# EFFECT OF SUPPLEMENTARY CONCENTRATE FEEDING ON MILK PRODUCTION FROM COWS GRAZING IRRIGATED KIKUYU PASTURE

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## SUMMARY

An experiment was carried out to determine the effect of feeding supplementary barley to cows grazing irrigated kikuyu pasture at a moderate (5 cows/ha) or high (7 cows/ha) stocking rate. In the 5 month grain feeding period the cows fed grain produced more solids corrected milk (SCM) than the non supplemented cows (11.00 17.56 kg/cow/d, P < 0.001) and cows stocked at 5/ha produced more than those at 7/ha (10.32 v 8.24 kg/cow/d, P < 0.01). The interaction between grain feeding and stocking rate was significant at the 10% level. The mean response of 0.6 kg SCM/kg grain for cows stocked at 5/ha would not be worthwhile but the mean response of 1.1 kg SCM/kg grain for cows at 7/ha would be, as non supplemented cows at 7/ha also had a lower liveweight gain (P < 0.001) which could adversely affect production in the subsequent lactation.

## INTRODUCTION

Kikuyu grass (Pennisetum clandestinum) is a major component of irrigated pastures grazed by dairy cows in the south west of Western Australia. Milk production as high as 15,000 kg/ha has been obtained from cows grazing kikuyu pastures in the 6 months summer irrigation season at a stocking rate of 7.5 cows/ha and using nitrogenous fertilizer at a rate of 500 kg/ha N (Olney et al. 1982). Production per cow was 11.8 kg/cow/d for the above treatment and the highest mean milk production per cow was only 13.2 kg/d at a stocking rate of 5.0 cows/ha and 200 kg/ha N fertilizer. The low milk production per cow is most likely due to the lower dry matter digestibility of kikuyu than for other pastures grown in the region. Low milk production per cow from kikuyu pastures has also been reported by Colman and Kaiser (1974).

This experiment was designed to measure the response in milk production from feeding barley grain as a supplement to cows grazing irrigated kikuyu pastures at two stocking rates.

## MATERIALS AND METHODS

The experimemt was carried out at Wokalup Research Station 140 km south of Perth. Thirty six Friesian cows with a mean calving date of September 7, 1981 (± 15 days s.d.) were selected, 16 being in their second lactation and 20 in their third or later lactation. The cows grazed annual clover based pastures from calving until the experiment began in November. Cows were stratified within the 2 age groups in calving order and cows within each strata of 4 were allocated at random to one of the following 4 treatments :-

5- , stocking rate 5 cows/ha, no supplement
5 + , stocking rate 5 cows/ha, 4 kg/d barley supplement
7 - , stocking rate 7 cows/ha, no supplement
7 + , stocking rate 7 cows/ha, 4 kg/d barley supplement

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The stocking rates were selected to be similar to those giving the maximum production per cow and maximum production per hectare in a previous experiment (Olney et al. 1982). The experimental area was divided into 3 blocks and each block was sub-divided into two 0.60 ha and two 0.43 ha paddocks. The 9 animals for each treatment were divided at random into 3 paddock replicates. Each paddock was continuously grazed by 3 cows from November 2, 1981 to April 28, 1982.

Feeding of barley to the relevant cows commenced on November 24 at 0.5 kg/cow/d and was increased by 0.5 kg/cow/d until the treatment level of 4 kg/cow/d was reached on December 1. This level of barley feeding was continued until April 27 when it was reduced to zero over 3 days.

The pasture consisted of over 90% kikuyu. The total fertilizer applied during the experimental period was 200 kg/ha N (applied as ammonium nitrate), 300 kg/ha superphosphate and 200 kg/ha muriate of potash. The area was flood irrigated. The first watering was given on October 20 and thereafter when the cumulative evaporation minus rainfall reached about 70 mm. There were 16 waterings in the irrigation season through to the end of April and a total of 11.5 ML/ha water was applied.

Milk yield of cows was measured every 14th day and the content of fat, protein and total solids was determined. The same information was obtained on 4 occasions in the two weeks prior to cows grazing the experimental area this data being used as a co-variate in the analysis. Cows were weighed on 6 occasions including the beginning and end of the experimental period.

Samples of pasture were taken every 4 weeks to estimate the total pasture on offer. Six 5 metre strips were cut in each paddock to a height of 2.5 cm above ground level using a rotary lawn mower. Total dry matter on offer was assessed and in vitro digestibility was determined using the technique described by Tilley and Terry (1963). In vitro digestibility was also determined on grab samples taken the same day as the on offer samples by two people walking a transect across each paddock selecting pasture samples they considered likely to be eaten by cows.

All data were analysed by analysis of variance.

