

## Control of currant bush (*Carissa ovata*) in developed brigalow (*Acacia harpophylla*) country

P.V. BACK

Queensland Beef Industry Institute, Department of Primary Industries, Tropical Beef Centre, Rockhampton, Queensland, Australia

### Abstract

Currant bush (*Carissa ovata*) is the major native woody weed invading sown buffel grass pastures in cleared brigalow (*Acacia harpophylla*) forests in Queensland. Stickraking followed by chisel ploughing is a viable alternative to and is more economical than herbicide treatment and blade ploughing for controlling currant bush. Chisel ploughing following stickraking gives good control of currant bush with no detrimental effect on existing buffel grass pasture. Stickraking alone is not sufficient to control currant bush.

### Introduction

Currant bush (*Carissa ovata*) is an erect or spreading, intricately branched shrub, 1–2 m tall, rarely semi-climbing up to 4.5 m tall, glabrous or scabrous with opposite axillary spines. In Queensland, it is found from the New South Wales border to southern Cape York. Its habitat ranges from seaside scrubs to softwood and brigalow (*Acacia harpophylla*) scrubs and semi-arid eucalypt woodlands. Currant bush occurs most frequently in the 500–650 mm annual rainfall belt (Anderson 1993). It is one of the commonest woody plant species to regrow following clearing of brigalow and brigalow-softwood scrubs on duplex soils in areas north of the Tropic of Capricorn. Currant bush spreads by seed and vegetatively by layering, forming dense clumps that can cover over 100 m<sup>2</sup>. These clumps

can coalesce to cover large areas that significantly reduce pasture production.

Ploughing to control brigalow regrowth (Johnson and Back 1974; Scanlan and Anderson 1981) can control currant bush effectively but is very expensive. A more cost-effective treatment is needed for areas where currant bush dominates in the absence of brigalow regrowth. This paper reports a study designed to test the effectiveness of 6 mechanical methods and 2 herbicide treatments for controlling currant bush in situations where it is the major weed.

### Materials and methods

#### Site

The experiment was carried out on “Tulloch-Ard”, a commercial cattle grazing property 10 km west of Blackwater in central Queensland (23° 33' S, 148° 44' E). The original vegetation comprised a brigalow — blackbutt (*Eucalyptus cambageana*) scrub with currant bush present in the understorey, which was cleared and sown to buffel grass (*Cenchrus ciliaris*) in 1988. Other woody species present at the time of treatment were: *Acacia excelsa*, *A. oswaldii*, *A. salicina*, *Alectryon diversifolium*, *Alstonia constricta*, *Apophyllum anomalum*, *Brachychiton rupestris*, *Capparis lasiantha*, *Cassia brewsteri*, *Clerodendrum floribundum*, *Denhamia oleaster*, *Diospyros ferrea*, *Ehretia membranifolia*, *Eucalyptus populnea*, *Hakea fraseri*, *Hovea longipes*, *Opuntia tomentosa*, *Owenia acidula*, *Terminalia oblongata*, *Ventilago viminalis*, and a number of unknown *Capparis* spp.

The soil is a brown sodosol (Isbell 1996) with a 40 cm sandy to sandy-loam surface over a sodic clay subsoil. The site was well grassed with buffel grass. To avoid heavy grazing following treatment, a 3-wire electric fence was erected to exclude stock during the trial. This also allowed the pasture to re-establish and build up fuel for the burning treatment.

Correspondence: P.V. Back, Department of Primary Industries, Tropical Beef Centre, PO Box 5545, Central Queensland Mail Centre, Qld 4702, Australia. e-mail: backp@dpi.qld.gov.au

### The experiment

Nine treatments were imposed on 0.5 ha plots (50 m × 100 m) in a randomised block design with 3 replicates. The treatments were:

1. Control, no treatment
2. Stickrake in one direction
3. Stickrake in 2 directions
4. Stickrake, then burn 19.5 months later
5. Stickrake, then chisel plough and sow
6. Stickrake, then offset disc plough and sow
7. Stickrake, then blade plough and sow
8. Apply tebuthiuron at 1.5 kg active ingredient/ha
9. Apply tebuthiuron at 2.0 kg active ingredient/ha

[Stickraking is a method of removing logs, sticks and shrubs from an area prior to cultivation with conventional equipment. In this case, a Caterpillar D7 tractor, fitted with a specially constructed stickrake replacing the normal blade, was used.]

