STUDY ON THE FEEDING REGIMES AND GROWTH PATTERN OF PRE-RUMINANT PABNA ZEBU CALVES

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Summary

Twelve day old Pabna zebu calves of similar weights were assigned at random to 3 different calf starter-rations namely T_0, T_1 and T_2 to determine the effect of feeding regimes and growth pattern of calves upto 3 months of age. Calves allowed to intake starter 0.5 percent of body weight from 2nd week on to 7th weeks of age, while starter at 1 percent of body weight was allowed later on upto 13th weeks of age. Calves started to intake green grass after 2nd to 3rd weeks and average intake per day was limited to 1 kg upto the end of experiment, while calves started to take rice straw *ad libitum* after 6th weeks of age. Colostrum feeding was offered *ad libitum* and in addition calves suckled their dam's milk shortly before and after milking usually in the morning and evening. Growth of calves in different treatment groups was found statistically insignificant. The mean growth rate per head per day ranged from 196.43 375.0 g for T_0 group, 185.72-360.72 g for T_1 group and 180.0-385.72 g for T_2 group respectively between 1st to 7th weeks of age while the growth rate ranged from 309.53-328.57 g for T_0, 304.29-342.86 g for T_1 and 304.77 333.30 g for T_2 groups respectively from 9th weeks on to the end of the experiment.

(Key Words: Pre-Ruminant, Suckling, Zebu Calves, Leucaena Leaf Meal, Growth Pattern)

Introduction

The calves at birth have four parts of stomach like adults, of which only abomasum or true stomach is functional. The development of reticulo-rumen and omasum depends upon the feeding regimes of calves. Inclusion of dry foods and fine tender grass or hay increase the size of reticulo-rumen, helps establishing of microbial colonization in the rumen which can convert fibrous feeds into available forms of energy (MAFF, 1984; Ranjhan, 1980). For normal rumen development, it has traditionally been advocated to feed high quality hay to calves (Bush, 1991) and hence leucaena leaf meal (LLM) would play a vital role in this aspect.

The traditional calf rearing and management practices in rural Bangladesh is characterized by backyard production practice. Ethnic superstition on colostrum feeding are observed among farmers. Most of them thinks colostrum affects negatively on calf health and thus left it without feeding the calf. Feeding colostrum is very important on neo-natal life as it protects against many diseases. As the newborn receives no antibody from its mother prior to birth, colostrum feeding is thus the only way in antibody formation in newborn calf. In Bangladesh, farmers allow calves to suckle their mother shortly before milking to stimulate milk let-down process and also a shortwhile after milking so that calves can get some milk from their dam during that time. In general no additional milk or starters are supplemented to the calves. The resultant effects are poor rate of gains and higher mortality at neo-natal stage. Complementing this type of suckling practice in calf production in Bangladesh, the day old calves were allowed to a series of feeding regimes incorporating different levels of LLM as supplementation, in order to determine ideal feed requirements, successive growth pattern and the usefulness of LLM in calf nutrition upto 3 months of age.

Materials and Methods

The experiment was carried out in the Animal Production Research Station of Bangladesh

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Calves

Twelve winter born day old Pabna calves were used in this experiment to develop feeding regimes for calves and to observe their growth pattern. These calves were born in the animal shed of Animal Production Research Station of BLRI. It was not possible to get all of the 12 calves born on the same day. Therefore, the calves born within the age variation upto only 3 days were selected to use in this experiment. Among 12 calves, half were male and half female. These calves were selected in 3 groups according to similar weights having 2 males and 2 females in each group.

Calf starters

The calves were allocated to 3 types of calf starter supplemented with leucaena leaf meal (LLM) at 0 (T_0), 20 (T_1) and 40 (T_2) g where other ingredients used were same in all treatment groups. The starters assigned to all 3 groups of calves are given in table 1. As the calves ingested poor amount of starters, therefore they were allowed as 0.5 percent of their body weights between 1st to 7th week while 1 percent of their body weight thereafter.

TABLE 1. COMPOSITION OF CALF STARTERS (FRESH BASIS, %)

Ingredients	T_0	T_1	T_2
Wheat bran	50	50	50
Rice bran	12	12	12
Khesari bran	30	30	30
Til oil cake	8	8	8
Leucaena leaf meal (g/day)	0	20	40

Measurements

The newborn calves were weighed immediately after birth to record birth weights. The calves were weighed daily till the end of the experiment by calf weighing electronic balance.

