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Short Communication

EFFECT ON MILK PRODUCTION AND COMPOSITIONS OF JERSEY CROSS COWS FED WITH DRIED LUCERNE CHAFF AS FEED SUPPLEMENTS IN LATE AUTUMN

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ABSTRACT: The study evaluated the effects of feeding dried Lucerne chaff as feed supplement on milk production and composition in Jersey cross cows grazing temperate pasture. The feeding experiment was conducted in late autumn in the month of October 2019 at the Brown Swiss Farm, Bumthang. Ten lactating Jersey cross cows weighing 329.80 ± 45.06 kg live body weight were divided into two groups of five each based on milk yield and stage of lactation as control and experimental group. The animals in control group were allowed to graze in open pasture for seven hours daily and were supplemented with cattle concentrate @ 1.5 kg per day. The cows in the experimental group were fed with dried Lucerne chaff @ 30 % (2.32 ± 0.34 kg) of the total DM requirement in addition to normal feeding regime as control group. The daily milk yield was recorded for ten days after two weeks of feed adaption period. Milk samples were collected from all experiment animals and analyzed weekly for the major nutrient composition. The daily milk yield from the experimental group was observed significantly ($p < 0.05$) higher than the control group. There was no significance ($p > 0.05$) difference in milk composition between the two groups. The findings from current study reveal that the dried Lucerne chaff can be used as a legume-based protein source for feeding dairy cows during fodder deficit period.

Keywords: Dried lucerne chaff; dairy; milk; crude protein; total mixed ration.

1. INTRODUCTION

Livestock production is an important farming activity of rural populace which contributes for an economic development, rural livelihoods and poverty alleviation (Hossain et al. 2017). In Bhutan, livestock farming is the important component of Bhutanese farming system and plays an important role in improving the livelihood of rural farmers (Wangdi, 2006). The government has been prioritizing dairy sector to enhance milk production through policy interventions such as timely supply of inputs, efficient services delivery, and providing subsidies and market facilities. Dairy farming is gaining momentum amongst rural population in Bhutan. As a result, improved cattle population are increasing, and milk production had increased too. But, the genetic potential of these improved cattle breeds are not fully explored mainly due to poor feedings. One of the important strategies to achieve this is to improve the quality of feed, especially under farmers' management condition. In any commercial livestock farming, feeding is the main driving force for successful livestock venture and most expensive item of production cost (Makkar 2016). Devendra and Leng (2011) have mentioned that the locally available feed resources act as the backbone for improving productivity of animals in developing countries. To maximize profitability from the dairy farming, one need to ensure that the dairy cows receive required quantity of essential nutrients in a cost effective way, preferably from locally available feed resources. In any country, pasture based feeding system is the best and

cheapest for sustainable dairy farming. Although the use of pasture is a profitable low cost feeding system, there are some nutrient limitations to milk production. Therefore, supplements must be considered to correct for nutritional imbalances and deficiencies in pasture. In Bhutan, milk production under smallholder farming systems is season sensitive. Fluctuations of feeds in both quantity and quality is a major driver. Milk production decline in dry season due to forage scarcity is a common phenomenon. One of the options for improving feeding strategy is to use legume based roughage such as dried Lucerne chaff prepared from green fodder Lucerne (*Medicago sativa*) to supplement grazing animal or feed during the scarcity of green fodder. The quality of forages fed, has a great impact on the performance of the cow. Alfalfa (Lucerne) is considered a high-quality pasture due to its lower fiber content and a higher protein content (Lin et al. 2019). Lucerne is the most widely cultivated legume in the world (FAO 2013) and may be grazed, preserved as hay or ensiled. The crude protein content of the Lucerne ranges from 15-20 % on dry matter basis, NDF from 26-39 % and ADF ranges from 20-25% of the dry matter (Gyeltshen et al. 2017). Therefore, to come up with suitable feeding strategy in temperate region, present study investigated the effect of feeding dried Lucerne chaff as supplement on milk production and composition of Jersey cross cows in late autumn.

2. MATERIALS AND METHODS

2.1 Experiment site

The feeding experiment was performed for 25 days (from 1st to 25th October 2019) at Brown Swiss farm in Choekhor Geog under Bumthang Dzongkhag. The farm is located at an altitude of 2700 masl with geographical location between 27.54° North latitude and 90.75° East longitude. The experimental site experiences a cool temperate climate characterized by cool and humid summer and cold dry winter. The average annual temperature and rainfall reported was 22°C and was 63.82 mm respectively (NCHM 2018).

2.2 Animal selection and management

A total of 10 lactating Jersey cross cows weighing 329.80 ± 45.06 kg live body weight of same age and lactation stage were selected for the study. Prior to the feeding trial, the selected animals were observed for physical health status and were dewormed with Rafoxanide +Levamisole @ 7.5 mg per kg live body weight.

2.3 Experiment design

The 10 jersey cross cows were blocked into two groups with five cows of similar milk yield and lactation stage in each group accordingly. Then each group was randomly assigned one of the two dietary treatments: i) Supplementation of Lucerne chaff ii) Normal feeding regime without supplementation of Lucerne chaff.

2.4 Preparation of dried Lucerne chaff

The green Lucerne fodder was harvested at early flowering stage and chopped into required size by chaff cutter. The chopped fresh Lucerne fodder was sun dried for one week inside Plastic green house at NRDCAN to prepare dried Lucerne chaff.

