

Effect of Concentrate Supplementation on Milk Yield and Density in Dairy Farms

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Abstract

Increased human population in the rural area has necessitated better dairy production techniques to meet the demand for milk and utilization of resources. About 50% of land in high potential area has been devoted to milk production from exotic high grade cattle. The dairy enterprise is a business that provides food, employment and high returns to the farmer. Milk quality is a key factor impacting on the milk market and social welfare of the consuming public. The objective of the current study was to determine the effect of homemade concentrates on milk yield and density over time. A study was carried out to supplement grazing cattle with four brands of concentrates at Bomet, Bureti and Nyamira Districts. Each of the selected farmers provided two lactating cows for the study and carried out the day-to-day management activities. The farmers were supplied with four bags of dairy meal, 5kg of Maclick supper dairy lick, milk record sheets and a lactometer. Brands of dairy meal formed the treatments of the study as follows; Diet 1-maize meal (50%) + cotton seed cake (20%) + wheat bran (24%) + fish meal (5%), Diet 2- maize germ (44%) + cotton seed cake (22%) + wheat bran (33%). Diet 3-Commercial Concentrates 1, Diet 4 Commercial Concentrate 2 Diet 5 – no concentrate. Each farmer fed 2kg of concentrate in the morning and evening and recorded milk yield and density using lactometers. Concentrate diets had effects on milk yield but treatments did not differ. There was significant improvement of milk yield among all the supplemented cattle over time. This indicated the effects of additional minerals, energy and crude proteins on production of milk. The study found that 89% of milk density could be predicted by the dairy cow's dietary sources. Highly significant improvement was observed in milk density between Districts and individual farms. Overall feeding day was highly significant for density with the effect of diets manifesting itself from the 22nd day of the consumption of concentrates, though all the dietary concentrate supplements improved milk yield and density. Diet 1 had significantly high density milk. The study portrayed supply of energy, concentrates and minerals alongside sufficient basal diets as the most effective way of improving milk yield and density among dairy cattle.

Keywords: Concentrates, Milk Yield, Density

Introduction

Livestock production is practiced by about 40 million rural persons in the arid and semi-arid grasslands of the sub-Saharan Africa and their contribution to food security is constrained by technical know-how (Stroebel, 2004). Kenya is one of the largest dairy product producers in the Sub-Saharan Africa with a milk market share of 24% in the region (Karanja, 2003). Increased human population pressure in high potential areas of Kenya has necessitated adoption and application of intensive livestock production techniques to enhance dairy productivity and make dairy enterprises competitive in the use of resources that include land, labour and capital. Amount of milk produced by cattle indicates miss-match with available feed resources. Dairy production plays a key role as a source of livelihoods in the rural areas with families producing milk showing low poverty index. Milk in Kenya is produced from cows, camels and goats. However, cow milk dominates the industry with exotic high-grade cattle from high potential areas producing the bulk.

About 50% of land in the high potential area is devoted to milk production from exotic high-grade dairy cattle where it serves as a business enterprise that provides food, employment and high returns to the farmer. It demands keen entrepreneurship, management and adequate inputs to keep it productive. Financial and management records are the basis for establishing and running a dairy business profitably.

Milk quality has become a key concern impacting on milk marketing and welfare of the milk consuming public. The density of raw milk is in the range of 1.026-1.034 mg/litre at a room temperature of about 20°C and is mostly used for quality control. Milk composition varies depending on the plane of nutrition of the animal, stage of lactation and the amount of milk produced (Chamberlain, 1992).

Optimum feeding, particular high energy intake, stimulates milk yield and solid-not-fat percentage and lower the fat percentage of the milk by dilution (Chamberlain, 1992). The processors, especially Kenya Cooperative creameries, have over the years bought milk of as low density as 1.025 g/ml (1.025-1.028mg/l), but recent developments in the market, especially export of milk and its products, has emphasized the significance of the higher density milk. There are many factors which affect the composition of raw milk such as breed, age, stage of lactation and body condition of the lactating cow. Milk is a nutritious and versatile food enjoyed by everybody in its natural form. It is also used to make a wide range of products including cream, butter, yoghurt, cheese and ice cream (Elert, 2002).

The objective of the study was to determine the effects of homemade concentrates on milk yield and density among grazing lactating dairy cattle at Bomet, Bureti and Nyamira Districts.

