EFFECT OF FEED SUPPLY ON THE SOLIDS-NOT-FAT FRACTION OF COWS' MILK ON THE ATHERTON TABLELAND, QUEENSLAND

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Summary

On the Atherton Tableland, north Queensland, a series of three experiments demonstrated that increasing the yield of a tropical grass-legume pasture to 1,500 kg green dry matter on offer per cow, or feeding 4.5 kg maize/cow/day, increased milk yield, solids-not-fat and casein content of milk. Extrapolation from these results to recommendations for solving the seasonal problem of sub-standard solids-not-fat content of milk are discussed.

I. INTRODUCTION

Each year on the Atherton Tableland, north Queensland, there is a consistant fall in the solids-not-fat (SNF) content of cow's milk during winter and spring. This fall is associated with cool, dry weather and is believed to be caused by a declining plane of cow nutrition following reductions in growth rate of pastures. To test this hypothesis data were collected from three experiments where milking cows grazed tropical pastures at different stocking rates and levels of supplementary feeding.

II. MATERIALS AND METHODS

Experiments were carried out on Kairi Research Station (700 m alt.; 17°14'S lat.; 145°34' long.) on the Atherton Tableland, north Queensland. Annual rainfall-averages 1248 mm, 830 mm of which falls in the months January to April inclusive. Maximum and minimum temperatures are 28.8 and 18.0°C respectively in December and 20.8 and 10.6°C in July.

Pastures were mixtures of green panic (*Panicum maximum* var. *trichoglume*) and glycine (*Glycine wightii* cv. Tinaroo). They had been established from 1961 to 1968 and received 123 kg superphosphate per year.

(a) Experiment 1

Forty Friesian cows were block into groups of four on calving date, previous milk yield and liveweight. They were then allocated to stocking rates of 1.3, 1.6, 1.9 and 2.5 cows ha and grazed experimental paddocks continuously from October 1970 to September 1972. Cows calved from November to January inclusive in both years. Half the cows in each stocking rate were fed a maize

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supplement in early lactation but feeding had ceased before the present measurements began.

Pastures were fenced into five equal strips along the contour and four stocking rate plots were randomly arranged within each of these strips. Cows grazed each strip for 2 days in a 10 day rotation.

Milk yield was recorded daily. A composite sample of milk from morning and afternoon milkings was taken for each herd once a week. These samples were analysed for fat, SNF, casein and total protein using I.D.F. standard procedures. From one pasture replicate, chosen to be representative, six 1 m^2 pasture samples were cut with hand shears to 3 cm stubble height from each stocking rate at monthly intervals from March to August inclusive. Samples were hand sorted into green grass and legume and dried at 75°C for 48 h in a forced draught oven.

(b) Experiment 2

In November 1972 ten Friesian cows were paired on calving date, previous milk yield and liveweight, then allocated to green panic-glycine paddocks chosen to receive nil or 100 kg N/ha in autumn 1973. Nitrogen fertilizer was spread in two dressings of 50 kg N/ha on 18th April and 8th June 1973. Each group of cows grazed three pasture replicate on a five day rotation (one pasture replicate was half the size of the other two) at a stocking rate of 2.5 cows/ha. Cows calved from December to February inclusive and no supplement was fed.

Milk yield and composition were recorded as in Experiment 1. Three 0.43 m^2 pasture samples were taken from each paddock monthly from May to August inclusive and green dry matter yield determined as in Experiment, 1.

(c) Experiment 3

Sixteen Friesian heifers calving in January and February 1972 were paired on body weight and received either no supplement or 4.5 kg crushed maize/cow/day from two weeks post-calving to 7th August, 1972. Cows grazed together as part of a larger herd of 100 cows at an average stocking rate of 1.6 cows/ha. Supplement was fed before afternoon milking and unsupplemented cows were prevented from grazing during feeding.

Milk yield was recorded daily. On one day each week a composite sample of morning and afternoon milk from each cow was analysed hydrometrically for SNF content.

(d) Analysis

Linear regression equations were calculated relating measurements to stocking rate or time. Lines were then tested for significance of slope and differences between intercepts (Snedecor and Cochran 1969).

III. RESULTS

In experiment 1 SNF content of milk was similar at all four stocking rates in March and April 1972, whereas in July and August 1972 SNF content declined linearly from 8.73 percent at 1.3 cows/ha to 8.35 percent at 2.5 cows/ha ($P<0.05$). Casein and total protein contents of milk tended to follow the same pattern as SNF. During July and August milk yield also declined from 8.3 kg/cow/day at 1.3 cows/ha to 2.0 kg/cow/day at 2.5 'cows/ha.

