SHORT-TERM EFFECTS OF BURNING NATIVE PASTURE IN SPRING ON HERBAGE AND ANIMAL PRODUCTION IN SOUTH-EAST QUEENSLAND

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SUMMARY

Liveweight gains of steers grazing native spear grass pasture for three months following burning in spring were significantly greater ($P < .01$) than steers grazing unburnt pasture. Associated with this greater gain was a higher nitrogen content and green leaf proportion in both pasture and diet. In constrast, higher liveweight gains ($P < .01$) were recorded by cattle grazing unburnt pasture during the second three months following burning. After nine months grazing the difference between groups was 8 kg in favour of the burnt treatment. Green leaf proportion in pasture was significantly correlated with liveweight gain ($R^2 = 0.72$ for burnt; $R^2 = 0.83$ for unburnt pasture).

Pasture regrowth resulting from burning allowed cattle greater potential to select green material but low dry matter yields together with apparent earlier flowering and maturity of burnt pasture may have prevented a further advantage in liveweight gains from the burnt treatment.

INTRODUCTION

Burning in spring is a regular feature of native pasture management in south-east Queensland. Although there are a number of reasons for using fire in pasture management (West 1965), burning in spring is largely practised to remove mature, low quality stand-over herbage, thereby improving accessibility of new pasture growth to cattle. Graziers claim cattle gain more weight on burnt pasture but there is little experimental evidence to support this view (Tothill 1971). This experiment measured short-term effects of a spring fire on quantity and quality of pasture and on animal production.

MATERIALS AND METHODS

The experiment was conducted at "Brian Pastures" Research Station, Gaydndah (20° 38' S151°41' E), south east Queensland from November 1980 to July 1981. Soil was a clay-loam derived from basalt and supported native pasture characterised by a dominance of Heteropogon contortus (spear grass) and Bothriochloa bladhii (forest blue grass). Average annual rainfall is 740 mm, 70% of which falls in spring and summer.

The experiment was a randomised block design with two replications of two treatments (burnt and unburnt native pasture) and a cell size of 5 hectares. Burning was successfully imposed in mid-October 1980 on the area which had been previously burnt in 1977. In early November, twelve 3/8 Sahiwal, 5/8 Hereford weaner steers were stratified according to initial live weight and randomly allocated to four groups of three at a stocking rate of 1.67 ha/beast. During winter and spring prior to the experiment, steers were supplemented with cotton-seed meal to meet maintenance requirements.

Every three or four weeks, herbage yield was measured from 20, 0.25 m^2 quadrats in each plot. Cut herbage was sub-sampled and handsorted into green and dead fractions and analysed for N, P, K and S.

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Cattle were weighed unfasted every three weeks when faecal samples were collected for N and P analysis. Coinciding with herbage yield measurements was diet sampling from six oesophageal fistulated steers introduced into the experimental area 3 days prior to sampling. Collected extrusa was sub-sampled into two portions; one freeze-dried for later sorting into green and dead and the second oven-dried (800C) for N and P analysis. The nine month grazing period was arbitarily sub-divided into 3 three month periods for the purposes of statistical analysis of liveweight data. Individual average daily gains were calculated for each treatment in each period and differences compared using Students' t-test.

RESULTS

Dry matter yields of burnt pasture (Fig. lb) were initially low (< 300 kg/ ha) but increased rapidly following rain in December. By April, yields were only 600 - 800 kg /ha lower than those measured in unburnt pasture. Green leaf yields of both burnt and unburnt pastures were low (120 vs 360 kg/ ha) in November and December but increased in January and February reaching a maximum in March of 1000 and 1200 kg/ ha respectively.

Green leaf proportion in the burnt pasture was initially high reaching a peak (68%) in January and slowly declined thereafter (Fig. la). In unburnt pasture green leaf increased from a small proportion (10%) in November to a maximum of 40% in March.

The average proportion of green leaf in the diet recorded on burnt and unburnt pasture was 76 and **68%** respectively although this difference was greatest in January (Fig. la). In both treatments the proportion of green leaf selected was greatest in March. Nitrogen content of green leaf, diet and faeces was greater in burnt than unburnt pasture for the first three months of the experiment, thereafter similar levels of nitrogen existed in both treatments (Table 1). Green leaf nitrogen was highest at the start of the experiment while dietary and faecal nitrogen content reached a maximum in January for the burnt pasture and February - March for the unburnt.

TABLE *1* Green leaf, dietary and faecal nitrogen (% DM) in burnt and unburnt native spear grass pasture

N% (DM Basis)	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun - Jul
Green leaf - burnt	1.69	1.74	1.56	1.19	1.08	0.97	0.82	0.81
N% unburnt	1.40	1.29	1.22	1.10	1.09	0.98	0.97	0.95
Diet N% - burnt	1.25	1.35	1.70	1.29	1.20	0.99	0.67	0.62
unburnt	0.93	0.87	1.22	1.28	1.28	1.05	0.70	0.62
Faecal N% - burnt	1.45	1.51	1.86	1.70	1.51	1.34	1.21	1.12
unburnt	1.25	1.41	1.60	1.66	1.55	1.38	1.22	1.14

During the first three months (Period **1)** cattle on burnt pasture had superior liveweight gain ($P < .01$) (0.59 vs 0.29 kg /ha) compared with those grazing the unburnt pasture but during the second three months (Period 2) the situation was reversed with liveweight gain being significantly greater on the unburnt pasture ($P < .01$) **(0.77** vs 0.58 kg / d) (Fig. 1c). Liveweight change was the same for both groups over the winter period and the final liveweight gain was 85 and 77 kg / head in burnt and unburnt pasture respectively.

