TEBUTHIURON CONTROLS BRIGALOW AND GIDGEE REGROWTH IN QUEENSLAND

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Summary. Woody Acacia regrowth must be controlled if animal productivity is to be maintained on large areas of once productive pastures in Queensland. In 1989 tebuthiuron was aerially applied to brigalow, *Acacia harpophylla*, in central Queensland. 36 months after treatment an obvious dose response indicated that 2.0 kg/ha tebuthiuron resulted in greater than 80% control of brigalow on light clay soils. Regrowth on soils of high clay content (greater than 45%) required a rate of 2.5 kg/ha to achieve similar efficacy. Grass response in treated areas was 4-5 times greater than that of the untreated.

In the more arid conditions of western Queensland aerial application of 1.2 kg/ha tebuthiuron resulted in greater than 80% control of Gidgee, *Acacia cambagei*, regrowth. On previously denuded areas *Astrebla sp.* had re-established 36 months after treatment.

Control of these high density regrowth species, and the resultant increase in pasture yields have improved the sustainability of the grazing industry in Queensland.

INTRODUCTION

Since the mid-1980's in Australia technology has been available to aerially apply pelleted herbicides for broadacre woody weed control. Tebuthiuron is applied to the soil in a clay pellet containing 200 g active ingredient/kg and is moved into the plants root zone by rainfall.

The herbicide inhibits photosynthesis in susceptible plants such as brigalow, *Acacia harpophylla*, and gidgee, *A. cambagei*. Visual effects of soil active herbicides are very slow with repeated defoliation and regrowth occurring. Control ratings may not be conclusive under three years.

The flora, land use and soil types of the brigalow belt have been described by many authors (6, 7, 8, 1, 5). Brigalow regrowth is prolific on soils which range in clay content, pH and gilgai development. In any given paddock there is often a mosaic of light and heavy soil types, ranging from sandy texture contrast soils to cracking clays.

Past clearing strategies have resulted in regrowth of brigalow and other woody weeds with the subsequent adverse affects on pasture productivity. The emphasis today on developing brigalow lands, covering an area of approximately 6 million hectares in Queensland, lies totally with regrowth control and the maintenance of productive pastures. Anderson *et al.* (1984) considered regrowth required immediate control in at least 50% of localities to prevent further pasture deterioration.

Growing as the dominant vegetation unit, gidgee was estimated to cover an area of 3.2 million hectares in central Queensland (13). Various forms of gidgee regrowth and seedling infestation were identified as being the major contributor to lost grazing potential (3).

A survey of producers in this region estimated that 11% of the area has been denuded/lost to woody weed invasion with the species causing most concern being gidgee (10). The spread or invasion of this plant into previously open downs is considered to be increasing. This problem is now more common than regrowth resulting from previous mechanical treatment.

Land degradation is occurring in central and western Queensland on the existing grazing lands of the beef and sheep pastoral industries (11). Woody weed regrowth and invasion have provided the major impact which is predominantly from these two Acacia species. The increase of woody weeds must be addressed if pastures derived from brigalow or gidgee communities are to maintain animal productivity and improve the sustainability of the pastoral industries.

The studies reported in this paper resulted from the aforementioned perceptions. Experiments were carried out to determine the rate of tebuthiuron as Graslan® pellets, which would be needed to obtain commercially acceptable control of brigalow and gidgee regrowth.

METHODS

Brigalow. A fixed wing aircraft applied Graslan® pellets onto brigalow regrowth at five sites throughout the Fitzroy region of central Queensland during October-November 1989. At 3 sites, Moura, Baralaba and Ogmore regrowth was 2 m to 4 m, Dingo 1 m to 4 m and at McKenzie River was 3 m to 4 m.

Treatments consisted of 100x1000 m unreplicated plots with 5 rates of tebuthiuron ranging from 1.5-3.0 kg/ha. An untreated control was included to compare grass response on treated plots. An assessment of canopy cover was obtained prior to treatment and at each assessment to determine plant reduction.

Populations ranging form 10,000-20,000 stems/ha provided sufficient density to seriously impede mustering. With livestock grazing carried out at normal stocking rates (c. 0.25 beast/ha), at all sites the trial occupied a small percentage of any given paddock.

Soil analyses were performed to determine clay content, pH and organic matter content of each site. Daily rainfall was recorded and assessment of herbicide efficacy through canopy reduction was undertaken at 12 monthly intervals for 3 years.