Colostrum and milk suckling

Upto the 1st week after birth, calves were allowed to suckle colostrum and milk *ad libitum* and the intake was estimated by the weight gain of calves by substracting the weight of calves before and after suckling as and when calves suckle. However, it was observed that during this period a calf could suckle its mother about 4-5 times a day. After a week, suckling was restricted to only in the morning and evening shortly before and after milking simulating traditional practice in Bangladesh, where farmers milked their cows 2 times a day. To determine the amount of milk suckled by calves a day, each of the calves were weighed before and after suckling in the morning and in the evening. The amount of milk consumed was then estimated by substracting the weight of calves before suckling from the gain in weight after suckling. The amount of milk consumed in the morning was then added up with evening to estimate the total milk consumed and the weight change was measured by a sophisticated electronic banlance.

Roughage intake

Farm produced green grass mixtures mostly para (*Brachiaria mutica*) and durba (*Cynodon dactylon*) was supplied to the calves. Supply of green grass was limited upto 1 kg per head per day. Chopped rice straw approximately about 5 cm in lenght was offered *ad libitum*.

Management and housing

The calves were housed in a well ventilated tin shed, well drained, sloppy herring-bone brick floor with an exercisable paved area. Starters offered separately in manger after clocking the neck in a specially designed wood harness. Drinking water was allowed *ad libitum*.

Chemical analysis

The proximate components of starter rations and the ingredients used were analysed for each month following the AOAC procedures (1975) and are shown in table 2.

Statistical analysis

Data on weight gains and amount of milk suckled were analysed by following Completely Randomized Design (Snedecor and Cochran, 1982).

TABLE 2. CHEMICAL COMPOSITION OF CALF STARTERS (%)

Ingredients/starter	DM	CP	CF	EE	NFE	ASH
Wheat bran	88.56	11.89	10.21	4.75	56.59	5.12
Rice bran	88.31	11.48	11.17	9.32	40.73	15.61
Khesari bran	87.32	19.98	20.72	1.34	37.47	7.81
Til oil cake	89.10	31.46	8.51	9.67	27.33	12.13
Leucaena leaf meal	88.56	22.23	12.41	3.24	38.01	10.67
T_0	88.32	18.71	12.65	6.27	40.53	1.16
T_1	88.98	19.92	11.76	6.01	41.12	10.17
T_2	88.57	20.23	12.12	5.40	40.99	9.33

Results and Discussion

Colostrum suckling

All the calves in each group were offered to suckle colostrum within an hour to three just after birth. Calves left with their mother to suckle colostrum *ad libitum* upto 5 days of birth. Colostrum suckling by calves amounted to 2.18, 2.39 and 2.23 kg daily in T_0, T_1 and T_2 groups respectively (table 3). MAFF (1984) suggested to feed calves with colostrum as soon as possible after birth, preferably within 6 hours for the effective antibody absorption and better protection as the efficiency of absorption continued to reduce 24 hours after birth and the same also suggested to feed colostrum allowing calf with its dam for maximum absorption of antibodies. Colostrum is rich in protein which provide antibodies to the newborn calves. At a later stage, the globulins are broken down by the proteolytic enzymes in the gastro-intestinal tract which reduces the efficiency (Ranjhan, 1980).

