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## Effects of Level of Nutrition on Milk Yield and Composition of Cows Fed Natural Grazing and Offered Different Supplements, in South Kordofan, Sudan

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**Abstract** Three feed ingredients that were locally used as supplements and fed to dairy cattle were offered to three groups of dairy cows while one group was considered as control and left on the natural grazing only and another one was offered a ration formulated to meet maintenance and production requirements. Milk quantity and its composition were monitored for 40 days. The results showed that supplementation of cows with 1.5 kg of any feed ingredient resulted in increment of milk production compared with those left on the natural grazing alone. Supplementation with oil seed cakes or cotton seeds was better as supplements than sorghum grains in promoting milk production. The highest performance was achieved with the group was fed 1.0 kg of formulated ration. The milk yield increased linearly ( $p < 0.01$ ) when the cows were supplemented with a ration from 0.99 to 4.37 kg. The fat content of cows on the natural grazing, NG, was 5.18%, while those fed NG supplemented with different ingredients was around 4.2 % with insignificant differences. There were also no different significances in total solids, protein, lactose and water content and ash among the five groups.

**Keywords** Nutrition Level, Milk Yield, Cows Fed, Supplements

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### Introduction

The traditional sector is the main producer of milk in Sudan where over 80% of dairy cattle are kept by this sector. Also more than 75% of milk is produced by the traditional herders. The main constraints to sustainable dairy production systems are low productivity of breeds, poor quality of feed during the long dry season of the year, diseases, harsh environmental conditions and lack of proper husbandry systems due to poor capacity and low skills of the herders. In Abbasseyia locality of the Nubba mountains area in Southern Kordofan State, local breeds of Baggara cattle cows are used for dairy production though in Sudan Butana, Fuja and Kenana and crosses of the three breeds with exotic breeds are used as dairy cows. Training producers combined with supplementation with proper feed ingredients are needed to promote production. Extension agents have taken initiative to build producers capacity and within that mission they need to show that traditional practices are neither capable for enhancing production nor appropriate in reducing production cost. This study has been proposed with the objective of showing that supplementation with a balanced ration was not only suitable for increased production but was able to reduce cost and maximize profits from dairy activity.

### Materials and Methods

#### The study area

South Kordofan occupies an area of 79470 km<sup>2</sup> with a population of 1066117. The most important crops grown are cotton, Hibiscus, sesame and millet. Livestock Census is 17025000 heads of camel, sheep, cows and goats. Abbasseyia is one of the nineteen 19 localities of the State. It has a large livestock population and herding is the



main occupation for the inhabitants. Dairy products are of important position in the livelihood of the traditional producers where milk is consumed and surplus is marketed.

### The experimental cows

The trial was conducted at Abasseya locality for sixty days. Seventy dairy cattle of Baggara cattle adapted to the Nubba mountains area were used in this study, The cows were previously vaccinated in a routine program against diseases endemic to the study area. They were treated with Ivermectin against internal and external parasites. The cows were in their second stage of lactation. The animals were weighed, ear tagged and were divided into five equal groups each with ten cows. The groups were offered natural grazing as basal diet with the first group being left on NG alone (group I) and were supplemented with sorghum grains (group II) sesame seed cake (III), cotton seeds (group IV) and the last group being supplemented with 1.0 kg of a ration formulated as indicated in Table (2). The animals were watered daily. Milk was estimated daily from morning and evening milking shifts. Samples were collected weekly for analysis.

### Statistical Analysis

Data for the feeding trial was analyzed as completely randomized design (CRD) by standard analysis of variance (ANOVA). Treatment means were separated by multiple ranges Test (DMRT) at 5% level according to Gomez and Gomez (1984).

### Results and Discussion

**Table 1:** Chemical composition of the ingredients used in the rations of trial (%)

The experimental ration	Nutrients						
	DM	OM	CP	CF	NFE	EE	ASH
Natural grazing	99.5	86	1.3	36.8	45.9	2	8.68
Sesame seeds cake	96.45	82.35	44.42	8.75	16.07	13.11	14.15
Cotton seeds	92	87	23	20	26.5	17.5	5
Sorghum seeds	95.5	92.9	10.9	2.3	75.31	3.2	2.6
Groundnut bran	95.17	76.9	9.71	26.6	23.3	3.5	6.18

