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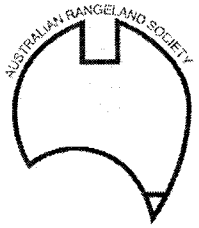

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INITIAL EFFECT OF TIMING OF SPELLING AND DEFOLIATION RATE ON THREE TROPICAL PERENNIAL GRASSES

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ABSTRACT
Sustainable grazing management systems need to be both economically viable and environmentally sustainable. Pasture spelling is now widely recommended, with its timing of great importance. Three key perennial grasses were investigated to determine their response to timing of spelling and defoliation rate. Markedly different responses were obtained between treatments over one wet season, with Mitchell grass increasing in basal area for some treatments, bluegrass showing mixed response and wiregrass declining. Investigations of longer duration will be undertaken to determine consistent results.

INTRODUCTION
Grazing management systems in the Australian rangelands have traditionally involved some form of set stocking, where stock are left permanently within a paddock and numbers increase due to successful animal husbandry or additional stock purchases, and decrease due to stock sales or in response to drought or other severe weather conditions. This has resulted in under and over-stocking, variable animal production and pasture deterioration (Earl and Jones 1996).

Some form of spelling or resting from grazing is highly recommended in contemporary grazing management systems, especially while pastures are actively growing (O'Reagain and Turner 1992). The primary reason is to benefit pastures, with the timing designed either to encourage vigour and health of perennial grass plants or to maximise reproduction by facilitating flowering and seeding. In the tropical savannas, this timing equates to either early or late wet season spelling respectively. Wet season spelling is recommended in Australia's tropical savannas, providing benefits of increased utilisation rates and profitability, while maintaining the dominance of important perennial grasses (Ash et al. 2001).

The Pigeon Hole study in the Victoria River District of the Northern Territory includes wet season spelling at a small commercial paddock scale and a project which more closely investigates the optimal timing of wet season spelling and most appropriate pasture utilisation rates through clipping treatments.

METHODS
At two sites, twenty individual plants of three key perennial grasses, the palatable curly Mitchell grass (*Astrebla elymoides*) and curly bluegrass (*Dichanthium fecundum*), and the increaser species feathertop wiregrass (*Aristida latifolia*), were subjected to treatments that included early, late or entire wet season spelling and defoliation at rates from 20 to 60% (in 10% increments).

Basal circumference and seasonal biomass production were the key response variables. The basal area of perennial grasses is a key measure of pasture sustainability and vigour and can

be calculated from plant circumference (Briske and Hendrickson 1998). McIvor and Gardener (1990) found that it explained 84% of the variation in pasture growth and botanical composition and was the most useful predictor of future pasture performance, as the number of buds on perennial grasses and their survival as growing points is related to basal area.

All 1,920 plants were selected and tagged in December 2005 when the basal circumference and height of each plant was recorded and all plants were cut to a uniform height of 10 cm. As all plants are tussock grasses, height was measured by gathering all leaf matter and raising vertically, with the height recorded at the point immediately below the flowering parts. Plants were listed in order based on the basal circumference measurements and assigned sequentially to each treatment category ensuring each treatment had a similar spread of small and large plants. Twenty control plants of each of the species were also measured and cut.

During 5–10 February 2006 heights were recorded for plants assigned to the late wet season spelling treatments. Defoliation heights were calculated and plants cut to the required height to simulate early wet season grazing utilisation rates. The cut parts were dried and weighed.

During 4-8 March 2006 heights were recorded for plants assigned to the early wet season spelling treatments. Defoliation heights were calculated and plants cut to the height to simulate late wet season grazing. The defoliated parts were dried and weighed.

At the end of the wet season (late April), for all plants, height and basal circumference measurements were recorded and the dead basal area estimated. Defoliation heights were calculated and plants cut to the required height to simulate the end of spelling for the entire and late wet season and ongoing grazing from early spelling. Defoliated parts were dried and weighed.

RESULTS

Basal area of the three different perennial grasses exhibited markedly different responses to treatments (see Figures 1 to 3). Results displayed represent the active photosynthetic basal area calculated from the basal circumference minus the area estimated to have died at the end of the wet season.