The chisel plough used was a 23 tine Shearer 'Trashworker' with 45 cm sweeps and the offset disc plough was an International 'Model 780'. It was planned to maintain a ploughing depth of 10–15 cm but, because of the dry conditions, an average depth of 5–10 cm was all that could be achieved. The blade plough was a 3 m Homan plough pulled by a Caterpillar D8 tractor and a minimum ploughing depth of 20 cm was attained.

The ploughed plots were seeded with the legume *Stylosanthes scabra* cv. Seca at 4 kg/ha following treatment. It was not necessary to replant the buffel grass, as adequate seed had been set from the existing pasture.

Tebuthiuron was applied to the plots as 'GRASLAN'® pellets using a modified 'Solo' misting machine which gave a swath width of approximately 20m. Three runs, 16.6m apart, were made along the length of the plot which allowed some overlap.

Permanent belt transects, 50m × 4m, were located in the centre of each plot to assess the density and canopy cover of currant bush prior to treatment. Currant bushes expand horizontally by layering and the multi-stemmed plant was recorded as an individual if it was not obviously joined to another (fire, drought and mechanical damage can cause the layered stem to be disconnected from the parent plant creating separate plants). All woody plants were recorded using the 'TRAPS' (Back *et al.* 1997) technique, which

allows the relocation of individual plants by recording their distance along the transect, which side of the transect centre line they are on and their distance from that line. The species, height, number of stems, stem basal area and canopy area for each plant can be recorded. In this study, only the plant species, its height and canopy area were measured. The canopy of each currant bush was recorded by measuring the diameter at right angles to the transect line and parallel to it. Where insufficient numbers (fewer than 50 plants) were present in a single transect, subsequent transects were placed alongside the first, thus effectively increasing the sample area in the centre of the plot. No more than five transects, giving a sampling area 50m long and 20m wide, were needed in any plot.

The 'GRASLAN' treatment was imposed on February 2, 1994 and stickraking was carried out between February 11–14, 1994. The chisel and offset disc ploughing treatments were imposed on March 28 and the blade ploughing carried out on April 11. Treatment 4 (stickrake and burn) was burnt on September 27, 1995 and individual plants rated for the effect of the fire on October 5, 1995. All plots were re-recorded in July 1995 (17 months) and June 1996 (28 months).

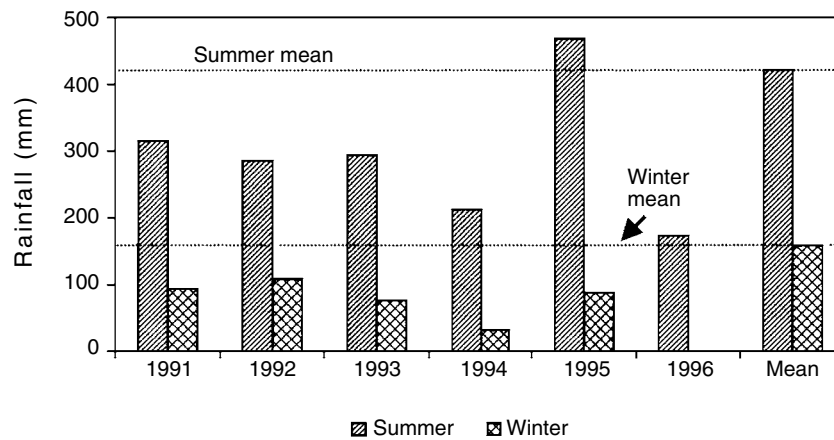
Rainfall data were collected on site using an automatic weather station.

An arc-sine transformation of the percent changes in plant numbers and canopy area was used in the analysis of variance.

