CONTROL OF BRIGALOW REGROWTH WITH THE CROP KING ® GRIDBALL ™

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Summary A trial was established at Carinya, a property between Cracow and Eidsvold in the north Burnett area of Queensland, in September 1986, to investigate the efficacy of the Crop King Gridball, a new formulation of hexazinone, to control brigalow, *Acacia harpophylla*, suckers. This trial investigated 4 rates of the Crop King Gridball (0.375 g a.i./pellet) and recommended rates of Velpar L®and Graslan*, which are commercial formulations of hexazinone and tebuthiuron respectively. The Crop King Gridball provided good control of brigalow suckers when applied at 1.23 kg a.i./ha and above. Efficacy in this trial was superior to that achieved with Graslan and similar to Velpar L. Response from Rhodes grass, *Chloris gayana*, which was the dominant pasture species in the trial, was very good as a result of mortality of at least 90 percent of brigalow suckers. Dry matter pasture production increased from nil in untreated plots to approximately 3000 kg/ha in the plots treated with the Crop King Gridball at 1.23 - 1.67 kg a.i./ha.

INTRODUCTION

The brigalow is an area in central and southern Queensland which is roughly bordered to the east and west respectively, by the 762 and 508 mm isohyets of mean annual rainfall. Within this region there is a mosaic of soils differing sharply in fertility with brigalow occupying clay soils of moderate to high fertility on some 4.9 million hectares. In the original state, the brigalow has a very low carrying capacity of about 1 beast to 20 hectares, despite the relatively high fertility of the soil. The poor growth of herbs is due to competition for light and water by the very dense tree layer, and replacement of the original vegetation is required for effective animal production from pastures (1).

After initial mechanical clearing of the original vegetation, the major problem has been regrowth of the woody species and particularly brigalow itself. In the past both mechanical and chemical methods have been used to control brigalow sucker regrowth. Until recently the most common method of control of brigalow suckers has been by aerial application of a mixture of 2,4,5-T butyl ester and distillate. However, results are variable, depending on climatic conditions and the nature of the regrowth, and recently 2,4,5-T has become more expensive and difficult to obtain. In recent years two herbicides, hexazinone and tebuthiuron have been registered for application to the soil for control of brigalow regrowth. Ground applications for root uptake are generally not as dependent on conditions at application, because the herbicide remains on the soil surface until sufficient rain has fallen to leach the herbicide into the root zone and the plants begin active growth (2).

During the past decade a dry pelleted formulation of hexazinone has been jointly developed for control of woody weeds in rangeland by DuPont (Australia) Ltd and Incitec Ltd. This report describes the methods and results of a trial conducted in the brigalow region of Queensland to determine appropriate rates of this formulation of hexazinone, the Crop King Gridball, to control brigalow suckers when applied by hand to the soil surface on a grid pattern.

METHODS

Location, vegetation and soil type. The trial was established on 16 September 1986 at Carinya, a property between Eidsvold and Cracow on the eastern margin of the central brigalow region.

The area had originally supported a brigalow / softwood scrub community, which had been pushed, burnt and sown to Rhodes grass twenty-five years before. At trial establishment, brigalow was the only woody species present which had regrown as suckers from the original roots to a height ranging from 0.5 - 3.0 m in height. Because of the density of regrowth which was greater than 3,000 suckers per hectare, there was little or no growth of pasture at the time of trial establishment. The soil at this site had some small degree of gilgai micro-relief, and is described as a clay with a neutral reaction.

Experimental design and application method.

Areas of brigalow regrowth with similar density and height were selected for each plot and an area of 12x12 m was marked out with a wooden peg in each corner. Each of the seven treatments were repeated 3 times, in a randomized complete blocks design. In each plot, twenty separate stems were selected and marked with a metal tag, each of which had a different number between 1 and 20. Suckers which were less than 1.0 m from the edge of plots were not selected to minimize edge effects.

The Gridball pellets each weighing 1.875 g were placed by hand to the soil surface at the appropriate spacing to achieve the required rate of application for each treatment. Velpar L was applied as 4 ml undiluted spots at 2 m intervals by use of the Velpar Spotgun®. The appropriate weights of Graslan pellets were broadcast to the surface of plots with a hand held shaker.

Assessment methods. The height of each tagged sucker was measured with a marked stick and recorded prior to treatment.

At approximately six monthly intervals the site was visited for two years and each tagged sucker was given a visual rating based upon the following 5 point scale.

(1) Nil response - Plants with 100% unaffected foliage.
(2) Slight response - Plants with less than 40% defoliation.
(3) Moderate response - Plants with between 40 and 60% defoliation.
(4) Severe response - Plants with 60-100% defoliation but still alive.
(5) Dead response - Plants with 100% defoliation and dead as indicated by bark splitting.

