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THE EFFECTS OF SUPPLEMENTATION RATIONS ON MILK YIELD, BODY CONDITION SCORE AND CALVES WEIGHT OF FUJA COWS

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ABSTRACT: This study was conducted in Western Sudan to evaluate the effects of supplementation on productive performance of Fuja dairy cows (local breed) and their calves. Forty lactating Fuja cows and their calves were selected on the basis of approximate similarity in age and live weight, the cows and their calves were randomly assigned into four groups (each group consisting of 10 cows). The diets were also randomly assigned to each of the four groups of the animals. The rations were fed after grazing at the rate of 2 kg per cow per day, during adaptation period of two weeks followed by the experimental period. Data collection of body condition score (BCS), milk yield and body measurements were carried out monthly for each new born calf to assess chance in body weight (BWT), body height (BH), body length (BL) and heart girth (HG). The results of the study indicated that milk yield was improved by supplementation, body condition score and parity number had significant (P< 0.05) effect on lactation curve. Body measurements were also affected by the sex of the calf. Strategic supplementary feeding of Fuja dairy cows increased milk yield. The treatment also reduced cows body condition loss (P<0.05) and caused no cows mortality. Therefore from the study result, it was possible to concluded that supplementation with molasses are essential for improving Fuja dairy cows and their calves' performance in range land of Western Sudan.

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INTRODUCTION

The Sudan is a large country of livestock population that estimated 133 million heads (FAO, 1999). This stock is raised under traditional pastoralist nomadic system involving extensive seasonal migratory movements for search of water and pasture (Elmansoury, et al 2000).

Nutritional limitation constitutes one of the most important productivity constraints for nomadic herd, where the natural pasture becomes more deficient in energy, protein and essential minerals during a long period of the year (Idris, et al 2014). Consequently the grazing dairy cows are apt to suffer from nutritional deficiency, loss of body weight and body condition during the dry season, when the pasture is scarce and low in it is nutritive value, this generally reflected in slower growth rate of heifers, reduced maturity and low productive and reproductive performance, also the milk yield is reduced (Idris et al 2011). Therefore, this research programme has been under taken in the rangeland of western Kordofan to develop feed supplementation strategies for improving milk production of Fuja herds. Also one of the objectives of this study is intended to assess the utilization of some of the commonly available feed concentrates for supplementary feeding of grazing milking herds.

MATERIAL AND METHODS

General

The experimental work of this study was consisted of feeding trials with milking herds of Fuja cattle (local name) in western Kordofan, Sudan. The trials were in the form of the supplementary feeding of concentrate mixtures (local ingredients) to the grazing milking herds during the dry season, shortly after the end of rainy season and during the dry winter season. The trails were conducted at the times when the experimental cows were in the early lactation mid-lactation and late lactation. Experimental rations were formulated, based on the local commonly available concentrate feeding stuffs, to contain varying levels of energy and crude protein, and were fed to the experimental animals in supplementation to grazing on the natural grasses and crop residue in the surrounding areas (table1).

Study area

The study was conducted at the farm of Peace University Western Kordofan State, that lies between longitudes 28° -30° east and latitudes 10° -12° north.

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Herd and management

The common system of herd management is traditional pastoralist. The animals were raised under traditional grazing. The herds are taken during the day light to natural grazing in the vicinity of the farm, and in the evening they are returned to the farm and kept in cattle enclosures.

Experimental animals

Forty lactating cows and their calves were selected on the basis of approximate similarity in age and live weight. Dairy cows and their calves were divided at random into four groups, and each group consisting of 10 cows with their calves, each group of animals was assigned for the experimental rations at random.

Experimental procedure

The diets were assigned at random to each of the four groups of the animals in a completely randomized block design arrangement. The rations were fed after grazing at the rate of 2 kg per cow per day, for adaptation period of two weeks followed by the experimental period (10 months), the supplementary ration was divided in two equal portions of one kilogram each, and each portion was fed immediately before the evening or morning milking.

The cows were taken each morning to the natural pasture, and allowed to graze on the available dry grasses and crop residues. They were then returned in the evening to the camp, and each group of animals were housed overnight in it is respective enclosure, each cow within each group was fed it is experimental rations and hand-milked in the evening and in the morning.

Data was collected for body condition score (BCS), milk production per milking was estimated for each cow. Body measurements were carried out for each new born calf to assess the body weight (BWT), body height (BH), body length (BL) and heart girth (HG). The body measurements were done by using a weight–band (tape). The body score measurements were determined according to 1-9 scale (Nicholson and Butterworth, 1986), The BCS was estimated at birth, 30, 60, 90, 120, 150, 180, 210, 240, 270 and 300 days post-calving, BH , BL and HG were taken at the calving and then at 30, 60, 90, 120, 150, and 180 days after calving. Milk yield was recorded at 30, 60, 90, 120, 150, 180, 210, 240 and 270 days post-calving.