### Results

Rainfall was below the long-term average for Blackwater during the trial and for the 3 years preceding the trial (Figure 1). This drought slightly reduced the canopy area of some of the individual currant bush plants in the control by causing the death of a few stems but had little effect on survival (See 'Control' — Figure 2).

The percent reduction in plant numbers achieved by the various treatments is given in Table 1. Treatment 7 (stickraking, blade ploughing and sowing) was significantly more effective ( $P < 0.01$ ) at killing currant bush than any of the other treatments. Treatments 9, 5, 8 and 3 were not significantly different from each other, but Treatments 9 and 5 produced better kills than Treatments 2, 4 and 6 and the control ( $P < 0.01$ ).



**Figure 1.** Rainfall at "Tulloch-Ard" during the trial period together with the long-term means for Blackwater (Clewell *et al.* 1994). Summer: Oct–Mar; Winter: Apr–Sep.

**Table 1.** Percent kill of currant bush as a reduction in numbers from original (arc-sine transformed values), 28 months after treatment (in rank order).

Treatment	Kill (%)	Transformed means <sup>1</sup>	Sig diff (P<0.01)	Sig diff (P<0.05)	Treatment cost (\$/ha)
2. S/rake in one direction	1.0	0.010			45
1. Control — no treatment	2.7	0.027			50
4. S/rake, burn	14.3	0.145			55
6. S/rake, offset disc plough	39.2	0.405		1,2	65
3. S/rake in 2 directions	56.3	0.600	1,2	4	120
8. Tebuthiuron @ 1.5kg a.i./ha	66.3	0.765	1,2,4		55
5. S/rake, chisel plough	76.8	0.908	1,2,4,6		140
9. Tebuthiuron @ 2.0kg a.i./ha	77.7	0.933	1,2,4,6		110
7. S/rake, blade plough	100	1.571	1,2,3,4,5,6,8,9		

<sup>1</sup>s.e. mean 0.121; LSD (P<0.05) 0.363; LSD (P<0.01) 0.500.

The percent reduction in canopy area achieved by the various treatments 28 months after they were imposed is shown in Table 2. At this time, all treatments still had significantly less canopy area than the control.

Figure 2 shows the changes in canopy area of currant bush over time as a percentage of original prior to imposition of treatments. The canopy area of the surviving currant bush increased rapidly in the 17 months following the mechanical treatments (all canopy removed) but slowed considerably in the next year. Most of the effect of the soil-applied herbicide treatments (8 and 9) was apparent after 17 months with only a further slight decrease in canopy area by 28 months.

## Discussion

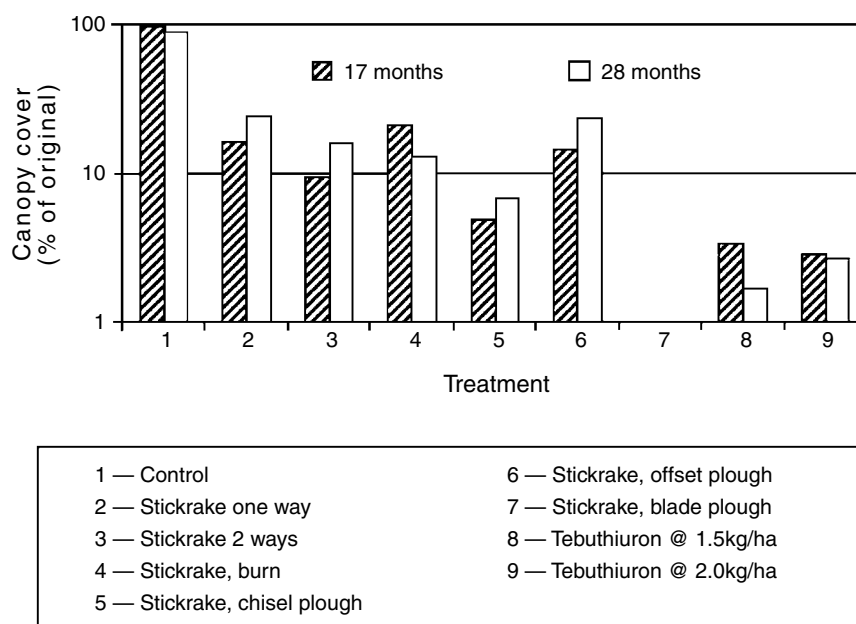
These results show that stickraking followed by chisel ploughing for controlling currant bush is a viable alternative to the effective but much more expensive blade ploughing or herbicide treatment (Tables 1 and 2). Stickraking followed by chisel ploughing gave good control of the woody weed, left the area free of logs etc. and produced a good seedbed for pasture reseeding if necessary.

