Session 3 Utilizing the resources of the subtropics and tropics

Supplementation of dairy weaners grazing tropical pastures

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Experiments were carried out to determine the potential of tropical pastures for growth of dairy replacement heifers, and to assess the need for supplementation of growing animals grazing these pastures. Grain supplementation (1,4 kg maize/head/day) increased ADG to 0,62; 0,56 and 0,51 kg/day at stocking rates of 7,4; 9,9 and 12,4 heifers/ha, respectively. Growth rates of the Friesian heifers were equivalent for animals fed either maize or molasses at equivalent DM levels. Protein supplementation also had beneficial effects on live weight gains of calves.

Eksperimente is gedoen om die potensiaal van tropiese weiding vir die grootmaak van verse wat as plaasvervangers in melkkuddes moet dien, te bepaal. Verder is die nodigheid vir byvoeging aan groeiende diere wat hierdie weidings bewei, ondersoek. Graanbyvoeding (1,4 kg mielies/kop/dag) het die ADG laat toeneem na 0,62; 0,56 en 0,51 kg/dag wanneer onderskeidelik 7,4; 9,9 en 12,4 verse/ha aangehou word. Groeitempos van die Friesverse was gelykstaande aan dié van diere wat mielies of melasse gevoer is teen ekwivalente DM vlakke. Proteïenbyvoeding het ook 'n voordelige effek gehad op die toename van lewende massa van kalwers.

Keywords: Dairy replacements, weaners, tropical pastures, stocking rate, supplements, growth of dairy replacements

Introduction

With irrigation and nitrogen fertilizer, tropical pastures produce high dry matter yields and can generate high levels of animal production per unit area. However, these pastures are of low quality and production of grazing animals is restricted by intake of digestible nutrients. Tropical pastures will not support growth rates sufficient for early-weaned Friesian calves to reach mating weight by 15 months of age.

To determine the potential of tropical pastures for growth of dairy replacements, and to assess the need for supplementation of growing animals grazing these pastures, a number of experiments were conducted at Ayr Research Station, which is located in the Burdekin River Delta in northern Australia.

Results and Discussion

Grain supplementation

Deans *et al.* (1976) showed that an irrigated pangola *(Digitaria decumbens)* pasture would support stocking rates of up to 12 weaners/ha. Pastures were fertilized with urea at 336 kg nitrogen/ha/annum and weaner calves were run at three stocking rates 7,4; 9,9 or 12,4 animals/ha. Over a 12 month period, animals gained 0,50; 0,43 and 0,37 kg/day, respectively. Stocking rate effects were negligible during summer.

Even at the lowest stocking rate, growth rates were too low for Friesian heifers to reach mating weight by 15 months of age. In the second year, all animals were supplemented with 1,4 kg maize/head/day; and growth rates increased to 0,62; 0,56 and 0,51 kg/day, respectively. The animals commenced the experiment at 156 kg live weight and after 12 months weighed 353; 340 and 322 kg at the stocking rates of 7,4; 9,9 and 12,4 heifers/ha.

These experiments showed that grain supplementation could improve the growth of dairy weaners grazing tropical pastures, and allow high stocking rates to be used without seriously affecting the growth of replacement heifers.

The relationships between level of supplementation and stocking rate were subsequently examined (Moss *et al.*, 1978). Friesian heifers, of 104 kg average live weight, grazed an irrigated *Setaria sphacelata* var *kazungula* pasture stocked at 8,25 (L) or 10,75 (H) animals/ha. They were offered maize at 0,5 (L) or 1,0 (M) kg/day (low stocking rate) or at 1,0 (M) or 1,5 (H) kg/day (high stocking rate). Initially stocking rate effects were small with the greatest live weight responses being a result of the level of supplementation. Live weight gains between 100 and 140 kg live weight were 0,25; 0,31; 0,29 and 0,35 kg/day for animals on LL, LM, HM and HH treatments, respectively. Growth rates increased with time and effects of stocking rate became greater as animals increased in weight. During the experiment (11 months) live weight gains were 0,45; 0,52; 0,48 and 0,52 kg/day with treatments of LL, LM, HM and HH, respectively.

Molasses supplementation

Moss *et al.* (1982a) compared maize and molasses as supplements for Friesian weaners between 125 and 300 kg live weight. Supplements were fed at equivalent dry matter levels in the ratio of 1,2 molasses to 1,0 maize. Animals grazed irrigated kazungula setaria pastures set stocked at 12 weaners/ha and supplements were fed at Nil, 0,5; 1,0 or 1,5 kg maize/head/day or 0,6; 1,2 or 1,8 kg molasses/head/day. Powdered mono ammonium phosphate (MAP) was added to the molasses at 1% of the supplement.