The SNF content of milk was curvilinearly related to the pasture on offer per cow (Figure 1). During July and August SNF content increased with pasture yield to approximately 1,500 kg green dry matter on offer per cow.

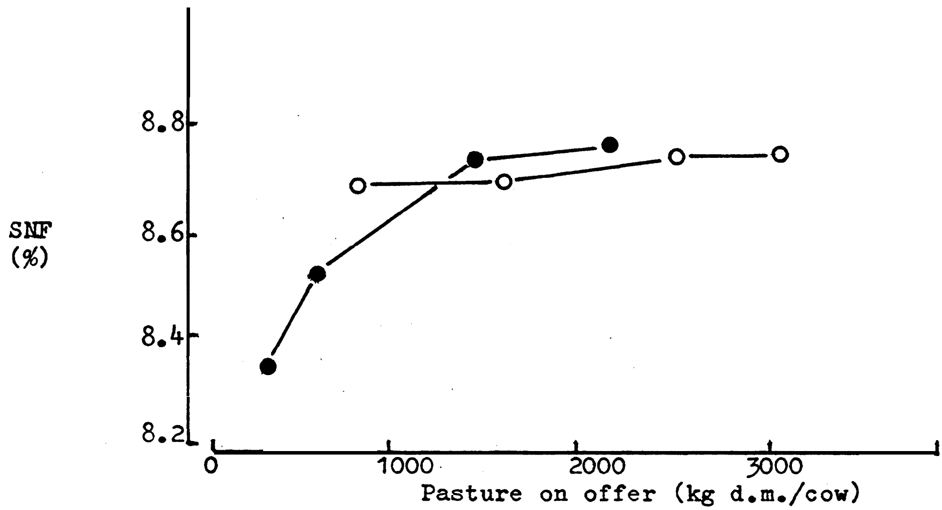

Fig. 1. Relationship between SNF content of milk and pasture on offer per cow.

O——O, 3rd March to 24th April, 1972; ●——●, 5th July to 29th August, 1972.

. Nitrogen fertilizer applied in autumn increased pasture on offer, milk yield and SNF, casein and total protein content of milk (Table 1).

TABLE 1

Effect of nitrogen fertilizer on presentation yield of pasture, milk yield of cows and milk composition at 2.5 cows/ha (Experiment 2)

Period and level of nitrogen fertilizer	Pasture yield (kg d.m./ha)	Measurement Milk yield (kg/cow/day)	Fat (%)	SNF (%)	Casein (%)	Total Protein (%)
1st May to 30th August 1973						
O N	1093	8.0	3.6	8.29	2.17	2.91
100 kg N/ha	1628	10.6	3.3	8.58	2.31	3.01
Significance	*	*	n.s.	**	**	*

(**$P<0.01$; *$P<0.05$; n.s. $P>0.05$)

From May to August inclusive 1972 milk yield averaged 11.3 and 6.9 kg/cow/day ($P<0.01$) and SNF content of milk averaged 8.73 and 8.44 percent ($P<0.01$) for supplemented and unsupplemented heifers respectively.

IV. DISCUSSION

Increasing feed supply during winter maintained the SNF content of milk above the legal standard of 8.5 percent. In addition the increased milk production offset the cost of providing extra feed. An average expenditure of 15 cents/cow/day on nitrogen fertilizer, or 45 cents/cow/day on maize, returned 28 and 48 cents/cow/day respectively in extra milk sold.

Cows grazing tropical pastures may be limited in energy intake by the low digestible energy content of the pasture (Hamilton et al 1970). Feeding concentrate with this pasture has consistantly increased milk yield and SNF content of milk (Hamilton et al 1970; St obbs 1971; Royal and Jeffery 1972). In the Kairi environment cows may be limited in energy intake during winter and spring by both a low pasture yield and low digestibility of pasture. In this situation Seeding an energy supplement caused a marked rise in SNF Content of milk.

Providing extra pasture was as effective as feeding maize in raising SNF content of milk. The SNF content increased linearly with pasture yield to approximately 1,500 kg green dry matter on offer per cow and beyond this is remained constant. Observations indicate that many farms on the Atherton Tableland have less than 1500 kg green dry matter on offer per cow daring winter and spring. Thus we conclude the problem of low SNF in milk is primarily due to a deficiency of pasture on offer to cows.

Alternatives available to farmers to correct the situation include (a) feeding maize or molasses, (b) autumn applied nitrogen, (c) irrigation and (d) conserved fodder. The choice will depend on the individual farm situation but the combination of nitrogen fertilization and irrigation has gained acceptance on approximately 60 percent of Tableland farms.

V. ACKNOWLEDGEMENTS

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