Stickraking alone removed the canopy but had very little effect on the number of plants. This result contrasts with a perception among some producers that currant bush can be controlled effectively by stickraking alone. Stickraking followed by burning 19.5 months later gave a slightly improved kill and canopy reduction but doesn't justify burning good buffel grass pasture. Stickraking in two directions gave a similar

**Table 2.** Percent reduction in currant bush canopy area (arc-sine transformed values) from the original, 28 months after treatment (in rank order).

Treatment	Reduction (%)	Transformed means <sup>1</sup>	Sig diff (P<0.01)	Sig diff (P<0.05)	Treatment cost (\$/ha)
1. Control — no treatment	11.4	0.115			
2. S/rake in one direction	75.6	0.861	1		45
6. S/rake, offset disc plough	76.9	0.884	1		55
3. S/rake in 2 directions	84.1	1.014	1		65
4. S/rake, burn	87.1	1.075	1		50
5. S/rake, chisel plough	93.1	1.204	1,2	6	55
9. Tebuthiuron @ 2.0kg a.i./ha	97.3	1.337	1,2,3,6	4	140
8. Tebuthiuron @ 1.5kg a.i./ha	98.3	1.414	1,2,3,4,6		120
7. S/rake, blade plough	100	1.570	1,2,3,4,5,6		110

<sup>1</sup>s.e. mean 0.804; LSD (P<0.05) 0.241; LSD (P<0.01) 0.332.

**Figure 2.** Canopy cover of currant bush at 17 and 28 months after treatment as a percentage of original cover prior to imposition of treatments. Note the log scale.

reduction in canopy area and a further enhanced reduction in plant numbers. However, this treatment is more expensive than stickraking followed by chisel ploughing (\$65/ha compared with \$55/ha), which gave a better overall reduction in both numbers and canopy area.

The poor result obtained by stickraking followed by offset disc ploughing was due possibly to the dry conditions which prevented the plough from penetrating deep enough to invert the sod completely. Disc ploughing under good soil moisture conditions may result in a similar control of

currant bush to the chisel ploughing treatment but would damage the existing pasture more.

Blade ploughing gave total control of currant bush but was very expensive (\$110/ha), costing twice as much as stickraking followed by chisel ploughing. Blade ploughing leaves the soil surface in a very rough condition although resowing the pasture is not necessary if there is some buffel grass present prior to treatment.

The tebuthiuron treatments gave good reductions in canopy cover but cost \$120–140/ha, and reductions in plant number were no better than

for the chisel ploughing treatment. The pasture was unaffected by the tebuthiuron treatment.

The Seca stylo seeded into the ploughed plots emerged well but failed to establish because of the vigour of the buffel grass sward that regenerated following treatment. This vigour is to be expected in this class of country following disturbance and some rundown in grass vigour would be necessary to warrant inclusion of stylo.

#### Acknowledgements

Thanks to the Meat Research Corporation for financial assistance under NAP2. Thanks also to Dr Bill Burrows for encouragement, Richard Romano, Matthew Watterfall and Martin Gale for technical assistance and also to Len Mikkelsen and John Compton for their help with the initial pegging out and fencing of the trial. Special

thanks to Rod and Kay Lawrie, owners of "Tulloch-Ard", for allowing the use of their country. Rod also gave his time, machinery and expertise to lay down the ploughing treatments.

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(Received for publication April 24, 1998; accepted July 31, 1998)