Gidgee. In July 1989 a solo powerblower was used to apply Graslan® pellets from the ground to gidgee seedlings and regrowth in 40x100 m unreplicated plots at 5 sites in the Longreach district of western Queensland. Rates of tebuthiuron were 0.8, 1.0 and 1.6 kg/ha. In September 1989 a fixed wing aircraft applied 1.2 and 1.5 kg tebuthiuron/ha, to large plots (100x500 m) adjacent to each of the ground applied sites, with an untreated control separating the plots. Soil analyses determined clay content, pH and organic matter content at each site, rainfall records were kept at 4 of the sites, and visual assessment of herbicide efficacy was undertaken at 12 monthly intervals for 3 years.

RESULTS AND DISCUSSION

Brigalow. Tebuthiuron efficacy on brigalow regrowth was evident 36 months after treatment (MAT). A rate of 2.0 kg/ha tebuthiuron gave effective (84.7%) control of brigalow regrowth when results were summarised across sites (Fig. 1). Experience indicates that commercial acceptance of this product requires control to be at least 80-85% of all regrowth.

Figure 1. Efficacy of tebuthiuron on brigalow regrowth at five sites in central Queensland

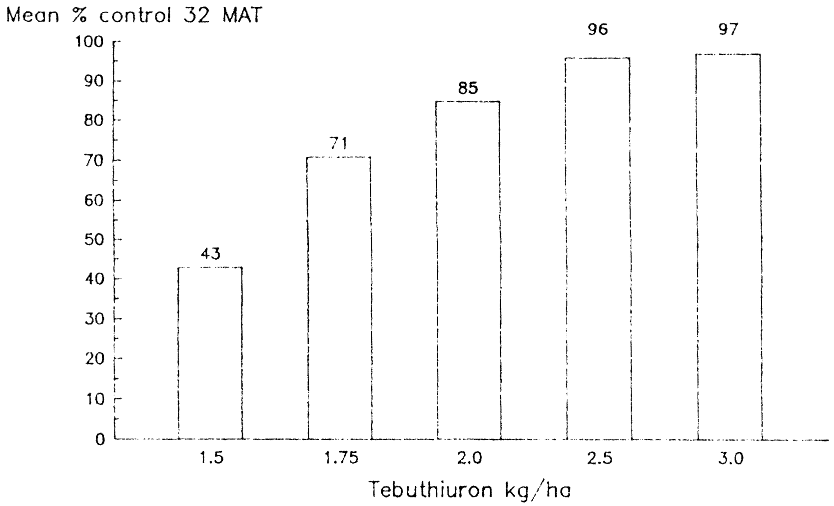
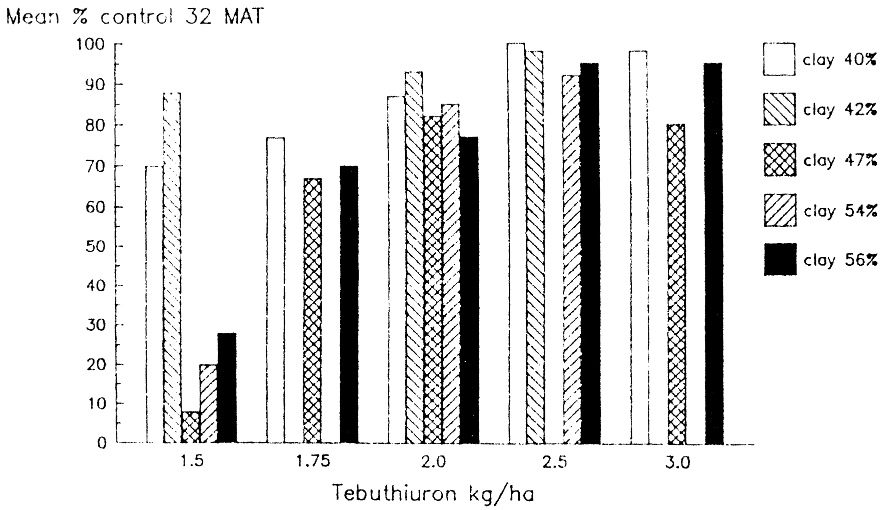


Figure 2. Tebuthiuron rate response by soil type on brigalow regrowth



The activity of the herbicide is sensitive to soil type, as reduced phytotoxicity was noted where soils are acidic and higher in clay content. On the lighter soil types (2 sites at 40% clay), the availability of tebuthiuron to the plant is evident by a 79% kill at 1.5 kg/ha. Regrowth on the acidic heavy clay soils (2 sites at 55% clay content and pH 5.3) required 2.5 kg/ha tebuthiuron to achieve greater than 85% control (Fig. 2).

