	1	22	41
Buffel	Aug.	0	1	4
	Dec.	2	6	40
	Mar.	0	2	10
	Mean	1	3	18

L.S.D. (.05) between times and species = 15

Birdseye wattle and black wattle seedling regeneration occurred after the fires especially that of December 1977. Virtually no false sandalwood seedling regeneration occurred. Shrub seedling regeneration was greatest in the native pastures and represented approximately 25% of the total shrub population.

DISCUSSION

The results show that fires at the times tested can substantially reduce existing shrub numbers, and that high levels of seedling regeneration occurred after the December fire. The results indicate the importance of morphological attributes of woody weeds in protecting plants against fire. False sandalwood can resprout vigorously from stem and root buds and as a consequence its survival is much higher than birdseye wattle or black wattle which have less effective root sprouts and depend more on seed production for survival as shown by the seedling establishment data.

The use of fire to control woody weeds depends initially on the ability of a fire to kill plants. However if a high death rate of existing plants is followed by a high seedling establishment then it is crucial to be able to reduce seedling numbers either by grazing (Moore and Walker 1972) or by a follow up fire. Whilst fires in native fuels gave roughly similar results to buffel grass fuel (Table 1) it has not been possible up to December 1980 to light another fire in native pastures following those of March and December 1977, but it has been possible to light fires in buffel grass plots under normal station grazing pressures. Buffel pastures appear to withstand fire very well and can be used for a follow up burn provided they are not over-grazed in the 1 to 2 month period following fires. However, the use of follow-up fires to permanently reduce woody plant populations in native pasture is rarely possible. Damage to native pastures following fire is a critical consideration, and at this stage fires in August appear to have least effect on future pasture production.

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