Statistical analysis

Analysis of variance (ANOVA) for completely block randomized design according to Gomez and Gomez (1984) was applied to determine significances of difference among different treatments. LSD test was used to separate among means.

RESULTS

The study showed that, milk production was significantly improved by supplementation cows with concentrate mixtures, cows supplemented with ration D recorded higher milk yield after mid-lactation on 180, 210, 240 and 270 days post-partum (table 2).

The study indicated that, cow parity number had significant ($P<0.05$) effect on BCS in the period from 30 to 300 days post-calving (Table 3). The BCS decreased for all groups as lactation curve increased, the cows in fourth and fifth age lost more BCS than the cows in sixth age. Cows of age 7 years were recorded better BCS than the other age groups.

There were positive correlation Coefficients between body condition score and milk yield (Table 4). The Correlation coefficients between the two traits tended to be higher at birth were (r) = 0.94 and 0.90 for milk yield in peak lactation. The study also indicated that there were higher significant ($P<0.01$) correlations between BCS and milk yield in mid-lactation.

The sex of calve significantly ($P< 0.05$) effects on heart girth (cm) at birth and over all age period, male calves recorded higher heart girth (HG) than female calves at birth, 60, 150 and 180 days post-partum. Female calves recorded longer ($P< 0.05$) HG on 30, 90 and 120 days after calving (Table 5). Also table 5 showed that, male calve recorded better ($P< 0.05$) body height (BH) at birth, 60, 90, 150 and 180 days post-partum and the female calves recorded longer BH ($P< 0.05$) on 30 days and 120 days after calving. Calve body length (BL) also affected by the sex, male calve recorded longer ($P< 0.05$) body length than female calves.

Table 1 - Ingredient composition of dairy concentrate (%)

Ingredients %	Ration A	Ration B	Ration C	Ration D
Sorghum	20	20	15	15
Ground nut cake	20	20	15	15
Wheat bran	20	20	20	20
Molasses	10	15	20	20
Corn residue	18	0	8	4
Ground nut cake Hulls	10	23	20	24
Salt +minerals	2	2	2	2
Energy density (Mcal DE/kg DM)	16.6	16.2	13.3	13.4
CP %	9.7	10	9.5	9.5

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Table 2 - The effect of supplementation on daily milk yield (Kg/cow)

	Daily milk yield (mean ±SE)								
Rations	**30 day**	**60 day**	**90 day**	**120 day**	**150 day**	**180 day**	**210 day**	**240 day**	**270 day**
Ration A	7.60 ± 0.54	9.80 ± 0.62	9.40 ± 0.83	9.10 ± 0.59	8.70 ± 0.55	7.40 ± 0.58 b	5.20 ± 0.59 c	7.30 ± 0.65 b	6.90 ± 0.26 c
Ration B	7.40 ±0 .06	9.70 ± 0.69	9.60 ± 0.92	9.90 ± 0.77	9.30 ± 0.71	7.70 ±0.60 b	7.90 ± 0.66 ab	7.60 ± 0.65 b	7.00 ± 0.29 b
Ration C	8.30 ± 0.45	10.7 ± 0.52	10.2 ± 0.70	9.20 ± 0.47	8.20 ± 0.44	7.10 ± 0.42 b	6.50 ± 0.50 bc	6.70 ± 0.49 b	7.00 ± 0.21 b
Ration D	7.30 ± 0.69	8.40 ± 0.80	8.70 ± 1.07	9.50 ± 0.77	9.90 ± 0.71	9.90 ± 0.70 a	8.30 ± 0.76 a	8.30 ± 0.75 a	7.70 ± 0.34 a

[abc]: means in the same column for each parameter with different superscripts are significantly different (p <0.05); NS Not: significant different (P >0.05)

Table 3 - The effect of cow's age on body condition score (BCS)

	BCS (mean ±SE)										
Age	**Birth**	**30 day**	**60 day**	**90 day**	**120 day**	**150 day**	**180 day**	**210 day**	**240 day**	**270 day**	**300 day**
4 th	6.0 ± 1.24	4.0±1 .04b	1.4±0.54c	1.2±0.61c	1.6±0.67c	1.6±0.78c	1.8±0.76c	2.2±0.75b	2.0±0.55c	1.5±0.80b	2.0±1.71b
5 th	6.0±0.88	6.5±0.52ab	4.5±0.60b	4.5±0.59b	4.3±0.75ab	3.8±0.87b	3.3±0.86bc	3.3±0.69b	3.0±0.62bc	3.3±0.80ab	3.3±0.98b
6 th	6.8±0.56	7.0±0. 50a	6.0±0.49ab	6.6±0.51a	6.4±0.57a	5.9±0.66ab	5.4±0.65ab	6.1±0.64a	5.1±0.47a	4.3±0.60a	4.8±0.69a
7 th	7.0±0.72	7.3±0.60a	7.0±0.69a	7.0±0.78a	7.0±0.86a	6.7±0.99a	6.7±0.99a	6.3±0.85a	5.0±0.71ab	5.3±0.93a	5.7±0.98a

