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Research Article

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Comparing mashed and pellet concentrate effects on reproductive performance and blood parameters of dairy cows

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ABSTRACT

This study was carried out to investigate the effects of physical processing of food on reproductive performance of dairy cows and blood parameters such as glucose and beta hydroxybutyric acid. 64 dairy cows from Holstein race were divided into two groups with 32 members in each group: control group (mashed diet) and pellet diet. Formulation of diet was similar in both groups. To measure blood parameters samples were taken three times from 10 members (10 replications) of each group every 20 days. Blood sampling for measuring blood urea nitrogen was done three hours after feeding. To evaluate reproductive parameters, sampling was done form all 32 replications by veterinarian in definite days. To specify the first estrus after calving, observation was accepted. Obtained data were analyzed using SAS program. Results showed that pellet could have positive effects on this factor. The amount of betahydroxybutyric acid did not show significant differences. Also, the number of days from calving to first insemination and observing the first estrus were not affected significantly but the number of insemination for each pregnancy was affected positively by pellet diet. On the whole, pellet concentrate had positive results and can be used for more efficiency and improving farmers' economy.

Keywords: physical process of food, mashed and pellet diet, production yield, dairy cows

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INTRODUCTION

Food standard system of ruminants is more complicated than other animals because of diverse foods and also wider range of digestion methods (microbial digestion or enzymatic digestion) in various parts of digestive system of these animals [1].Therefore, balancing the diet of ruminants is harder and needs experience. Preparinga balanced diet of concentrate has specific method which needs wide knowledge of animal requirements and nutrients. In view of expensive primary matters, the best efficiency of diet is inevitable and wasting the nutrients in production, consumption, digestion and absorption must be prevented. One of proposals for this goal can be using pellet diet [2]. Changes in macroscopic- microscopic structure of food have significant effects on use amount and performance of digestive system. Pelleting is a process in which food materials are grinded, mixed and converted to cube form by using steam, hot water and pressure, and after that are cooled and dried immediately by the air flow.

Big animals separate different parts of concentrate and at the end of feeding; this selective separation leads to a non-homogenized mixture of forage and mashed food. By using pellets, animal is forced to use a formulated mixture of all necessary nutrients. This also reduces food waste and dusts in poultry herds which control problems and diseases [3].

Sometimes mixing the nutrients must be done according to requirements plus materials costs and also limitations because about 70% of husbandries costs are feeding costs. Alijoo et al (2013) studied the effects of barley processing methods (pellet and mashed) and various fat sources on chewing activity and ruminal fermentation of Holstein cows at early lactation [4].PH of stomach was significantly higher in mashed barley and rumen ammonia nitrogen was lower in pellet non-significantly. Also, the activity of chewing and champing were not affected

significantly. Samanta et al. (2003) studied the effects of pellet food on goats on ruminal fermentation [5]. They reported that the production of volatile fatty acids in the rumen was similar in all groups but ammonia nitrogen was significantly ($p<0.05$) less in mashed diet.

Pellet concentrate has been used for a long time in dairy husbandries but few studies have been carried out about that. This study was carried out to compare pellet and mashed concentrate and their effects on reproductive parameters and blood.

EXPERIMENTAL SECTION

The study was done in Isfahan west (2014 spring). The husbandry was a semi-covered yard with full ventilation.
64 Holstein dairy cows were divided into two groups with 32 members in each group: control group (mashed diet) and pellet diet. All cows had an average of 96 kg milk production and about 21 days lactation. Mean birth was approximately two.

After adaptation period treatments were enforced. Diets were prepared according to food standard tables (NRC, 2001) of dairy cows counting 650 kg average weight and the number of birth in each herd. Definite amount of food was mixed every day and gave to cows every day. Pellet and mashed diets were also mixed completely with food of each animal and gave them at 8, 12 and 16 hours. Animals had free access to water.

To evaluate blood parameters sampling was done three times at intervals of 20 days from the first day from 10 members (10 replications) of each group.

Blood samples were taken using 10 ml syringes from vein and were sent to laboratory in vacuum tubes. Blood was centrifuged at 3400 cycles for five minutes and serum was separated. Beta hydroxybutyrate(BHBA)was measured using *Pars Azmoon* trade kits and RA1000 *Technocon* auto analyzer.

To evaluate reproductive parameters, sampling was done form all 32 replications by veterinarian in definite days. To specify the first estrus after calving, observation was accepted. Obtained data were analyzed using SAS 9.2 software in a completely randomized design and least significant difference test (LSD) at 5% probability level was used to compare means.