Materials and Methods

The study was designed to supplement grazing dairy cattle with concentrates of different nutrient sources at Bomet, Bureti and Nyamira Districts using a sample of dairy farmers. Ten farmers were selected from each District based on moderate standards of management but distributed among Divisions in each District. Each of the selected farmers provided two lactating cows for the study and was the one to carryout the day-day management. A sample of milk was taken for analysis initially to determine the levels of density, fat solid – not fat and proteins the components. The farmers were supplied with four bags of dairy meal, 5 kg of Maclick mineral lick, milk record sheets and a lactometer. Four concentrate brands of dairy meal were supplied and each farmer used one brand at a feeding rate of 2 kg at milking time, but the minerals were provided free of choice. The concentrates used were the following; Diet 1- Maize meal (50%) + cotton seedcake (20%) + wheat bran (24%) + Fish meal (5%), Diet 2- Maize germ (44%) + cotton seed cake (20%) + Wheat bran (33%), Fish meal (3%). Diet 3- Ungord and Diet 4- Sigmhy. Farmers recorded the basal diet used (to monitor any possible change), quantity of concentrate used, milk yield and density on the record sheet provided. The study began in early June 2007 and ran for 29 days. Feed samples were analyzed for nutrient contents using near –infra- red spectrophotometer, while milk yield and density data were subjected to analysis of variance using statistical analysis system (SAS). Significant means were separated using least significant difference (LSD).

Results and Discussion

The nutrient components of the concentrate supplements provided to the cattle is provided in Table 1.

Table 1. Nutrient composition of feeds consumed by the cattle

DIET	DM	FAT	CP	CF	ASH	ME MJ/Kg
1	88	4.6	14.8	5.6	5.7	3469
2	88.5	7.4	14.1	7.2	7.1	3041
3	87.3	8.2	13.8	8.2	7.6	2658
4	89.2	8.6	14.6	7.8	6.8	3126

Daily milk yield at the region was found to range between 8 and 10 litres per day, which was slightly lower than the 11-12 lt/day reported by Njarui *et al.* (2009). There were no significant effect of treatment on milk yield in the study but, there was overall highly significant ($P < 0.01$) differences in yield over time among supplemented cattle. This was particularly important as an indicator of the effects of concentrate diets over time (Figure 1). The consistent additional energy, crude proteins and mineral lick caused an overall increase of milk yield.

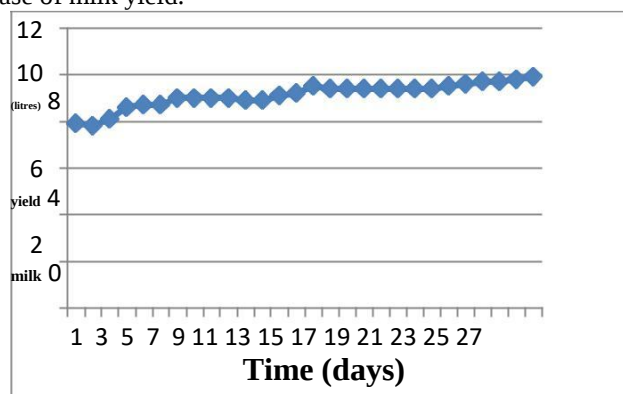


Figure 1. Milk yield over feeding time

The study found that 89% of milk density can be predicted by the dairy cow's dietary sources. Highly significant ($P<0.01$) improvements were observed in milk density among districts and individual farms. This might have been an indication of differing responses of farmers in different Districts to feeding interventions. This was particularly evident at Nyamira where the human population density was high and limited pasture availability hence the provided supplements were readily utilized.

Overall, feeding day was highly significant ($P<0.01$) for milk density. This effect started being manifested on the 22nd day of consumption of concentrates by the dairy cows (Figure 2). This was particularly important as the cumulative effects of the concentrate supplements began to show up through milk density. The initial intake of concentrates showed improved but unstable improvement of milk density may be due to the nutrient demands for body repair, maintenance and for improving the cow's body condition.

