THE PERFORMANCE OF FEMALE CALVES FED LIMITED MILK AND FOUR RATIONS AT MOBLISSA, GUYANA[1]

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ABSTRACT

The performance of calves reared for 21 weeks on four isocaloric rations were compared in a trial using a randomized complete block design. The four rations were compounded from rice bran, wheat middlings, fish meal and copra meal. The average pre-trial weight of the calves at four days of age was 30 kg and did not differ significantly among rations (P>0.05). Milk was fed at an average of 3.5 kg per calf per day and the rations *ad libitum*. Calves were weaned when they achieved a liveweight of approximately 60 kg. There were no significant differences (P>0.05) among the rations for the time that the calves required to attain this weight (averaging 11 weeks). There were also no significant differences (P>0.05) in feed intake, which averaged 28.6 kg per calf up to weaning time. At the end of the trial (21 weeks) there were no significant differences (P>0.05) among the rations for the time (averaging 11 weeks) that the calves required to attain this weight. There were also no significant differences (P>0.05) in feed intake, which averaged 28.6 kg per calf up to weaning time. At the end of the trial (21 weeks) there were no significant differences (P>0.05) among rations for liveweight gain, which averaged 465 g per calf per day. It was concluded that the rations gave acceptable performance and the choice of ration would depend on the availability and cost of the various ingredients.

(Key words: Calf feeding systems, early weaning, rice bran, copra meal, fish meal, wheat middlings).

COMPENDIO

En un ensayo con un diseño de bloques completos al azar se comparó el desempeño de terneras, criadas durante 21 semanas con cuatro raciones distintas pero isocalóricas. Las cuatro raciones se prepararon con afrecho de arroz, acemite de trigo, harina de pescado y harina de copra. El peso promedio pre-experimental de las terneras, a una edad de cuatro días, fue de 30 kg y no difirió entre los distintos grupos experimentales (P>0.05). Las terneras recibieron un promedio de 3.5 kg por día y la ración ad libitum. El destete se hizo cuando alcanzaron un peso aproximado de 60 kilogramos. No se encontró diferencias significativas (P>0.05) entre las raciones con respecto al tiempo que las terneras requirieron—en promedio 11 semanas—para alcanzar este peso. Tampoco se encontró diferencias significativas (P>0.05) en el consumo de alimentos, el cual promedió 28.6 kg por animal hasta el destete. Al final de las prueba, 21 semanas, no se habían detectado diferencias (P>0.05) entre tratamientos en cuanto a la ganancia de peso, la que promedió 465 g por ternera al día. Se concluyó que las raciones permitieron un desempeño animal aceptable y que la selección de la ración dependería más bien de la disponibilidad y costo de sus ingredientes.

INTRODUCTION

Solid feeding of the calf can begin early in its life (4), and be adopted as a strategy to reduce quantities of liquid milk fed in rearing (3). This would increase the amount of milk sold and improve farm profitability.

Satisfactory growth performance can be obtained with limited milk provided the solid feed concentrate is of sufficient quality to satisfy the nutrient requirements of the calf and has good fermentative characteristics that produce volatile fatty acids which stimulate increases in the rumen papillae and promote rapid rumen development (4).

The benefits of early weaning and feeding a commercial calf ration had been demonstrated at Moblissa (3). In Guyana, however, since milk replacements and supplemental feeds in the form of calf starters are imported and not routinely available, the need arises to develop alternative supplemental feeding systems based on locally available feed ingredients and to test their utility. This study was therefore devised to compare the performance of calves grown on four diets compounded from rice bran, copra meal, wheat middlings and fish meal, with different levels of protein but similar levels of energy.

MATERIALS AND METHODS

Statistical design

A randomized complete block design was used. Female calves were assigned to the treatments as they were born. There were six blocks and each block had one calf receiving one of the four rations, giving a total of 24 calves for the trial.

1 Received for publication 18 March 1991.
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Ration formula

The four iso-caloric rations were formulated from the various ingredients as shown in Table 1. The ingredients were weighed and mixed manually in batches of 100 kg for each ration, then bagged and stored for subsequent feeding.

Table 1. Ration composition: protein and energy contents.

Item	Ration I	II	III	IV
Ingredients				
Rice bran	17.8	23.6	11.6	30.6
Wheat middling	51.6	64.2	35.9	69.4
Fish meal	7.5	12.2	—	—
Copra meal	23.1	—	52.5	—
Nutrients				
Crude protein/calculated (%)	21.0	16.7	14.0	11.0
Crude protein/as analyzed (%)	23.7	21.9	23.9	14.9
Energy (Mcal ME/kg)	2.62	2.61	2.64	2.68

ME = Metabolizable energy, calculated

Milk feeding

The calves remained with the dams three days after birth to receive colostrum. At the end of the third day they were removed from the dams, given 3 cc of vitamin E - selenium and 3 cc of Ferrofax and were placed in individual calf pens measuring 2.4 m^2. Milk was fed individually to calves from buckets. In the first week, they received 2.3 kg of fresh milk in three equal feedings (morning, midday and afternoon). From the third week, until they achieved a weight of 60 kg, they were given 3.5 kg milk in two equal feedings (morning and afternoon). When they achieved a weight of 60 kg milk feeding was stopped (weaned).