At 28 months after establishment dry matter production of pasture species from each of the plots was measured by cutting a 0.25 m^2 quadrat, 3 m inside each corner of each plot. Care was taken not to place the quadrats on bare areas caused by the point applications of hexazinone. A measure of the diameter of bare spots from each plot were made to give an estimate of the percentage area of each plot which was bare.

Daily rainfall totals were measured and recorded approximately 2 km from the site for the duration of the trial.

Spotgun ® is a registered trademark of E.I. duPont de Nemours & Co Inc.

RESULTS AND DISCUSSION

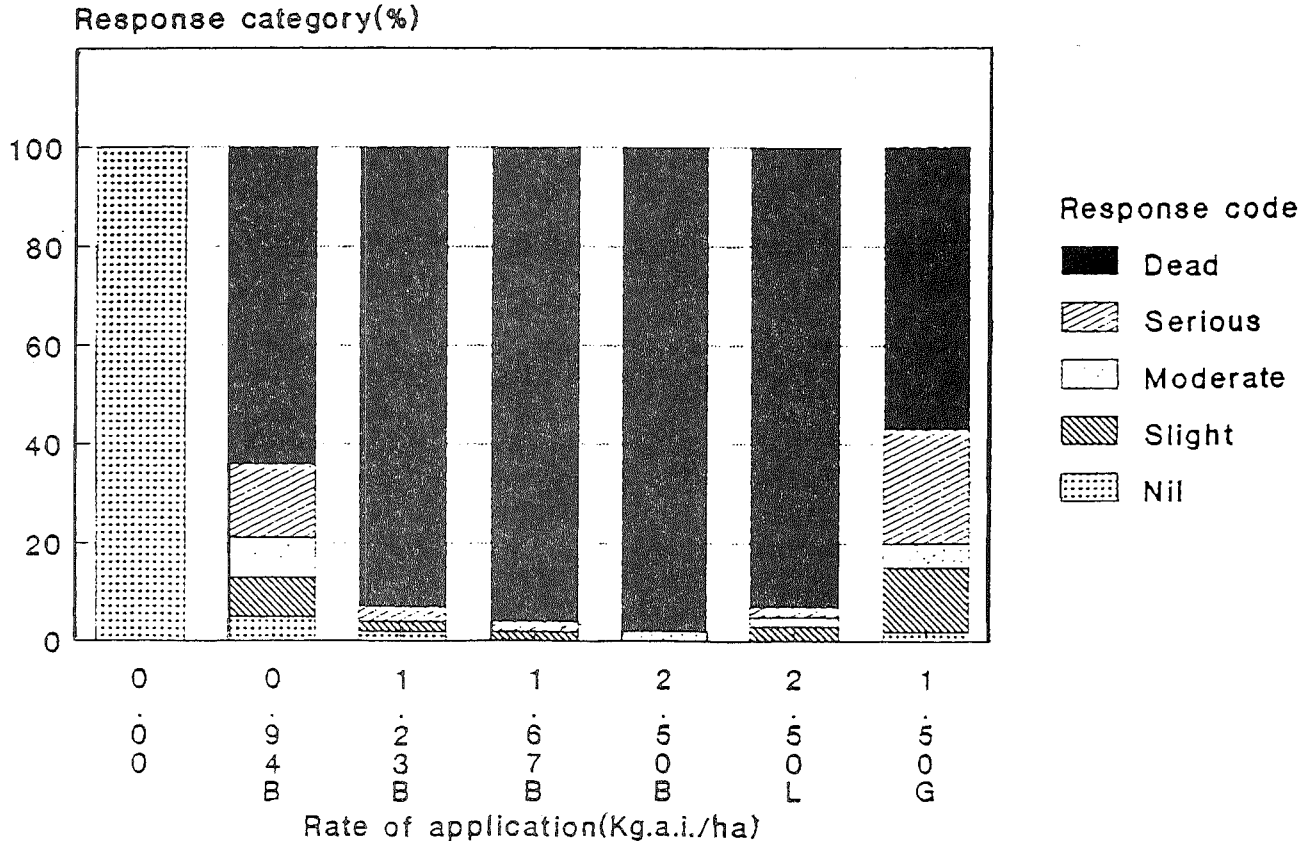
Statistical analyses of percent mortality at the final assessment, for suckers that were <1 m, >1-2 m high and all sizes are given in Table 1.

Table 1. Affect of treatments on percent mortality of brigalow suckers in relation to size 105 weeks after treatment.

