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Liveweight Gain and Efficiency of Feed Utilization by Bunaji Cows during Early Lactation

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Target audience: Ruminant Nutritionists, Animal Scientists, Beef and Dairy Cattle Farmers.

Abstract

A feeding trial was carried out to study the effect of feeding increasing levels of total digestible nutrients (TDN) on the liveweight of Bunaji cows during early lactation. The feeding trial ran for 56 days, starting on the 6th day after parturition. The experimental cows, in a completely randomized design, were randomly allocated to four diets at 3.5, 4.5, 5.5 and 6.5 kg TDN levels. These diets were compounded using cottonseed cake, dried brewer's grains and Lablab purpureus hay. The daily feed intake; daily milk yield and two weekly liveweight changes in the cows were recorded. The mean daily dry matter and crude protein consumed per metabolic size increased significantly (P< 0.05) as the dietary TDN increased from 3.5 to 6.5 kg. The values were 82.4, 106.6, 118.2 and 131.2 g kg-^{1} W$^{0.75}$ day -^{1} for dry matter intake and 22.5, 29.0, 33.1 and 38. 0 g kg-^{1} W$^{0.75}$ day -^{1} for crude protein intake for the diets at the 3.5, 4.5, 5.5 and 6.5 kg TDN levels respectively. The daily milk yield ranged from 1.83 to 3.83 kg, while the liveweight gain ranged from 598.2 to 946.4 g day -^{1}. The experimental diets were better utilized for liveweight gain at the 3.5, 4.5 and 6.5 kg TDN levels, with the mean efficiency of feed utilization ratios of 7.1: 1, 9.3: 1 and 9.9: 1 respectively. The least efficiency of feed utilization ratio of 13.5: 1 was obtained at the 5.5 kg TDN level.

Key words: *TDN, Bunaji cows, liveweight gain.*

Description of Problem

Holstein cows fed higher crude protein and energy rations were observed to have lost less weight during early lactation and subsequently reported (1) to have recovered the lost weight faster than those fed the lower levels. It was also observed (2) that by increasing the concentrate level of the diet from 5.40 to 7.25 kg / day, there was body weight gain of about 291g/day in well grown Holstein heifers during early lactation. Information also revealed (3) that it was not experimentally possible to partition the energy utilized for lactation from that required for maintenance and body weight change, since all the three functions run concurrently. Results (4) obtained for Bunaji cows fed concentrate supplements containing yam peels showed that average daily weight gain ranged from 257 to 424 g. A similar study (5) however recorded 323 to 729 g/cow/day. Mean liveweight gain of between 142 and 214 g/cow/day was obtained (6) for Bunaji cows fed grass hay and concentrate feed mixtures. Lower liveweight gain of 74.1, 81.4 and 83.5 g/cow/day was however reported (7) for lactating Bunaji cows either grazed or on natural range forage or given supplemental feed mixture of 50% *Lablab purpureus* hay and 50% maize offals; or offered sole cottonseed and sole *Lablab purpureus* hay respectively. Values of efficiency of feed conversion to liveweight gain expressed as liveweight gain per unit dry matter intake, were reported (6) as 26.7 and 38.8 g kg-^{1} per cow per day for multiparous and primiparous Bunaji cows respectively. This study was therefore carried out

Nutrients consumed per metabolic size of Bunaji cows

The daily intake of nutrients per metabolic size (Table 3) were significant ($P < 0.05$) and increased as the dietary TDN levels increased from 3.5 to 6.5 kg TDN levels as reported elsewhere (13,14,15).

Performance of Bunaji cows

The average daily milk yield of Bunaji cows ranged from 1.8 to 3.8 kg/cow/day (Table 4). The highest daily total milk yield at the 5.5 kg TDN level, was about 2.1 times that for the least daily total milk yield at the 3.5 kg TDN level. Treatment effects were significant ($P<0.05$). These values were consistent with the highest mean milk yield of 3.9 kg/cow/day earlier reported (16) for White Fulani or Bunaji cows.

Table 3: *Mean daily nutrients consumed per metabolic size by Bunaji cows fed experimental diets*

	Dietary levels of TDN (kg)				
Intake (g kg^{-1} $W^{0.75}$)	3.5	4.5	5.5	6.5	SE
Dry matter	82.4d	105.6c	118.2b	131.2a	0.78
Crude protein	22.5d	29.0c	33.1b	38.0a	0.34
Ether extract	3.7c	6.1b	6.6a	6.1b	0.03
Crude fibre	19.2d	22.4c	23.8b	25.0a	0.18
Nitrogen free extract	31.5d	41.0c	46.5b	52.5a	0.45
Acid detergent fibre	11.6c	13.7b	17.0a	17.3a	0.12
Neutral detergent fibre	22.9d	27.5c	34.1b	35.5a	0.15

Means in rows followed by different letters differ ($P < 0.05$).