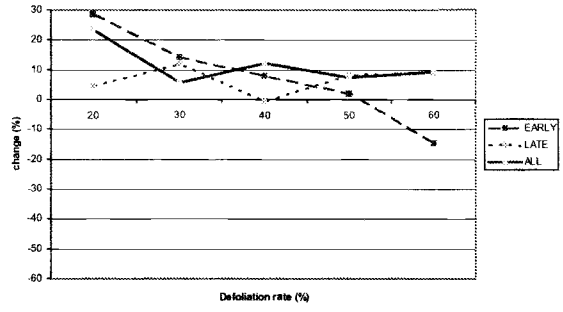

Figure 1: Mitchell grass change in basal area for different spelling periods and defoliation rates

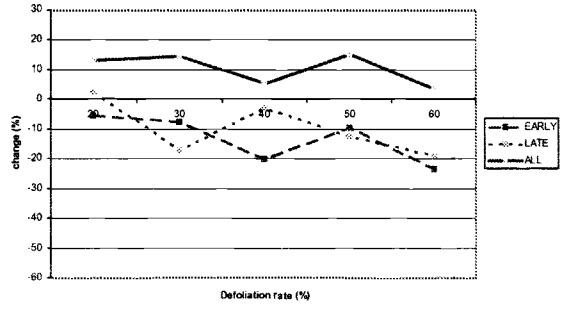

Figure 2: Bluegrass change in basal area for different spelling periods and defoliation rates

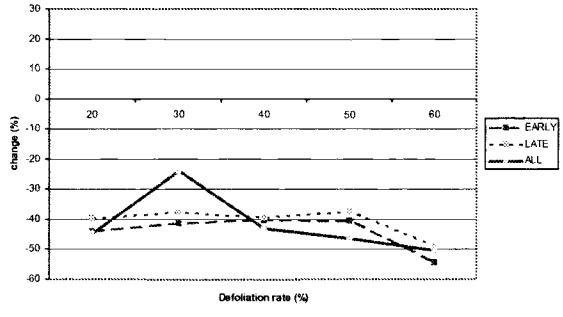

Figure 3: Wiregrass change in basal area for different spelling periods and defoliation rates

Harvested yield figures from the cumulative defoliations are not presented as these do not represent a complete growing period. Plants were still actively growing at the last clipping and final weights are still to be obtained. No obvious trends were evident from current data.

Response of the three grasses varied between species and to all treatments. Mitchell grass exhibited an increase in basal area of 28.6 % for the early wet season spelling treatment at the lowest utilisation rate (20%). This declined to a 15% loss of basal area for the 60% defoliation. Late wet season spelling resulted in the maintenance or a slight increase in basal area (up to 10%) across all defoliation rates. Spelling over the entire wet season gave an increase in basal area of 23.5% at 20% utilisation, with other defoliation rates exhibiting between a 5% to 12% increase.

Early wet season spelling of bluegrass showed a 5.5% loss of basal area at 20% utilisation, declining to a 23.5% loss at 60% utilisation. Late wet season spelling produced a 2% increase in basal area at 20% utilisation, declining to 19% loss at 60% utilisation. Spelling for the entire wet season produced increases in basal area of between 3% and 15% across all defoliation rates.

Wiregrass exhibited large declines in basal area over all treatments. These were generally less, between 24% and 44%, at the lower defoliation rates (20% and 30%), increasing to losses of between 49% to 54% at the 60% defoliation treatments. No consistent trend was evident between the different times of spelling.

DISCUSSION

The results reported are preliminary as they are from a single wet season, i.e. December 2005 to May 2006. Moreover, record rainfall was received at Pigeon Hole during this unusually long wet season, with over 160 mm of rain recorded in late April.

Response of the three perennial species to the different treatments varied greatly. Mitchell grass appears to be most resilient to defoliation, exhibiting increases in basal area at low defoliation rates. Results for Mitchell grass are in general agreement with Orr (1986) who reported grazing induced vigour for *Astrebla* spp. Wiregrass appears very susceptible to defoliation, displaying consistently large declines in basal area. Bluegrass appears to need spelling from defoliation for the entire wet season in order to maintain basal area, otherwise declines were evident.

The main reason for this investigation is to provide information for the design of a spelling regime suited to the sustainable use of the productive, preferred, perennial grasses in the Victoria River District. Data collection over one wet season is obviously inadequate to achieve this and will need to continue for a number of seasons. However, interesting trends have become apparent even at this early stage.

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