Treatment	Rate of application		Sucker height (m)		
	Grid (m)	kg a.i./ha	<1	>1-2	All sizes
1. CK Gridball [a]	2.00	0.94	52 (0.81)[b]	67 (0.96)	63 (0.92)
2. CK Gridball	1.75	1.23	90 (1.22)	97 (1.48)	93 (1.31)
3. CK Gridball	1.50	1.67	90 (1.32)	100 (1.57)	97 (1.42)
4. CK Gridball	1.25	2.50	97 (1.46)	100 (1.57)	98 (1.50)
5. Velpar L	2.00	2.50	91 (1.24)	95 (1.48)	93 (1.31)
6. Graslan	-	1.50	57 (0.95)	55 (0.81)	57 (0.85)
7. Untreated	-	-	0 (0.10)	0 (0.10)	0 (0.10)
l.s.d. P=0.05			(0.30)	(0.22)	(0.18)

a CK = Crop King

b Values in brackets are transformed means, after an arcsin $\sqrt{(x/100)}$ transformation.



B - Crop King Gridball; L - Velpar L; G - Graslan

Figure 1. Response of brigalow suckers 105 weeks after treatment.

In Fig. 1 the response of brigalow suckers of all sizes, at the last assessment is illustrated by showing the percentage of suckers in each response category.

There was good correlation between the rate of application of the Crop King Gridball and final mortality of all sizes of brigalow suckers in the trial. However after 1.23 kg a.i./ha the increase in mortality from 93 to 97 percent was not significant indicating an optimum rate of 1.23 kg a.i./ha in this trial.

Throughout all treatments except for Graslan there tended to be a slightly higher mortality for suckers which were higher than 1 m compared with those of less than 1 m. For lower rates (0.94 and 1.23 kg a.i./ha) of the Crop King Gridball and for Velpar L this trend continued with even higher mortalities on suckers over 2 m high. These trends are probably due to a wider rooting range from the larger suckers compensating for the wider grid spacing in the low rates of Crop King Gridball and Velpar L.

The dissappointing result with Graslan in this trial is difficult to explain, as commercial experience with the product on brigalow has been very good. Both rate of response and final mortality was slower and lower than similar rates of the Crop King Gridball. It is possible that the plot size of 144 m^2 resulted in significant edge effects, resulting in insufficient uptake of tebuthiuron for many of the brigalow suckers. However this would still indicate a lower level of potency from tebuthiuron than hexazinone on brigalow suckers.

Pasture response. Because of drought conditions which persisted for a period of 19 months after good falls of rain at the start of the trial there was little opportunity in the early stages of the trial to measure pasture response to the herbicide treatements. However, during the late winter and summer months of 1988 the good falls of rain resulted in excellent growth of pasture over the trial site. This provided the opportunity to obtain some objective measurement of dry matter pasture production, and hence the relationship between herbicide treatment and consequent brigalow sucker control and pasture production in this trial.

A statistical analysis of dry matter pasture weights for each treatment is shown in Table 2.

Table 2. Dry matter pasture yield [a] 124 weeks after treatment.

Treatment	Grid Spacing	Rate of application kg a.i./ha	Pasture yield [b] g d.m. 0.25/m^2	% of area bare spots
1. Crop King Gridball	2.00	0.94	17.1 (0.81) [c]	7.1
2. Crop King Gridball	1.75	1.23	69.2 (1.62)	9.4
3. Crop King Gridball	1.50	1.67	78.7 (1.68)	12.6
4. Crop King Gridball	1.25	2.50	85.5 (1.74)	18.1
5. Velpar L	2.00	2.50	93.9 (1.79)	11.0
6. Graslan	-	1.50	30.4 (0.84)	-
7. Untreated	-	-	0.0 (0.04)	-
l.s.d. P=0.05			(0.51)	

a The dominant pasture species was Rhodes grass.
b Pasture yield was determined by calculation of the percentage of the area in each plot covered by bare spots from point applications of hexazinone and then subtracting this from the dry matter pasture weights as taken from the quadrats in each plot.
c Values in brackets are transformed means, after a log (x+1) transformation.

There was good correlation between the level of brigalow sucker mortality and dry matter pasture production in this trial. Those treatments which achieved poor control of brigalow suckers, Crop King Gridball at 0.94 kg a.i./ha and Graslan, resulted in relatively small increases in dry matter pasture production. As the level of brigalow sucker control improved from other herbicide treatments so did the pasture dry matter production from the Rhodes grass. It was somewhat surprising to find an increase in pasture dry matter production, as the rate of the Crop King Gridball increased from 1.23 kg a.i./ha to 1.67 kg a.i./ha and then to 2.50 kg a.i./ha, as the difference in brigalow sucker mortality only increased by 5 percent over this range. This was also despite a negative influence of the percentage bare areas from the hexazinone spots increasing from 9.4 to 18.1 percent of the total area, over this range. This may indicate the very strong competitive effect of even very low numbers of surviving brigalow suckers and compensatory growth of pasture away from the bare spots. However, it is also possible that these differences are due to experimental error as they were not significantly different, at the 95 percent level of confidence. What is very clear from this trial is the highly competitive nature of brigalow suckers as pasture growth was completely suppressed in untreated plots despite excellent seasonal conditions.

REFERENCES

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