**Table 2:** Chemical composition of the ration used in experiment

Ingredients	Nutrients						
	DM	OM	CP	CF	NFE	EE	ASH
Sorghum seeds	35.81	34	4.08	0.86	27.86	1.2	0.97
Sesame cake	28.95	24.69	13.32	2.62	4.82	3.93	4.24
Groundnut bran	27.25	23.7	2.52	12.6	7.68	.90	3.55
Limestone	-	-	-	-	-	-	-
Premix	-	-	-	-	-	-	-
Salts	-	-	-	-	-	-	-
Total	91.19	82.39	19.92	16.08	40.36	6.03	8.76

Dairy milk yield(kg) of the seven groups of cows were recorded in the morning and evening, using buckets and scale balance fifteen milk sample were collected from the five groups to determinate the content of total solids, protein, fats, lactose, water content and ash using milk analyzer .

**Table 3:** Daily milk production of cows on natural grazing as affected type of supplementation

Weeks	Treatment					Sig
	I	II	III	IV	V	
1	1.10±0.15 <sup>d</sup>	1.54±0.15 <sup>c</sup>	2.96±0.28 <sup>b</sup>	3.69±0.33 <sup>b</sup>	4.0±0.36 <sup>a</sup>	**
2	0.94±0.16 <sup>d</sup>	1.77±0.25 <sup>c</sup>	3.25±0.54 <sup>b</sup>	2.96±0.36 <sup>b</sup>	4.5±0.24 <sup>a</sup>	**
3	0.98±0.16 <sup>d</sup>	1.67±0.19 <sup>c</sup>	3.5±0.45 <sup>b</sup>	3.9±0.37 <sup>b</sup>	3.85±0.47 <sup>a</sup>	**
4	0.87±0.13 <sup>d</sup>	1.58±0.20 <sup>c</sup>	3.66±0.45 <sup>b</sup>	3.5±0.24 <sup>b</sup>	4.58±0.27 <sup>a</sup>	**
5	0.81±0.16 <sup>d</sup>	1.6±0.21 <sup>c</sup>	3.34±0.31 <sup>b</sup>	3.58±0.27	4.40±0.27 <sup>a</sup>	**
6	1.00±0.24 <sup>d</sup>	1.85±0.26 <sup>c</sup>	3.25±0.49 <sup>b</sup>	3.37±0.30 <sup>b</sup>	4.9±0.37 <sup>a</sup>	**
7	0.98±0.11 <sup>d</sup>	1.98±0.31 <sup>c</sup>	2.85±0.27 <sup>b</sup>	3.40±0.27 <sup>b</sup>	3.96±0.30 <sup>a</sup>	**
8	1.05±0.19 <sup>d</sup>	1.76±0.21 <sup>c</sup>	3.83±0.47 <sup>b</sup>	2.85±0.47 <sup>b</sup>	4.85±0.27 <sup>a</sup>	**
9	1.10±0.18 <sup>d</sup>	1.67±0.20 <sup>c</sup>	3.51±0.44	3.51±0.19 <sup>b</sup>	4.37±0.33	**
Mean	0.99 <sup>d</sup>	1.72 <sup>c</sup>	3.36 <sup>b</sup>	3.36 <sup>b</sup>	4.37 <sup>a</sup>	

Values with different superscripts a, b, c, on the same row are significantly different



\*\* Highly significant ( $p < 0.01$ ) \*Significant .1, 11, 111, 1V, and V ratios for the groups.

I = natural pastures (NG) only

II are on NG +1.5kg sorghum seeds

111 on NG +1.5 kg sesame seed cake

IV on NG +1.5kg cotton seed

V fed NG + 1.5kg of the trial ration

Table 4: Cows' milk composition as affected by amount and type of supplement offered (kg) %  $\pm$ SD in Abbasseya locality, Sudan

Variable	Treatment					F-test
	I	II	III	IV	V	
Total solids non-fat	14.13 $\pm$ 0.04	14.10 $\pm$ 0.08	14.18 $\pm$ 0.06	14.1 $\pm$ 0.03	14.10 $\pm$ 0.08	NS
Protein	3.73 <sup>c</sup> $\pm$ 0.05	3.50 <sup>d</sup> $\pm$ 0.03	3.81 <sup>b</sup> $\pm$ 0.07	3.81 <sup>b</sup> $\pm$ 0.07	3.90 <sup>a</sup> $\pm$ 0.08	NS
Fat	5.25 <sup>a</sup> $\pm$ 0.29	4.89 <sup>b</sup> $\pm$ 0.13	4.95 <sup>b</sup> $\pm$ 0.40	5.18 <sup>a</sup> $\pm$ 0.02	4.90 <sup>b</sup> $\pm$ 0.24	*
Lactose	4.7 $\pm$ 0.01	4.8 $\pm$ 0.02	4.6 $\pm$ 0.02	4.8 $\pm$ 0.02	4.7 $\pm$ 0.01	NS
Water	85.82 $\pm$ 0.29	85.9 $\pm$ 0.31	88.5.9 $\pm$ 0.0	85.81 $\pm$ 0.28	85.9 $\pm$ 0.05	NS
Ash	0.80 $\pm$ 0.0	0.77 $\pm$ 0.05	0.79 $\pm$ 0.00	0.80 $\pm$ 0.00	0.80 $\pm$ 0.00	NS