The calves were also allowed to suckle milk *ad libitum* from their dams only for 2 days after colostrum suckling i. e., the calves were allowed to suckle colostrum and milk upto 1 week after birth. During this period, the calves suckle on an average 2.27, 2.49 and 2.36 kg daily in T_0, T_1 and T_2 groups respectively (table 3). In Bangladesh, calves are used to stimulate their mother via suckling shortly before milking. After a complete stimulation, calves are tied up near the cow and milking is performed. After milking is complete, calves are left to suckle their mother with their (calves) satisfaction and then it is separated from its mother till next milking. As most of the Bangladeshi farmer milked their cows two times a day, in the morning and in the evening, after a week of *ad libitum* suckling calves were subjected to the above traditional practice followed in rural Bangladesh upto the end of the experiment. Milk consumption in the morning and evening was then added up for total amount consumed. In this way, the quantity of milk consumed during suckling per head per day ranged from 1.16-1.55 kg in T_0 group, 1.13-1.49 kg in T_1 group and 1.10-1.34 kg in T_2 group (table 3). It is interesting to note that the amount consumed by the calves after a complete milking was as much as one third to one fourth of the per head per day of milk produced by Pabna cow, where Kibria et al. (1990) stated that a Pabna cow produced 3.0-4.0 kg milk a day. How could a cow hide this amount of milk for her calf might be an interesting field of research. Farmers called this phenomena in the rural areas as milk thefting for the calf. For complete milk letdown only 8 minutes are left for a milkmaid or milkman after stimulation of cows for milking (Etgen and Reaves, 1978). The milking practice in Animal Production Research Station cow shed was hand milking and in most cases it took more than 8 minutes for milking and thus it took more time than scheduled, milk thus may be left for her calf and the calf then suckles through stimulation through suckling shortly after milking. The another reason may be the inherent characters (genetic) of native cows as stated by the experienced rural farmers and milkmen. However, which factor is responsible needs to be studied.

Calf starter intake

The calves were habituated to feed starters from their 1st week of age on, but the calves have

TABLE 3. FEEDING CALVES FROM BIRTH TO 3 MONTHS OF AGE (MEAN ± SE)

Age in weeks	Milk suckle (kg/d)	Calf starter (g/d)	Green grass (g/d)	Rice straw (g/d)
		[T_0]		
1st 5 days	2.18 ± 0.05	–	–	–
1st week	2.27 ± 0.05	–	–	
2nd week	1.41 ± 0.09	50	–	–
3rd week	1.36 ± 0.06	122	–	–
4th week	1.20 ± 0.07	129	400	–
5th week	1.24 ± 0.06	136	400	–
6th week	1.16 ± 0.07	146	500	
7th week	1.35 ± 0.14	155	500	100
8th week	1.20 ± 0.12	328	600	100
9th week	1.16 ± 0.08	350	800	125
10th week	1.51 ± 0.07	373	900	200
11th week	1.55 ± 0.10	396	1000	350
12th week	1.40 ± 0.12	418	1000	400
13th week	1.42 ± 0.08	437	1000	600
		[T_1]		
1st 5 days	2.39 ± 0.10	–	–	–
1st week	2.49 ± 0.11	–	–	–
2nd week	1.36 ± 0.12	50		
3rd week	1.49 ± 0.11	123	300	–
4th week	1.31 ± 0.13	130	400	–
5th week	1.24 ± 0.07	136	400	
6th week	1.10 ± 0.07	146	500	–
7th week	1.21 ± 0.11	154	500	90
8th week	1.18 ± 0.13	324	600	150
9th week	1.24 ± 0.16	346	800	150
10th week	1.14 ± 0.07	370	900	225
11th week	1.13 ± 0.06	391	1000	300
12th week	1.16 ± 0.13	413	1000	550
13th week	1.30 ± 0.10	437	1000	650
		[T_2]		
1st 5 days	2.23 ± 0.14	–	–	–
1st week	2.36 ± 0.08	–		
2nd week	1.29 ± 0.16	50	–	–
3rd week	1.18 ± 0.07	123	–	–
4th week	1.19 ± 0.13	130	390	
5th week	1.19 ± 0.10	137	400	–
6th week	1.10 ± 0.07	146	500	–
7th week	1.22 ± 0.17	154	500	100
8th week	1.22 ± 0.17	325	600	120
9th week	1.26 ± 0.14	349	800	200
10th week	1.34 ± 0.08	372	900	200
11th week	1.16 ± 0.17	394	1000	300
12th week	1.20 ± 0.18	415	1000	480
13th week	1.21 ± 0.06	438	1000	590

started with only small amount of starters (50 g/h/d) from 2nd weeks of age on. Starter intake was increased gradually with the increase in age and weight, where at the end of the experiment (13th week) starter intake of each calf was 437, 437 and 438 g in T_0, T_1 and T_2 group respectively (table 3).

Roughage intake

Green grass intake

The calves started to take natural green grass after 2nd to 3rd weeks of age and took 300-400 g green grass at this period. However, it was limited to 1.0 kg upto 13th weeks of age for each calf of all groups (table 3).