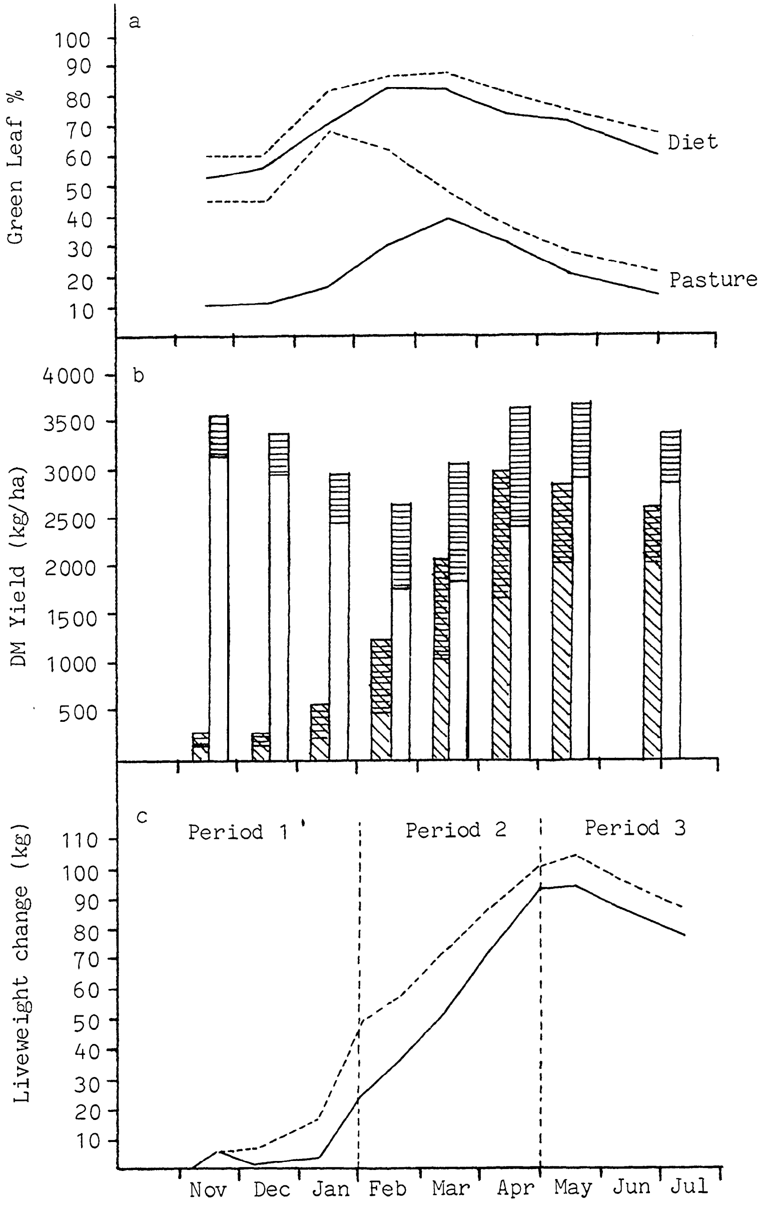

Fig. la Green leaf percentage in diet and pasture of burnt (---) and unburnt (-) native pasture

Fig. lb Yield of standing DM (kg / ha) of burnt (▧) and unburnt (□) native pasture showing green leaf yield (kg / ha) (▤)

Fig. lc Liveweight change of cattle grazing burnt and unburnt native pasture

DISCUSSION

Initially, green material available in burnt pasture was readily accessible to cattle as indicated by high green leaf proportion in both pasture and diet, despite low green leaf yields. Over the same period, green leaf yields were higher in unburnt pasture but green leaf proportion was low thereby suggesting that the proportion or accessibility of green leaf in the pasture, rather than green leaf yield is an important determinant of liveweight gain. This is supported by relationships between green leaf percentage (x) in pasture and liveweight gain (y, $g/kg^{-0.75}/day$):

$$\text{Burnt} \quad y = 0.32x - 9.1 \quad (R^2 = 0.72^{**})$$
$$\text{Unburnt} \quad y = 0.49x - 7.1 \quad (R^2 = 0.83^{**})$$

Green leaf proportion reached a maximum in burnt pasture two months earlier than in unburnt pasture. This may have resulted from flowering and maturity of grasses in burnt pasture being four to six weeks earlier. Dietary nitrogen followed. a similar trend in burnt pasture, reaching a maximum in January, then declining rapidly. Earlier flowering and subsequent decline in pasture quality may explain the better liveweight gains of steers grazing unburnt pasture in late summer and autumn.

Liveweight gains achieved on burnt pasture in the first period after burning reflected higher nitrogen contents in green leaf and diet and greater accessibility of green material. Higher nitrogen content of green leaf following burning has been reported elsewhere in northern Australia (Smith 1960).

An interesting feature of the diet selection studies was the observed preference by cattle in the burnt area for new shoots of *Aristida* spp, a normally unpalatable species. This preference was also reported by Hilmon and Hughes (1968), who found *Aristida stricta* comprised 17% of the diet shortly after a burn compared with 2% in unburnt pasture.

Although little difference (P > . 05) was recorded in final liveweights between the two groups, burning initially produced herbage of a higher nutritive value. Lack of dry matter following 100% burning probably restricted further advantage in gains by cattle grazing burnt pasture in this experiment. The practice of burning a portion of a pasture to provide high quality green feed together with a reserve of standing dry matter needs to be investigated further.

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