## RESULTS

Solids corrected milk (SCM) yield per cow and milk fat yield per cow were higher for the cows fed grain ($P < 0.001$) and for cows at the lower stocking rate ($P < 0.01$) (Table 1). The mean response to feeding 4 kg barley/day was 4.46 kg SCM/cow/d at 7 cows/ha and 2.42 kg SCM/cow/d at 5 cows/ha. The interaction between stocking rate and grain feeding was significant at the 10% level ($0.05 < P < 0.1$). The mean protein % and total solids % were higher for cows fed grain (3.36 v 3.14, $P < 0.05$ and 12.95 v 12.35, $P < 0.01$ respectively). There was no effect of grain feeding on fat % (mean 3.91) and no effect of stocking rate on fat, protein or total solids content. Cows in the 7- treatment had a lower liveweight gain during the experimental period than cows in the other treatments ($P < 0.001$) Table 1).

The low stocked paddocks had more pasture on offer than the high stocked paddocks throughout the experiment ($P < 0.001$). There was more pasture on offer in the 5+ than the 5- paddocks but this was only significant ($P < 0.05$) on three of the five sampling dates after grain feeding commenced. The amount of pasture on offer was similar in the 7+ and 7- paddocks at all samplings (Table 2). The mean in vitro digestibility of the pasture on offer samples was 47.8% being much lower than the grab sample mean of 67.8% ($P < 0.001$).

TABLE 1 Mean daily SCM yield, milk fat yield and mean live weight change of cows grazing irrigated kikuyu pasture during the grain supplementation period

| | Treatment | | | | LSD |
|---|---|---|---|---|---|
| | 5 - | 5 + | 7 - | 7 + | P = 0.05 |
| SCM yield (kg/cow/d) | 9.11 | 11.53 | 6.01 | 10.47 | 1.65 |
| Fat yield (kg/cow/d) | 0.36 | 0.46 | 0.25 | 0.42 | 0.07 |
| Liveweight gain (g/cow/d) | 328 | 334 | 104 | 291 | 84 |

TABLE 2 Pasture dry matter on offer (kg/ha)

| Sampling | Treatment | | | | LSD |
|---|---|---|---|---|---|
| date | 5 - | 5 + | 7 - | 7 + | P = 0.05 |
| 29/10/81 | 3161 | 3614 | 3156 | 3489 | 487 |
| 30/11/81 | 3782 | 5339 | 3356 | 3540 | 862 |
| 21/12/81 | 3661 | 3978 | 2333 | 1954 | 881 |
| 25/1/82 | 3908 | 4481 | 2614 | 2243 | 987 |
| 22/2/82 | 3728 | 5142 | 2681 | 2774 | 1052 |
| 23/3/82 | 3832 | 5881 | 2144 | 2036 | 1080 |
| 28/4/82 | 3430 | 4553 | 1469 | 1644 | 922 |

## DISCUSSION

The response to feeding barley in this experiment would be economically worthwhile at the high stocking rate but not at the lower stocking rate for current prices of surplus milk and barley in Western Australia. Cows stocked at 7/ha had a mean response of 1.1 kg SCM/kg barley. The value of the extra milk produced would be similar to the cost of barley but the non-supplemented cows at the high stocking rate had a lower liveweight gain that would not be made up by compensatory gain as pasture availability is restricted in winter. These cows would be expected to have a lower production in the next lactation as they would calve at a lower liveweight and in poorer condition. Barley feeding had no effect on liveweight gain for cows at the lower stocking rate so no long term advantages of grain feeding would be expected. The lower mean response of 0.6 kg SCM/kg barley is not worthwhile at present prices.

With temperate pasture species such as clover and ryegrass responses to feeding concentrates to milking cows have only been obtained when pasture is limiting. For example Taparia and Davey (1970) reported no increase in milk production when concentrates were fed to cows receiving ad lib clover/ryegrass pasture largely due to substitution of feeds. On the other hand Le Du and Newberry (1982') obtained responses as large as 1.9 kg milk/kg concentrate when pasture availability was restricted for 5 weeks. This response rose to 3.5 kg/kg concentrate when residual effects were included.

Responses to feeding grain supplements are related to the quality, particularly the digestibility, as well as the quantity of the pasture available. The mean digestibility of 48% for the total pasture on offer amply demonstrates the poor quality of kikuyu. The grab samples representing the material likely to be selected by cows had a mean digestibility of 68% but this is still lower than would be obtained for clover/ryegrass pastures. Moir et al. (1974) concluded that energy concentration of the kikuyu pasture was the main factor limiting milk production on farms when the quantity available was not limiting. Kaiser et al. (1982) obtained a response of about 1 kg milk/kg concentrate from cows grazing kikuyu pasture when availability of the pasture was unrestricted.

Kikuyu is similar to other sub tropical and tropical species in having a low digestibility. Cowan et al. (1977) working with green panic/glycine pastures in north Queensland obtained a response of about 0.6 kg milk/kg concentrate when availability was high (> 2500 kg DM/ha) and up to 1.7 kg milk/kg concentrate with low pasture availability (< 2500 kg DM/ha). These responses are similar to those we obtained with equivalent availability of kikuyu pasture.

Milk production will be increased by feeding concentrate to cows grazing pastures of low digestibility such as kikuyu even when the quantity of pasture available is not limiting. The response is likely to be greater when pasture is limiting. The economics of feeding concentrate supplements will depend on the price cost ratio of the milk and concentrate as well as the availability of pasture.

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