Table 4 - Prediction equations for milk yield (Kg) using body condition score

Quadratic equation	**a**	**b**	**c**	**Correlation Coefficient (r)**	**S.E**
Milk yield at birth Y1= a+bX1+ CX1 2	- 0.149	2.357	- 0.177	0.94	1.15
Milk yield at lactation peak Y2= a+bX2+ CX2 2	0.344	2.646	- 0.127	0.90	1.90

Y1 = daily milk yield at birth (Kg/cow); X1 = BCS at birth; Y2 = daily milk yield at Lactation peak (Kg/cow); X2 = BCS at Lactation peak

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Table 5 - The effect of sex on calve body measurements (Cm) (mean ±SE)

Items	Birth	30 days	60 days	90 days	120 days	150 days	180 days
Heart girth							
Male	67.8±1.15 [a]	69.0± 2.19 [b]	83.3±3.67 [a]	91.3±3.28 [b]	95.3±4.94 [b]	101.0±6.35 [a]	110.53±3.34 [a]
Female	61.8±1.07 [b]	76.0±2.53 [a]	81.3±4.24 [b]	92.5±2.84 [a]	98.0±4.94 [a]	93.2±4.01 [b]	107.3±2.36 [b]
Body Height							
Male	53.2±3.24 [a]	68.5±1.70 [b]	66.3±3.36 [a]	65.0± 2.14 [a]	65.7±2.05 [b]	69.5±3.76 [a]	72.0±2.20 [a]
Female	51.0±2.97 [b]	71.3± 1.96 [a]	60.5±2.91 [b]	62.3±1.85 [b]	67.3±2.05 [a]	66.4±2.38 [b]	70.3±1.56 [b]
Body length							
Male	49.8±1.70 [a]	53.3±1.59 [b]	61.3±2.60 [a]	67.3±1.87 [a]	69.3±2.69 [a]	73.0±5.65 [a]	77.0±4.22 [a]
Female	47.6±1.57 [b]	58.0±1.84 [a]	57.8±2.25 [b]	66.0±1.62 [b]	66.7±2.69 [b]	66.4±3.57 [b]	74.8± 2.99 [b]

DISCUSSION

Under the condition of the present study, it was evident that post-partum supplementary feeding resulted in a certain degree of improvement in milk yield and BCS of grazing nomadic milking herd, also supplementation of dairy cows improved the body measurement and their calves.

Milk production was significantly improved by supplementation cows with concentrated mixtures during their early or mid-lactation, the cows offered with 20% molasses and higher ground nut cake mixtures (Ration D) produced higher milk yield compared with cows of other groups, these findings are in line with Hoogendroon, and Griever (1970), Ali, (1991) and Eltaher (2002). Also Tag Elsir et al (1988) reported that, supplementation of grazing cows with concentrate increased milk yield.

The body condition of the cows at calving was generally low and it was further reduced as the milk was increased, for all the experimental cows. The BCS declined sharply from calving to 300 days post-calving for all experimental cows, was follows the lactation cure of milk yield. The cows of 6 and 7 years of age lost less BCS than the cows on young ages. These results were in line with a number of other studies (Jones and Garnsworthly, 1988 and Oldman and Kyrisasis 1993).

The positive correlation Coefficients between BCS and milk yield is higher at birth and in peak of lactation. This is due to the loss in BCS of the cows during early lactation that an indication of the mobilization of the body reserve for milk production. The nutrients supplied by both grazed forage and concentrated mixtures seemed to be satisfy the increasing total nutrient requirements for milk production during the first two months of lactation.

The correlation between BCS and milk yield are shown in table4. The correlation regression (r) values are highly related to milk yield at birth and lactation peak although (r) is above 0.9 .Body condition could be used to predict milk yield accurately.

Calf sex all strongly influenced ($p<005$) heart girth (HG), body height and body length (BL). This finding is in agreement with Essien and Adesope, (2003), Orheruata (1988) and Alade (1990). Male calves were longer than female calves, the differences in the measurements obtained between the sexes can most probably be attributed to the fact that the gestation period of the male foetus is often a little longer than that of the female. It can also be explained by the findings of Essien and Adesope (2003).

CONCLUSION

The study indicated that, post-partum supplementation of nomadic milking cows with energy and concentrated mixtures during the dry season effectively improved milk yield during early and mid-lactation periods. Concentrate supplementation that, containing local ingredients were also found to improve milk production, and also molasses can be used to replace sorghum grain or sorghum brewery residue in the concentrate mixtures. These results of the present study indicated the importance of the nutritional status of the nomadic cows at calving and early post-partum on the production and reproduction performance of the animals.

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