Table 4. *Milk yield, liveweight changes and efficiency of feed utilization by Bunaji cows fed varying TDN levels*

	Dietary levels of TDN (kg)				
Parameters	3.5	4.5	5.5	6.5	SE
Duration of experiment (days)	56	56	56	56	-
Total milk yield (kg day^{-1})	1.83d	2.20c	3.83a	3.21b	0.48
Initial liveweight (kg)	251.5b	243.4c	262.8a	268.0a	1.23
Final liveweight (kg)	295.5b	285.1c	296.3b	321.0a	1.18
Mean liveweight (kg)	273.5c	264.3d	279.5b	294.5a	1.02
Metabolic weight (kg^{-1} $W^{0.75}$)	67.3ab	65.5b	68.4ab	71.1a	1.00
Liveweight gain (kg)	44.0b	41.8b	33.5c	53.0a	1.18
Daily liveweight gain ($gday^{-1}$)	785.7b	745.5b	598.2c	946.4a	33.49
E F U ratio (feed intake : liveweight gain)	7.1 : 1c	9.3 : 1b	13.5 : 1a	9.9 : 1b	0.26

Means in rows followed by different letters differ ($P < 0.05$).
EFU = Efficiency of feed utilization

The liveweight gain of 398.2 to 946.4 g/cow/day observed (Table 4) was higher than the corresponding values of 143 to 729 g/cow/day earlier reported elsewhere (4, 5, 6). The high liveweight gain observed for the Bunaji cows used in this study might be due to the fact that the cows probably utilized more of their nutrients intake for weight gain rather than milk production. The cows fed diets of 5.5 kg TDN level had the least average liveweight gain of 598.2g/cow/day probably because they converted more of the energy and other nutrients consumed into milk rather than for liveweight gain. The efficiency of feed utilization ratios obtained in this study ranged from 7.1: 1 to 13.5: 1 ($P<0.05$). This was in close agreement with the range of values of between 6.1: 1 and 13.4: 1 earlier reported (5). The least efficiency of feed utilization ratio of 13.5: 1 observed at the 5.5 kg TDN level, which had the highest milk yield, also could be due to the cows that converted more of the nutrients absorbed from their diets into milk rather than liveweight gain.

Conclusions and Applications

It can be concluded that:

1. The mean daily liveweight gain of the lactating Bunaji cows ranged from 598.2 to 946.4 g/cow/day, while the efficiency of feed utilization values ranged from 7.1 to 13.5 for the Bunaji cows during early lactation.
2. The Bunaji cows had higher potentials as tropical beef cows than as dairy cows, since they gained appreciable weight during early lactation.

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to determine liveweight gain and efficiency of feed utilization by Bunaji cows fed increasing TDN levels during early lactation.
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Materials and Methods

Sixteen Bunaji cows in their early lactation were randomly assigned to four treatments of four animals per treatment in a completely randomized design (CRD) for a 56 days period (6th to 62nd day). The four treatment diets containing 3.5, 4.5, 5.5 and 6.5 kg TDN are presented in Table 1. TDN (per 100kg) = kg digestible crude protein (CP) + kg digestible crude fibre (CF) + kg digestible nitrogen free extract (NFE) + 2.25 (kg digestible ether extract (EE) (8). Therefore the TDN levels of the diets were estimated based on the proximate composition of the feed ingredients used and their digestibilities being fitted into the above equation. The actual amounts in kg weight of these three feed ingredients (cottonseed cake, dried brewer's grains and *Lablab purpureus* hay) fed to the animals were obtained by estimation. The cows were housed individually in a barn.

Table 1: *Composition (kg) of experimental diets*

	Levels of dietary TDN (kg)			
Ingredients	3.5	4.5	5.5	6.5
Cottonseed cake	2.3	3.0	3.5	4.3
Dried brewer's grains	2.5	3.2	3.7	4.6
Lablab purpureus hay	1.3	1.6	1.9	2.3
Total	6.1	7.8	9.1	11.2

roofed with aluminium sheets. Each animal had an individual feeder and drinker located right in it's front. The cows were tethered individually to iron hooks on the floor, while wood shavings were used as bedding material on the concrete floor. On the first day of the experiment and fortnightly thereafter, the cows were weighed and dipped against ectoparasites using Asuntol insecticide solution. The cows and their calves were tagged. The cows were fed according to their dietary TDN levels and salt licks and water were given *ad libitum*. Concentrate feeds made up of cottonseed cake and dried brewer's grains mixed together were offered in the morning at about 07.30h while the *Lablab purpureus* hay (cut into about 5cm lengths) was given in the afternoon at about 14.00h. The cows were hand milked twice daily between 07.30h and 08.30h and also between 14.00h and 15.00h. The records kept included the daily feed intake and refusals, morning, evening and daily total milk yield and two weekly liveweight of cows. Sub-samples of each diet were weighed and dried in the oven at 105°C for 24 hours for dry matter determination. Other sub-samples of the diets were also oven-dried at 65°C for 48 hours for chemical analysis. The sub-samples were ground in a laboratory hammer mill to pass through 1.0mm sieve. These were stored in airtight containers, labeled and kept in a dark cupboard at room temperature until required for chemical analyses. These sub-samples of the diets and feed refusals were analysed for their proximate components (9). Neutral detergent fibre and acid detergent fibre of the feed samples were also determined (10). Analysis of variance (11) was used to run the data and where significant, means were separated (12).

Results and Discussion

Chemical composition of experimental diets

The chemical composition of the diets fed to the cows are presented in Table 2. The dry matter contents of the diets were very high. As the TDN levels of the diets increased, there were slight increases in the crude protein contents.

Table 2. *Chemical composition (g 100g^{-1} DM) of experimental diets fed to Bunaji cows*

	Levels of TDN (kg)			
Parameters	3.5	4.5	5.5	6.5
Dry matter	91.3	91.5	91.7	91.8
Crude protein	27.2	27.4	28.0	29.0
Ether extract	4.6	5.8	5.6	4.6
Crude fibre	23.4	21.3	20.2	19.1
Nitrogen free extract	38.4	38.8	39.4	40.0
Acid detergent fibre	14.0	13.0	14.4	13.2
Neutral detergent fibre	27.7	26.0	28.9	27.0

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