2.5 Experimental feeding and diet composition

The treatments were divided into two equal parts and were fed twice a day along with the basal diet. The inclusion level of dried Lucerne chaff in experiment diet per day was 2.32 ± 0.34 (SD) kg (30 % of the total dry matter requirement of the cows). The experimental cows were allowed to graze in the pasture field along with the herd during the day and water was supplied throughout the day. The basal diet consisted of forage intake from seven hour of grazing in temperate farm pasture and cattle concentrate were fed as supplement as shown in Table 1.

Table 1: Diet composition (%) of experimental ration

Parameter	Experimental	Control
Dried Lucerne chaff (%)	30	
Cattle concentrate (%)	18:20	18.20
Grazing pasture in hour a day	7	7

2.6 Laboratory analysis

Composite sample of dried Lucerne chaff weighing 250 gm was collected from dried lot. The laboratory analysis for dry matter and nutrient content was done at the Animal Nutrition Laboratory, Bumthang. The proximate analysis was performed to determine crude protein, crude fat and crude fiber content. The nutrient composition of dried Lucerne chaff was shown in Table 2.

Table 2: Nutrient composition of dried lucerne chaff

Forage sample	Percentage (%)			
	DM	Ash	Crude fat	Crude protein
Dried Lucerne chaff	89	13.02	1.00	14.98

2.7 Milk production and recording

The experimental animals were milked twice a day; once in the morning and in the evening and the milk yield was recorded during each milking. The animals were milked by bucket milking machine and the milk yield was recorded in kilograms using weighing balance.

2.8 Milk sample collection and analysis

Milk samples were collected in the last day of every week. The milk samples were tested in automatic milk analyzer for determination of milk fat, milk protein, lactose and SNF.

2.9 Statistical analysis

The data on milk production and composition recorded during the experimental period was analyzed using Microsoft excel and IBM SPSS version 23. The dataset was checked for outliers, followed by Shapiro Wilk's and Levene's tests for normality of data and homogeneity of variance, respectively. The data was analyzed for descriptive statistics such as mean and standard deviation. Two sample independent t test was performed to find the significance effect of treatments on milk yield and composition in lactating cows.

3 RESULT AND DISCUSSIONS

3.1 Milk production and composition

Table 3 presents the milk production and composition of control and experiment group.

In present study, the daily average milk production of cows in the experimental diet group was found significantly (p<0.05) higher than the control group. This finding is in line with the result of Wang et al. (2014) who reported increased milk production when supplemented with alfalfa hay forage. The increased milk yield for experimental diet group may be attributed to increased dry matter intake from additional feeding of Lucerne chaff in addition to normal feeding regime of the farm. Increasing energy intake can improve milk yield and supply more energy and nutrients for milk synthesis (Wei et al. 2019). The pasture intake from autumn grazing in temperate pasture appears to be not sufficient to sustain milk production with limited concentrate feeding. According to Reynolds et al. (2011), a higher milk yield in alfalfa hay diet resulted in the highest feed efficiency and digestibility represents an important indicator for improving the efficiency of energy utilization in dairy cows. The ingredients and composition of diets fed to dairy cows also affect nutrient digestibility and milk production performance (Weiss et al. 2009). Concentrate inclusion level were similar between the two diets and therefore, the differences were attributed to the increase DMI from additional legume forage source. But there was no significant (p>0.05) effect observed on milk composition such as milk fat, SNF, milk density, lactose and salt content between experimental and control group. Similar finding was reported by Kahyani et al. (2013) and Zyl et al. (2014) when feeding cows with various chopped lengths and different quality of alfalfa hay. A decreased ruminal pH due to low dietary fibre content can decrease the ratio of acetate to propionate, which in turn could cause a reduction in the milk fat content (Mertens 1997). Grant et al. (1990) also reported that a reduction in hay particle size resulted in a decreased milk fat content, and eventually a reduction in 4% fat corrected milk (FCM) production. However, additional feeding from legume forage source in this experiment did not alter any of the parameters of milk quality. This indicates the minimal changes in the ratio of acetate to propionate despite supplementary feeding of legume forage in this experiment.

Table 3: Milk production and composition in lactating Jersey cross cows (Means ± SD)

Parameters	Control	Experiment	Sig. level
Milk yield (kg/day)	4.33 ± 0.52	5.61 ± 0.24	*
Milk fat (%)	5.96 ± 1.12	5.94 ± 1.62	ns
Solid not fat (%)	8.54 ± 0.49	8.66 ± 0.46	ns
Lactose (%)	4.68 ± 0.28	4.74 ± 0.24	ns
Salt content (%)	0.64 ± 0.05	0.66 ± 0.05	ns
Milk density	27.37 ± 1.45	27.88 ± 2.07	ns

**p ≤ 0.05; ns: nonsignificant*

4 CONCLUSION

The current study concluded that the supplementation of legume based roughage such as dried Lucerne chaff to late autumn grazing dairy cows in temperate pasture can increase the milk production. It is also convinced that the dairy cows in Bhutan are not receiving adequate protein and thus not being able to produce as per their genetic potential. Based on the present finding, it is recommended that dried Lucerne chaff can be fed as legume based protein source for dairy cows during fodder deficit period to enhance milk production in temperate region. It can

also complement protein source without negative effect on milk production and economic return. However, additional research is needed to recommend optimum level of Lucerne supplementation to increase cow's productivity given its genetic composition.

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