RESULTS AND DISCUSSION

The amount of Beta hydroxybutyrate was not significantly different in sampling times although BHBA amount of pellet diet had considerable increase in second sampling (Table1).

Table 1:The effect of diet on the quality of milk urea nitrogen consumption in different periods (Milligrams/deciliter)

TRT	Different periods			
	total	third	second	first
Pellets	17.7	17.09	18.7	17.2[b]
Mesh feed	18.5	17.9	19.05	18.3[a]
SEM	0.32	0.77	0.45	0.27

The amount of blood glucose was affected by diet in first sampling (Table2) and mashed diet had more glucose ($p<0.05$) in second sampling although the difference was not significant, but in third sampling the pellet diet had higher glucose amount significantly ($p<0.05$). In whole period, treatments did not show significant differences.

Table 2: The treatments effect on blood glucose levels in different periods (milligrams per deciliter)

TRT	Different periods			
	total	third	second	first
Pellets	57.1	56.5[a]	54	61[b]
Mesh feed	57.9	53.1[b]	52	68.6[a]
SEM	2.34	2.32	0.83	2.12

The number of insemination per pregnancy was belonging to mashed diet (3.2) and pellet diet showed lower insemination number, but the difference was not significant (Table3).

Table 3: The effect of different dietary treatments on reproductive parameters in different periods

	Metabolites		
TRT	First estrus	Calving interval	The number of insemination
Pellets	41.7±2.05	48.7± 3.22	2±0.25
Mash feed	39.3±2.05	44.9±3.22	3.2±0.25

The effects of various diets on the number of days from first estrus to pregnancy (first estrus after the birth) are presented in table 3.Pellet group had higher number of days (41.77)than mashed diet (39.3) but the difference was not significant.

Another parameter of table 3 is the time from calving to first insemination. As it is seen pellet diet had a longer period (48.7 days)which was not significantly different form mashed diet (44.9 days).

Evaluation of various diet forms for dairy cows have shown that among mixed large pellet, crumble and ordinary diet, cows consumed pellets faster. Reduced feeding time because of faster consumption increases blood sugar [6].
Diet processing methods can improve food consumption and growth performance of livestock and poultry by changing physical or chemical structure of food and increasing the digestibility and nutrient availability. Various studies have shown that in hot and humid processing methods, by gelatinizing grains starch and changing the physical and chemical structure of food, availability and digestibility of nutrients was increased and therefore feed intake and growth performance was improved.

Furthermore, the performance of digestive system is also influenced by various methods of grains processing.

Thus, whatever food carbohydrates be more absorbable, the glucose amount of blood will be increased faster [7, 8 and 9].The most important ketone bodies of ruminants blood system is beta hydroxybutyrate which is strongly correlated with acetoacetate amount of blood.

Many researchers have announced that by increased flow of starch to intestine, its digestibility will be reduced; therefore ketone bodies can easily pass cell walls and be used as energy sources in terms of food shortages. Increased butyric acid of blood shows lipolysis stimulation or excessive absorption of butyrate from diet [10]. Non-significant results of this study may be due to difference in cell quality of treatments. Joséeduardo and Santos (2007) reported that reduced insemination numbers can be due to maturity and better growth of reproductive organs after labor because of better energy distribution and ovulation occurred in pellet diet [11].

Some reports showed that increase in glucose and fatty acids concentration, increased pulse frequencies of gonadotropin releasing hormone. On the other hand energy is really effective for stimulating metabolic receptors, hormone intermediaries and central neuropeptides [12].Thus, it can be said that increase in blood glucose of pellet group improved reproductive parameters.

Considering the higher glucose amount of pellet group this group needs fewer inseminations for pregnancy. On the other hand, reduction in milk urea nitrogen of pellet group can increase reproduction efficiency [13].

CONCLUSION

About blood parameters, Glucose amount can be affected positively by pellet diet which can be important for early lactation period, production peak and reproductive issues. Beta hydroxybutyric acid was not significantly different; therefore there is no concern about it in using pellet diet.

About reproductive parameters, the number of days from calving to first insemination and observing the first estrus were not affected significantly but the number of inseminations for each pregnancy was affected positively by pellet diet. On the whole, pellet diet had positive and more acceptable results than mashed diet which can be appropriate for dairy cows industry to improve production efficiency and inputs of owners.

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