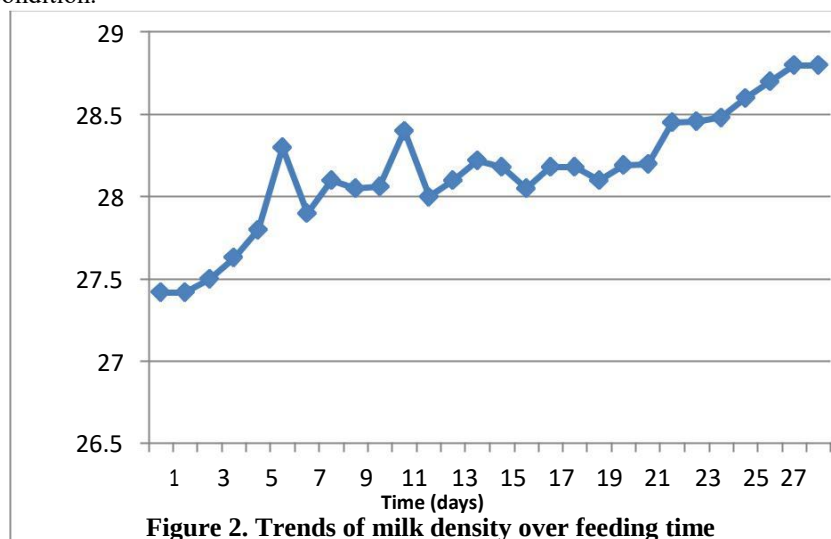


Figure 2. Trends of milk density over feeding time

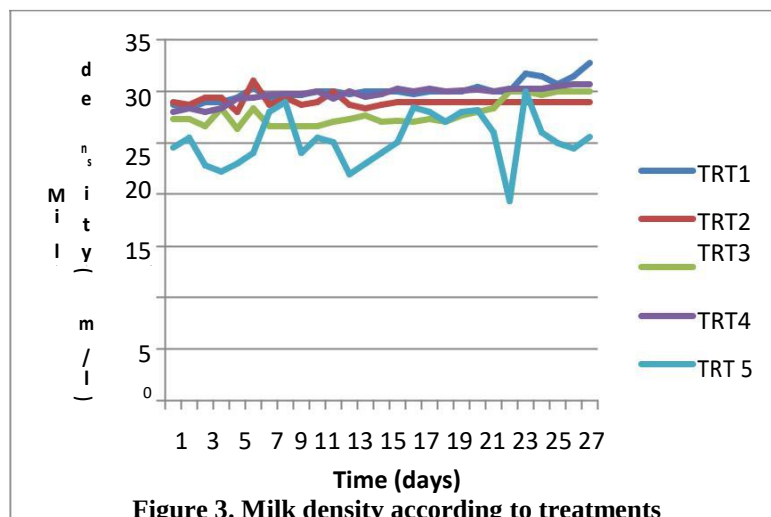


Figure 3. Milk density according to treatments

The study established that milk density before feeding was quit low in all the District. The actual recorded values were 1.025, 1.026 and 1.024 mg/ litre for Bomet, Bureti and Nyamira respectively. The study found a highly significant ($P\leq 0.01$) positive correlation of 0.9 and a moderate of 0.6 between Milk density and solid not fat and milk density and proteins respectively. There was a highly significant ($P\leq 0.01$) negative correlation of -0.8 between milk density and fat and a moderate negative correlation between solid not fat and fat. These findings indicate that when the objective of feeding is to improve density, the feed that promote solid not fat and protein should be given a priority and less of those that promote fat production.

Mean milk density for the treatments were; 1.032, 1.028, 1.028 and 1.029 mg/litre for treatment 1, 2, 3 and 4 respectively. Dietary treatments 1 had significantly ($P<0.05$) high milk density ($LSD=1.9$) compared both to the control and the other treatments as shown in Figure 3. This was an indication of the

role played by the pure maize incorporated into treatment 1 as compared to the those with had wheat bran and maize germ as energy sources and to both ordinary and high yield concentrates. This emphasized the role played by high energy in the diets for the stability of milk density among dairy cattle. Dairy cattle in early lactation demand the supply of feeds containing about 11.7 MJ ME/ kg dry matter and 17-19% crude proteins (Erasmus *et al.*, 2000) together with a consistent supply of highly digestible mineral lickto be able to synthesize milk of high density.

In conclusion, diet 1 was a better supplement than diets 2, 3, 4 and control, although all the concentrate brans had possitive effects on milk yield and density. This was an indication that milk yield and density can be improved when cattle are supplied with sufficient highly digestible energy, crude proteins and mineral lick.

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