# INFLUENCE OF NITROGEN BASED SUPPLEMENTS ON LIVE WEIGHT, FERTILITY AND MORTALITY OF HEIFERS GRAZING DRY SEASON NATIVE PASTURE

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## SUMMARY

Supplements containing urea or biuret were fed in the dry season to yearling and two year old pregnant heifers grazing native spear grass pastures in north Queensland. Liveweight change and survival during the dry season and fertility in the following year were measured.

In the first experiment during a relatively favourable dry season, supplementation significantly ($P < 0.01$) reduced liveweight loss in yearling heifers (5 *vs* 32 kg). In the following year during a drought, supplement significantly ($P < 0.01$) reduced liveweight loss in yearling heifers (32 *vs* 41 kg) and significantly ($P < 0.01$) reduced mortalities (23.5% *vs* 5.2%) in pregnant and lactating heifers. The supplement had no significant effect on subsequent fertility in either experiment.

## INTRODUCTION

During extended dry seasons in north Queensland loss of live weight caused by protein and energy deficiencies can cause high mortality rates in beef cows. Urea based supplements have reduced weight losses during drought years (Holroyd *et al.* 1977) but have had no effect on subsequent fertility in cows calving at the end of the dry season (Siebert *et al.* 1976).

Biuret is a non-toxic form of non-protein nitrogen. Both urea and biuret fed with molasses have produced similar liveweight responses in growing cattle (Winks *et al.* 1979). This paper reports the effect that supplements containing urea or biuret had on live weight, survival and fertility when fed to yearling, and pregnant or lactating two year old heifers during dry seasons.

## MATERIAL AND METHODS

Two experiments were conducted at "Kirk River", Mingela during 1971/72 and 1972/73 respectively. The native pasture present was predominantly spear grass which is typical of the region. Average annual rainfall is 650 mm with 70% falling during December to March.

During 1971/72 above average rainfall (1115 mm) was recorded with 91% of rain occurring between December and March. Thus, the feeding period was preceded by favourable seasonal conditions. In the following year, drought conditions occurred in the latter half of the feeding period. Total rainfall (441 mm) was below average with 73% of rain falling between December to March.

In the first experiment (June 1971 to May 1972), yearling Brahman Shorthorn crossbred heifers were allocated to four paddocks by stratified randomisation based on live weight (Mean and standard deviation of $244 \pm 36$ kg). In the second experiment (June 1972 to August 1973), pregnant animals from the first experiment were allocated to two paddocks by stratified randomisation on live weight ($342 \pm 38$ kg) and foetal age ($4.65 \pm 0.87$ mo) determined by rectal

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palpation. Another draft of yearling crossbred heifers of similar breeding was allocated to two groups by stratified randomisation based on live weight (220 ± 24 kg). Stocking rates were approximately one beast per 2.4 ha. The animals were mated each year in December for five months with five per cent bulls of similar breeding. No reproductive disease problems were detected following routine testing.

The first experiment comprised four treatments: (i) Control (nil supplement); (ii) 57 g urea and 170 to 225 g molasses per head per day in drum rollers; (iii) 70 g biuret, 30 g molasses and 2 g sulphur in troughs; (iv) 70 g biuret and 1.8 kg grain in self feeders. Initially animals in treatment (iv) were fed biuret and glycine (*Neonotonia wightii)* pellets but the biuret-grain mixture was substituted after 84 days because of poor intake. Feeding commenced in June 1971 and continued for 196 days. The control group was given access to treatment (ii) for the last 24 days of the feeding period to prevent expected deaths.

The second experiment comprised two treatments for both two year old and yearling heifers: (i) Control of nil supplement; (ii) 120 g/hd/day of mixture containing 57:28:2:6:7 parts by weight of biuret, monoammonium phosphate, sulphur, salt, molasses respectively. The mixture was fed in open troughs and the salt and molasses levels were adjusted to regulate intake. Feeding of yearling heifers commenced in July 1972 and continued for 147 days, whilst pregnant two year old heifers were fed from June 1972 for 181 days. The control group of the pregnant two year old heifers were fed for survival during the last seven weeks of the dry season. Survival feeding commenced after 10% of the control group had died. These animals were fed 2.7 kg lucerne hay and 0.45 kg per head per day of a grain-urea mix.

The data were analysed by the least squares method (Harvey 1960). Initial live weight was fitted as a covariate to estimate its effect on liveweight gain and fertility and to adjust for any group bias due to mortalities.

## RESULTS AND DISCUSSION

Table 1 summarises the effect of supplementation on live weight and reproductive performance in both trials. Deaths amongst the yearling heifers in both experiments were restricted to accidental deaths not associated with nutritional stress.