Growth rates were equivalent for animals fed either maize or molasses. The response to level of supplementation was linear and the relationship between growth rate (Y kg/day) and supplement level (X kg/day) was described by the equation:

$$Y = 0{,}439 + 0{,}128\ X$$

($SE_b = \pm 0{,}021$; ($P < 0{,}01$; RSD $\pm$ 0,063)

Protein supplementation

Even with high levels of energy supplementation, the growth rates of early weaned calves on tropical pastures are generally too low for heifers to reach mating weight by 15 months

Table 1 Effect of maize or maize plus cotton seed meal on the growth of weaner calves

Supplements	Level (kg/day)	Wean wt (kg)	Wean to 110 kg (kg/day)	(days)	110 – 130 kg (kg/day)	Wean to 130 kg (kg/day)	(days)
Maize	1,0	74	0,49[a]	79	0,59[a]	0,53[a]	115[a]
Maize	1,5	73	0,49[a]	79	0,61[ab]	0,53[a]	111[a]
5M:1CSM	1,0	73	0,54[a]	73	0,59[a]	0,55[a]	105[ab]
5M:1CSM	1,5	71	0,62[b]	70	0,72[b]	0,64[b]	98[b]
SE		1,5	0,027	2,6	0,044	0,024	4,2

[a,b]Means in columns with different superscripts are significantly different ($P < 0,05$)

of age. Crude protein levels in tropical pastures are often low, and protein intakes of grazing animals can be reduced when high energy, low protein concentrates such as cereal grains are fed. Recent studies investigated the effect of added protein in supplements for young weaner calves. In the initial experiment, Friesian calves were weaned off milk at eight weeks of age onto irrigated kazungula setaria pastures stocked at 10 calves/ha (winter-spring). They were fed supplements of maize (M) and/or cotton seed meal (CSM) (mechanically extracted) mixed to provide isocaloric supplements of 9, 15, 19, 24 and 40% crude protein. Supplements were fed at 1,0 kg/head/day. A sixth treatment group was unsupplemented. The greatest response to supplementation occurred with maize. There was little further response to added protein. Live weight gains of calves from 2 to 6 months of age were 0,54; 0,51; 0,56; 0,60; 0,52 and 0,21 kg/day, respectively.

The lenient stocking rate allowed the pasture on offer to increase in November – December, with a resultant decline in pasture quality because of increasing maturity. However, oesophageal fistulated calves were able to select a diet almost entirely of green leaf with a consistent crude protein content of 16%. Rumen fistulated calves were also used in the experiment. Rumen ammonia levels averaged 120 mg NH_3-N/l in pasture fed animals but fell to 60 – 80 mg NH_3-N/l in animals receiving maize. This would be marginal for maximum rumen microbial activity. In all treatments with added protein rumen ammonia levels indicated that available protein was in excess of the requirements, and in animals receiving cotton seed meal alone, rumen ammonia levels peaked at 700 mg NH_3-N/l two hours after feeding.

These measurements indicated that animals could select a high protein diet from leniently stocked tropical grass pastures. If pastures are of a lower quality, or higher levels of grain supplementation are used, dietary protein may be insufficient for maximum rumen microbial activity and animal growth will be limited.

To assess the value of adding rumen degradable protein to an energy concentrate when fed at high levels to weaner calves, animals were offered supplements of maize (M) or maize plus cotton seed meal (5M:1CSM) at 1,0 or 1,5 kg/day (Moss *et al.*, 1982b). Calves were weaned at 70 kg live weight onto irrigated couch (*Cynodon dactylon)* pastures and continued in the experiment until they exceeded 130 kg live weight. An increased level of maize supplementation did not increase live weight gains. The inclusion of cotton seed meal in the supplement had only a small effect ($P < 0,05$) at the 1,0 kg level, but markedly increased live weight gains ($P < 0,01$) when 1,5 kg of supplement was fed (Table 1).

Conclusion

Low digestibility of tropical pastures will restrict growth of weaned dairy calves. Animals may gain only 0,2 kg/day between weaning and 130 kg live weight. As animals grow and are more able to utilize feeds of lower digestibility, growth rates will increase, but tropical pastures will not support growth rates above 0,5 kg/day until heifers are around 200 kg live weight. Live weight gains will be increased by the use of high energy concentrates. Utilization of high levels of these concentrates can be limited by available protein, and supplements balanced for protein and energy should be used for early-weaned calves grazing tropical pastures. Growth of older animals is equivalent for animals fed either maize or molasses when these are offered in the ratio of 1,0 maize:1,2 molasses.

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