Original Article

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THE COMPARISON OF TWO DIFFERENT PROTEIN-CONTAINING RATIONS (CP;17.82% vs CP;19.18%) FOR ANATOLIAN WATER BUFFALOES

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ABSTRACT

Effects of feeding with diets (D1 and D2), Crude protein (CP) 17.82% and CP;19.18% contents on dry matter intake, milk yield, and composition were compared for 20 Anatolian Water buffaloes, distributed in two groups (T, E). Diets did not affect DM intake of concentrate and silage among buffaloes. Milk yield got improved (4.93 to 5.63 kg d-1) ($P<0.05$) in buffaloes fed by a diet D2 (CP;19.18%) as compared to diet D1 (CP; 17.82%). In general, D1 and D2 diets did not cause any difference in the milk compositions examined of buffaloes on the other hand, using of sunflower cake should be encouraged on the buffalo's farm.

Keywords: *Bubalus bubalis*, buffaloes, crude protein, sunflower seed meal, water buffalo

INTRODUCTION

The origins of the buffalo living in Turkiye are based on the Mediterranean water buffalo, which is a subspecies of the river buffalo and is defined as the Anatolian buffalo (*Bubalus bubalis*) (Ministry of Agriculture and Villages, 2009). Buffalo milk in Turkiye, is processed in the production of yogurt and cream, its meat is preferred in sausage production, and its horns are preferred for making bows and knife handles in the production of Turkish (Değirmencioğlu *et al*., 2015). Buffaloes have a miraculous population of bacteria that can break down feed raw materials with different nutrients and cause chemical changes, and a magnificent digestive system that can evaluate them. What makes this animal different from other animals is the instinct of life and the nutrient richness of animal products (Değirmencioğlu, 2020; Değirmencioğlu, 2021). Dairy producers prefer rations with high protein content to increase the milk yield and milk protein of their cows Olmos Colmenoro and Broderick, 2006). In a study, it was determined that increasing the crude protein content (CP) of the ration from 15% to 16% positively affected the milk yield up to 750 ml, and when the CP level of the ration was increased from 19 to 20%, It was reported that it increased milk yield by half (350 ml) (NRC, 2001). On the other hand, the early form of the pastures causes the pasture forages to be rich in NPN-derived amide substances. Ammonia levels in the rumen increase rapidly in buffaloes consuming these feeds. Accordingly, increased

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ammonia concentration causes irritability, uterine inflammation, early embryonic death, and hypomagnesemia tetany in buffaloes (Morrow, 1976). The effect of protein content in diets has been investigated mainly on milk yield and composition in ruminants. However, the effects of protein levels in the ratio on dairy cow performance have been inconsistent (NCR, 1978). Positive effects of protein content in the diet on milk production in ruminants have been reported in some studies (Gardner and Park, (1973); Polan *et al*. (1976); Roffler *et al*., 1978 whereas other studies were unable to determine the effect on the milk yield (Van Horn *et al*., 1976; Kwan *et al*., 1977, Grieve *et al*., 1980, Cunningham *et al*.,1996; Leonardi *et al*., 2003). Some of the ammonia produced as a result of the breakdown of nitrogenous feeds in the rumen is used in the synthesis of bacterial proteins.

Unevaluated ammonia passes into the blood, then is synthesized to urea in the liver later it is excreted through the kidneys, and the other half reaches the rumen through saliva (Muck, 1982). In feeding buffalo and dairy cows, Turkey prefers sunflower meals obtained by extrusion as a protein feed. There are small-scale water buffalo breeders in Turkiye. These enterprises their buffaloes fed by roughage and grain and do not give or give limited or no meal as protein supplement feed. Thus, milk yields of buffaloes during the lactation period are below expectations (Değirmencioğlu, 2016). Studies on the use of protein levels in ration buffalo are rare. So, the Reliable level of protein in buffalo feed needs to be investigated. The study aims to determine the protein contents in the diets of milk buffaloes.

MATERIALS AND METHODS

Animal material

The trial in a semi-open barn system was conducted on buffaloes (5 and 6 years old) (32 to 37 days of lactation). Buffaloes are divided into two groups (T and E). Each group consisted of 10 buffaloes respectively (Table 1).

Trial material ratios

Group T was fed on a diet (D1) with Crude protein (CP); 17.82%. and Group E was fed on a diet (D2) with CP;19.18%. Animals in both groups were fed a concentrated mixture containing sunflower cake, barley, wheat, marble powder, salt, and premix (Table 2). According to their requirement, once a day alfalfa at 6.00 am and corn silage at 7.0 pm.

According to the report of Maynet and Doherty (1984), the consumption of silage and concentrate mixture by individual buffalo was determined at the end of the experimental period. Diet samples were collected daily for determining the DM consumption according to DM analysis of feeds (at 105°C overnight). After drying, samples were ground (1 mm) for chemical analysis. Feeds were evaluated for crude protein (AOAC, 1990) and fiber fractions (NDF and ADF) (Robertson and Van Soest, 1991). The metabolizable energy content was also estimated (NRC, 2001).