Values with different superscripts a, b, c, on the same row are not different significantly at 0.05 level according to DMRT. Significantly different, NS: Not significant, \*: significant

I = natural pastures (NG) only

II are on NG +1.5kg sorghum seeds

111 on NG +1.5 kg sesame seed cake

IV on NG +1.5kg cotton seed

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Milk production as affected by systems supplement offered is presented in Table (3). There were significant ( $p < 0.05$ ) linear increase in milk yield from 1.10 kg when the group consumed natural grazing only to 1.54.1.92, 3.69 and 4.00 kg when they were fed the natural grazing supplemented with sorghum seeds, sesame cake, cotton seeds and dairy cattle ration respectively. Table (4) presents the effects of type of supplement on percentage of milk composition. There were significant differences ( $p < 0.05$ ) within groups of cows in milk fat percentage. G I and G IV recorded the highest fat percentage (5.18 and 5.25 respectively) compared to G II, G III and G V (4.89<sup>b</sup> $\pm$  0.13, 4.95<sup>b</sup> $\pm$ 0.40, 4.90<sup>b</sup> $\pm$  0.24 ). The statistical analysis of milk composition showed no different significant ( $p < 0.05$ ) in protein % among the five groups of milking cows. Lactose, total solids, water content and ash did not affected by the systems of supplement.

## Discussion

Increased milk production upon supplementation with of cow on the natural grazing might be attributed to provision of nutrients that were deficient in the low quality roughage grazed. Similar results were reported by El Hag *et al.*, (1998) [1] who showed that supplementation of cows on South Kordofan rangelands was necessary to improve their productivity. The ration that was formulated containing needed level of protein, energy and mineral had greater effects in enhancing milk production. That could be attributed to providing the milking cows with nutrients needed for production at optimal levels. These results are similar to the findings of Abdulla (1993) [2] and Darwish (2009) [3] who concluded that the milking cows' feed must be supplemented with external sources of protein, energy, minerals and vitamins if the basal diet is a low quality roughage. Also similar Doyle, (1983) [4] and Stock dale and Trigg (1989) [5] reported that the completely balanced rations of feed is needed to attain higher milk production. This must include minerals and vitamin to milking cows especially on natural pastures. Such systems of feeding led to increasing milk quantity. Also these result were in agreement with the findings reported by McDonald *et al.*, (1996) [6] who found that the best sources of protein are found in oil seed cakes and the best ration to milking animals are those containing all requirements of animal to produce. A significant ( $p < 0.05$ ) reduction in milk fat concentration resulted from increasing concentrate supplementation. Most of the studies showed that milk fat percentage decrease when amount of concentrate was increased [7-10]. Also Castillo (1999) [11] reported that grazing dairy cows had higher fat content compared to those raised on limited grazing. Systems of supplement had no effect on milk protein concentration, Dillon *et al.*, (1997) [12] stated that protein content of milk was not affected by concentrate supplementation from 0 to 3.6kg DM/day of grazing dairy cows. Walker *et al.*, (2001) [9] found no changes in milk protein within range of supplementation from 0 to 10 kg DM/day. Lactose, Water content was not significantly ( $p < 0.05$ ) affected by the concentrate treatment, similar results were reported by Hilali (1986) [13]. The non significant effect of



concentrate supplementation on percentage of solids, Ash substance was in line with the finding reported by Hilali (1986) [13].

### Conclusion

Supplementation of dairy cattle with balanced concentrate rather than ingredients with varying amounts of feed could enhance production. Provision of any supplement containing energy such as sorghum grains or protein such oil seed cakes or cotton seeds was found better than leaving animal on the natural grazing alone. Cost of feeding (price of added concentrate versus increase in milk yield and the final profit) was found justifiable to small producers than leaving cows grazing natural pasture of poor quality roughage.

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