Rice straw intake

Calves have started to intake rice straw after 6th weeks of age and taken only 90 to 100 g a day. The intake was increased with the increase in age and 600 650 g was taken by each calf at the end of experiment (table 3).

Birth weight of calves and weight gain

The birth weight and their successive growth rates are presented in table 4. The mean birth weight of calves were 18.68, 19.30 and 19.84 kg respectively in randomly alloted groups T_0, T_1 and T_2. One calf of T_2 group had died 3 days after birth and thus eliminated from the data analysis. However, no calves died except that till the end of the experiment. Gain per day of calves in each group from 1st to 13th weeks was analysed statistically to compare among T_0, T_1 and T_2 group means but found insignificant among groups of respective age category. During 1st week liveweight gain per day per calf was 375.0, 360.72 and 382.72 g in T_0, T_1 and T_2 groups respectively. However, gain was much lower in calves after 1st week to 8th week in each group and ranged from 196.43-278.0 g for T_0 group, 185.72-271.44 g for T_1 group and 180.0-283.1 g for T_2 group respectively. The comparatively lower liveweight gain during this period may be the restricted milk suckling and also the poor consumption of starter and roughages during that period where starters were supplied as 0.5 percent of their weight due to their poor consumption. Poor consumption may be due to that their rumen was not much developed or habituated to feed much solid food. However, the weight gain of calves in each group tended to increase after 8th weeks of age on and continued upto the end of the experiment. Gain per day per calf during this period ranged from 309.53-328.57 g for T_0 group, 304.29-342.86 g for T_1 group and 304.77-333.3 g for T_2 group respectively. The

TABLE 4. GROWTH RATE OF CALVES FROM BIRTH T_0 3 MONTHS OF AGE (MEAN ± SE)

Age in weeks	T_0	T_1	T_2
Birth weight (kg)	18.68 ± 0.16	19.30 ± 1.39	18.94 ± 2.45
1st 5 days (g/d)	320.0 ± 87.55	272.86 ± 53.21	310.0 ± 61.89
1st week (g/d)	375.0 ± 79.19	360.72 ± 27.58	385.72 ± 21.43
2nd week (g/d)	221.44 ± 75.92	200.0 ± 64.94	242.86 ± 79.54
3rd week (g/d)	228.58 ± 42.05	192.86 ± 65.33	190.96 ± 17.97
4th week (g/d)	196.43 ± 42.20	207.14 ± 78.57	200.82 ± 16.49
5th week (g/d)	210.71 ± 69.34	185.72 ± 35.95	180.0 ± 11.98
6th week (g/d)	278.57 ± 42.65	271.44 ± 71.90	283.10 ± 80.95
7th week (g/d)	257.15 ± 62.26	219.06 ± 38.09	216.91 ± 50.39
8th week (g/d)	257.15 ± 30.30	228.59 ± 14.29	247.64 ± 25.20
9th week (g/d)	317.86 ± 20.51	319.05 ± 31.22	333.34 ± 38.97
10th week (g/d)	328.57 ± 15.43	342.86 ± 21.82	328.58 ± 21.82
11th week (g/d)	321.44 ± 32.20	304.29 ± 10.0	314.30 ± 42.85
12th week (g/d)	319.05 ± 61.90	323.81 ± 9.52	304.77 ± 9.52
13th week (g/d)	309.53 ± 12.60	328.57 ± 92.00	323.82 ± 37.19
Overall (g/d)	278.58 ± 10.59	268.00 ± 12.46	273.30 ± 12.53

All values in rows are not statistically significant.

higher gain after 8th weeks may be due to that the rumen begans to be functional and rumen microbes started to establish in the rumen during this period (Ranjhan, 1980; Banerjee, 1980; McDonald et al., 1982) which may increase feed intake and efficiency of calves to convert food and fibers into product. Supplementation of LLM however, did not significantly increase liveweight gains and none of any apparent (visual) toxic effect was observed, suggesting that LLM supplemented T_2 calf starter may be alloted during the early stages of calf ration. Since no toxic effect or reduction in growth, was observed during the feeding trial, somebody who wants to supplement LLM in calf ration can supplement with a limited amount in this stage for acclimatization in the rumen of neonatal calves.

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