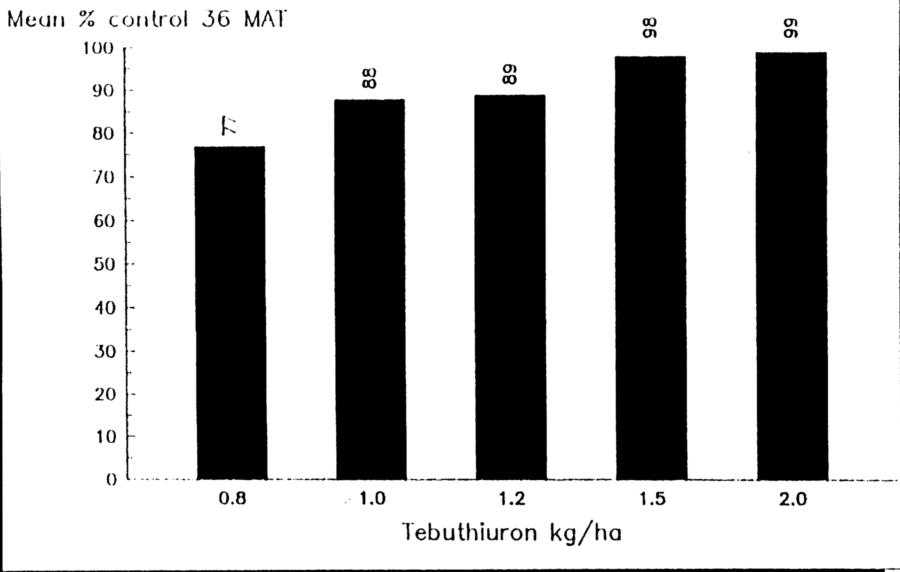
These results indicate that edaphic factors greatly influence the phytotoxicity of tebuthiuron to woody regrowth as reported previously outside Australia (4, 12).

Grass response occurred during the first defoliation cycle and continued to increase reaching 4 to 5 times the control plot at individual sites 30 MAT. Total dry matter yield of buffel grass, *Cenchrus ciliaris*, pastures has been measured at 6450 kg/ha after regrowth was controlled with 2.0 kg tebuthiuron/ha (9).

Although all sites recorded well below average rainfall throughout the trial period, these studies demonstrated the dose response obtained with tebuthiuron in controlling brigalow regrowth.

Gidgee. This Acacia species was highly susceptible to tebuthiuron regardless of application method. At 1.0-1.2 kg/ha greater than 85% control of gidgee regrowth was obtained 36 MAT. A dose response of gidgee to tebuthiuron is evident when the data from 5 sites in western Queensland are summarised (Fig. 3). The edaphic factors were extremely uniform with no variation in tebuthiuron efficacy to gidgee across sites. Clay content was 40-42%, being of neutral-alkaline pH (7.2-8.0) with low organic matter (0.7-1.0%) and indicates that gidgee is adapted to a narrow range of soils in this region.

Figure 3. Control of gidgee with tebuthiuron at five western Queensland sites



Excellent seasonal conditions occurred for a soil applied herbicide to be activated, as summer rainfall during the first two years of the trial was equal to or greater than Longreach's long term average of 320 mm. Winter rainfall was 3.5 times the long term mean (120 mm) during the first year after application, but then fell below this value in the last two seasons.

Death of many annual broadleaf species of forbs and herbs was evident at the lowest rate of tebuthiuron applied. This is not desirable as they provide a valuable protein source for sheep and cattle. However recolonisation of mitchell grass, *Astrebla spp.,* which was not damaged with the highest rate of tebuthiuron, occurred at the base of most dead gidgee stems 36 mAT.

It is evident that regrowth and invasion of brigalow or gidgee has adversely affected pasture productivity, with subsequent losses in animal production, in a large area of Queensland. Results from these field experiments using tebuthiuron to obtain effective control of 85% of these high density regrowth and invasive species has demonstrated that woody weeds can be managed in these established grazing lands. The resultant grass response following the reduction of competition for soil water and nutrients indicates how Graslan® can aid in the long term sustainability of pastoral industries based on brigalow and gidgee lands in Queensland.

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