Supplemental feeding

The calves were offered the various rations in boxes placed in the pens from the first day they entered the pens. In the first week, small amounts (100 g) were offered in the morning. The following day, the refusals were collected, weighed, and fresh feed offered. The amounts offered were increased by 100 g weekly or by 20% if all the feed was consumed for two consecutive days.

Minerals were offered *ad libitum* in boxes placed in the pens.

Pasturage

After one week, the calves were gradually introduced to *Brachiaria humidicola* (UF 717) pasture, spending more time on pasture as they grew older. If inclement weather prevailed, the calves were kept indoors. As the calves grew older they were also allowed to graze *B. decumbens* (signal grass) pastures, as the UF 717 pasture area was too small. Therefore, they grazed these two types of pastures alternately. No attempts were made to measure herbage intake.

Health

Calves were dewormed every month and deticked according to the level of infestation. If coughing, scouring or any ailment occurred, they were treated with the appropriate antibiotics or drugs on the advice of a veterinarian.

Animal weights

The birth weights of the calves were recorded when possible. They were weighed again at four days old, at seven days, and then at weekly intervals until the end of the trial.

Intake

The amount of feed offered daily was weighed and the weights of the refusals were recorded on the following day. The difference between the two weights was assumed to be consumption.

RESULTS

Live weight

The live weight data are presented in Table 2. There were no significant differences among the rations for the initial weights of the calves at four days of age, the weaning weights and the weights at the conclusion of the trial. There were also no significant differences among the rations for the time it took to wean or for weight gains over the trial.

Linear regressions of live weight over time for the four rations were highly significant ($P<0.001$). For the linear model $Y = A + BX$, the following equations are the solutions for the four treatments (Table 3):

Intake

The quantities of milk and feed consumed are given in Table 4. There were no significant differences among

Table 2. Initial weights, weaning weights, time to weaning, final weights and daily gain of calves fed four rations.

Parameter	Ration I	II	III	IV	Standard error
Initial wt. at 4 days old (kg)	30.0	30.2	29.6	30.2	1.11
Weaning wt. (kg)	62.0	61.7	61.2	60.8	1.05
Time to weaning (weeks)	10.5	11.7	11.2	10.8	0.48
Final wt. at 21 weeks (kg)	93.9	92.1	92.6	89.7	5.99
Daily gain up to 21 weeks (g/calf/day)	435	421	428	405	31

Error, degrees of freedom = 15

Table 3. Linear regression of live weight of calves/age.

	Equation[a]	Standard error of A	Standard error of B	R^2
Ration I:	Y = 25.8 + 0.474 X	0.70	0.0082	99.29
Ration II:	Y = 23.6 + 0.459 X	0.80	0.0093	98.97
Ration III:	Y = 24.7 + 0.459 X	0.60	0.0070	99.38
Ration IV:	Y = 24.8 + 0.468 X	0.86	0.0100	99.36

a Y is liveweight in kg, A is a constant estimating birth weight, B is a coefficient indicating the daily weight gain and X is the time in days (age).

the rations for the milk consumed to weaning, the quantity of feed consumed to weaning and the total amount of the rations consumed for the trial.

DISCUSSION

Milk feeding is important in the early life of the calf, as milk is a very good source of rumen bypass nutrients (5, 6). Additionally, lactose is supposed to be the only carbohydrate utilized by the calf up to three to four weeks of age (2). The introduction of solid feeding early in the life of the calf is to stimulate the rapid development of the rumen. Milk feeding can continue, however, since closure of the oesophageal groove (when liquid milk is taken) will allow the milk to by-pass the rumen (4). Thus, the usual check in growth observed when calves are placed on a solid diet can be avoided if this diet is combined with milk feeding.

Table 4. Quantities of milk and rations (as fed) consumed by calves.

Consumption indicators	Ration I	II	III	IV	Standard error
Milk consumed (kg/calf)	243.4	271.8	259.6	259.6	10.92
Ration consumed to weaning (kg/calf)	29.6	29.7	22.8	32.5	4.85
Ration consumed to 21 weeks (kg/calf)	180.9	154.9	129.3	160.1	20.68

Error, degrees of freedom = 15

The similarity of the growth performances of the calves on the four rations may be due to the fact that similar quantities of milk were consumed, and the nutrients derived from this source perhaps did not allow the differences in nutrient content of the rations to show before weaning. Chemical analysis of the rations (Table 1) indicated large differences between the calculated crude protein content of the rations and the actual crude protein content. The results indicate that ration IV was clearly inferior in protein value to the other three rations. However, neither before weaning nor during the 10 subsequent weeks was there any significant effect of these differences in protein content upon growth rates. In fact, the growth rate in all four treatments was satisfactory.

The intake of rations and milk and the period during which milk was fed to the calves were similar to those recommended by the Kenyan Ministry of Agriculture (1) for an early weaning, limited-milk calf rearing system. It seems that the rations formulated are comparable to the young stock commercial rations recommended by that Ministry for calf rearing.

The fact that the four rations gave similar performances means that the use of any one of them may be dictated primarily by the costs of the various ingredients and their availability.

CONCLUSION

It may be concluded that rations formulated from the feed ingredients in the stated combinations are nutritionally adequate and that calves fed these rations achieve a satisfactory growth rate for 21 weeks, when limited quantities of milk are fed for the first 11 weeks.

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