### Experiment 1

Supplementation caused a significant reduction ($P < 0.01$) in liveweight loss during the dry season (10/6/71 - 29/11/71). There was little difference between the supplemented groups, with the apparent disadvantage to the grain-biuret probably due to the delay in the commencement of effective feeding. However a difference between the effectiveness of molasses and grain as a carrier for the biuret cannot be discounted. Overall the supplemented groups lost an average of 4.5 kg live weight compared to 33.9 kg liveweight loss in the control group. Initial live weight had a significant effect ($P < 0.05$) on liveweight change, with heavier heifers losing more weight ($b = -0.2277 \pm 0.0359$ kg liveweight change per kg of initial weight). Although the molasses-urea mixture seemed marginally better than the biuret based supplements, there was little advantage to any supplement when the reproductive performance was evaluated.

There was no significant difference attributable to supplementation in either fertility or foetal age, which is an indication of time of conception. However, live weight of all trial animals at mating (232 kg on 29/11/71) had a significant effect ($P < 0.005$) on fertility ($b = .028 \pm 0.09\%$ per kg). There was a tendency for heavier animals to have older foetal ages. ($b = 0.0062 \pm 0.0033$ month per kg; $P < .10$). Liveweight response to supplementation was not sufficient to cause reproductive differences according to treatment, despite a significant relationship between live weight and reproductive performance amongst all trial animals.

TABLE 1 Least squares means for liveweight change, final live weight, mortality rate, pregnancy rate and foetal age

| Treatment | Liveweight | | | Mortality | Fertility | | |
|---|---|---|---|---|---|---|---|
| | No. | Change (kg/hd) | Final (kg) | Deaths (%) | No. | Preg (%) | Foetal Age (m ) |
| Experiment 1 Yearling Heifers | 10/6/71 - 29/11/71 | | | | | 31/5/72 | |
| Control | 36 | -33.9 | 210 | | 31 | 71 | 4.3 |
| Molasses urea | 43 | + 3.7 | 248 | | 40 | 88 | 4.5 |
| Molasses biuret | 47 | - 6.0 | 238 | | 46 | 87 | 4.1 |
| Grain biuret | 37 | -12.2 | 232 | | 36 | 89 | 4.6 |
| Experiment 2 Yearling heifers | 10/7/72 - 11/12/72 | | | | | 30/7/73 | |
| Control | 56 | -40.7 | 180 | | 52 | 37 | 5.1 |
| Biuret mix | 58 | -31.5 | 189 | | 57 | 39 | 5.2 |
| Experiment 2 Pregnant/Lactating 2 yr heifers | 1/6/72 - 11/12/72 | | | | | 3/8/73 | |
| Control | 54 | -88.2 | 254 | 23.5 | 35 | 47 | 5.0 |
| Biuret mix | 39 | -77.0 | 265 | 5.2 | 52 | 30 | 5.5 |

Experiment 2

Supplementation reduced liveweight loss ($P < .005$) in the yearling heifer group and this liveweight change was affected by initial weight ($b = -0.3417 \pm 0.0475$) kg liveweight change per kg initial weight ($P < .005$). Supplementation had no effect on fertility or foetal age. There was a tendency ($P < 0.10$) for heavier animals at the start of mating (11/12/72) to achieve higher pregnancy rates ($b = 0.43 \pm 0.24\%$ per kg). Treatment effect was not sufficient to increase reproductive rates in the supplemented group. The low reproductive rate overall was probably a reflection of low prejoining live weight (185 kg).

Supplementation had no effect on liveweight change in the surviving pregnant or lactating heifers. However, an effect may have been masked by high death rates in the control group and the necessity to feed remaining control animals to avoid unacceptably high losses. Liveweight changes were influenced by calvings between June 1 1972 and December 11 1972. However, because the animals were allocated to the groups by random stratification on pregnancy status as well as live weight any bias in the difference between groups should be minimal.

In this experiment supplementation significantly reduced ($P < 0.01$) death rate (23 *vs* 5.2%; control and pregnant/lactating heifers respectively). Half of the deaths in the control group occurred in the first four weeks of the seven week survival feeding period.

Calves produced by the fed group of pregnant/lactating heifers were significantly heavier (46.8 kg *vs* 37.2 kg; $P < 0.005$) at the end of the feeding period (11/12/72), and their calves gained more weight (99.8 *vs* 89.7 kg; $P < 0.05$) during the following nine months (11/12/72 to 17/9/73)/

## CONCLUSION

These results agree with other work in the subcoastal spear grass region of north Queensland that found supplements containing nitrogen fed from early in the dry season may reduce weight loss but do not improve the fertility of cattle mated during the following wet season (Siebert *et al.* 1976; Holroyd *et al.* 1982). Work with steers (Winks *et al.* 1979) found that non-supplemented animals had higher rates of liveweight gain during the following wet season than animals supplemented in the previous dry season. Although no live weights were recorded over the following wet season in these experiments, a similar situation should occur in heifers, and this could account for the observed lack of fertility response as liveweight changes over the mating period influence fertility (Plasto 1968).

The justification for non protein nitrogen feeding is in the survival of pregnant cows when the dry season is prolonged. Breeder mortality has more effect on gross income than breeder fertility especially when three year old bullocks are sold (Taylor, *et al.* 1980).

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