Statistical analysis

Data for performance and milk development in the buffaloes were tested by analysis of variance using the SPSS version 15.0 Statistical Package (2006) and means were analyzed with the t-test model described by Cochran and Cox (1957):

$$Y_{ijk} = \mu + T_i + D_j + E_{ijk}$$

Where;

Y_{ijk}: Observation

μ: Population mean

T_i: Dietaries (I = D1 and D2)

D_j: Animals (k=1, 2, 3,….18 or 20)

E_{ijk}: Residual error

RESULTS AND DISCUSSIONS

During the experimental period, the daily average dry matter intake (DMI) was 9.88±0.48 and 10.14±0.55 kg $(d)^{-1}$ in the T and E groups (P>0.05, Table 3). In this study, total dry natter ıntake (TDI) in the Group T was similar to Group E (2.56% (P>0.05); Table 3), which was consistent with the findings of Polan *et al.* (1976), Foldager and Huber (1979); Cressman, *et al.* (1980); Olmos Colmenoro and Broderick (2006); Mustafa *et al.* (2017) that showed that the addition of protein in the diet did not affect DMI in adult dairy cows.

However, other studies have observed that protein levels in diet positively affected DMI in dairy cows (Roffler *et al*., 1978; Van Horn *et al*., 1979; Cressman, *et al*., 1980). Similarly, Broderick (2003) observed that the protein level in the diet increased DMI in dairy cows.

The observed response variance may be related to several factors, such as animal factors, the temperature inside the shelter, daylight, energy level of the ration. As shown in Table 1, daily milk yields for the T and E groups were 4.38 and 4.41 kg/day, respectively, before the experiment. Protein improved (P<0.05) milk yield by 0.70 kg/d (% 12.43; 4.93 vs. 5.63 kg/d for the T and E groups, respectively) after the experiment. The balance of nutrition was also better as a result of adding 35% sunflower cake (D2) for the rest of the milk yield in Group E. In a study, NRC (2001) observed that a 1% CP content difference in the diet increased milk yield by 0.75 kg/d. The milk yield (0.70 kg/d) for the CP; 19.18% content studied here was observed to be similar to the value (0.75) reported by NRC (2001). In other studies, Cressman *et al.* (1980) also reported that increasing from 12% to 18% CP of ration positively affected (P<0.05) milk yield kg/d (18.85%) for dairy. This value % 12.43 was significantly little lower than the 18.85% reported by Cressman *et al.* (1980). Significant increases in milk production associated with protein supplementation have previously been reported in dairy cows (Gardner and Park. (1973); Polan *et al.* (1976); Roffler *et al.* (1978); Cressman *et al.* (1980); NRC (2001); Reynal and Broderick (2003); Wattiaux and Karg (2003); Ipharraquerre and Clark (2005); Hugo *et al.* (2010); Mustafa *et al*., (2017).

However, some studies have reported inconsistent results regarding the influences of protein difference, partially due to confounding effects of ration composition, the level of protein content in the diet, and the source of protein in the diet Leonardi *et al.* (2003); (Olmos Colmenoro and Broderick, 2006).

In this study, milk composition was not affected significantly by protein level (Table 3). When the energy level in the diet increases, the blood glucose level effect. As a result, insulin (hexokinase enzyme) secreted by the β-cells of the pancreatic gland affects the cell membrane and increases the permeability of glucose. Insulin also increases amino acid uptake by the mammary glands by inhibiting the formation of gluconeogenesis in the liver (Chamberlain and Wilkinson, 1998) this result complies with the other studies (Van Horn *et al*., 1976; Kwan *et al*., 1977; Grieve *et al*., 1980; Cunningham *et al*., 1996; Broderick, 2003; Leonardi *et al*., 2003; Mustafa *et*

Table 1. Results of preliminary information about buffaloes before trial (mean±SE).

Groups	Number of buffaloes	Bodyweight (kg) $\overline{X} \pm S_{\overline{X}}$	Milk yield (kg/day) $\overline{X} \pm S_{\overline{X}}$	Days in milk
Group T	10	439.10±17.83	4.38±0.36	37.56±9.90
Group E	10	448.10±22.62	4.41±0.32	32.56±6.70
Insignificant		IS	IS	IS

Table 2. The composition of concentrate feed mixture (CFM), alfalfa and silage DM(%) (DM).

Feed	Diet 1	Diet 2	Roughages	
	17.82 % CP	19.18 % CP		
Barley	34	31	Alfa	Maize silage
Wheat	35	32		
Sunflower cake	29	35		
Marble powder	1	1		
Salt	0.75	0.75		
Vitamin + - Mineral	0.25	0.25		
Total	100	100		
Dry matter/(Natural)[1]	90.17	90.37	89.44	31.03
Organic matter	86.71	86.59	80.38	26.11
Crude protein	17,82	19,18	14,65	6,62
Crude fiber	9.00	9.05	33.46	20.97
Crude oil	2.20	2.21	1.52	2.32
Crude ash	3.46	3.78	9.06	4.92
Nitrogen free ext	45.03	36.41	31.17	18.2
Starch	28.88	41.63	20.0	21.81
NDF (Neutral Detergent Fibre)	21.66	28.79	40.99	42.86
ADF (Acid Detergent Fibre)	11.71	13.67	37.04	30.72
ME (kcal kg)	2649.09	2649.34	1631.180	659.318
NR	148.65	138.13		

Table 3. Results on performance of buffaloes (mean±SE).

Parameter	Group T	Group E	P-value
	D1(17.82% CP) $\bar{X} + S_{\bar{X}}$	D2 (19.18% CP) $\bar{X} \pm S_{\bar{X}}$	
Silage DMI (kg d^{-1})	4.72±0.15	5.07±0.27	IS
Alfalfa DMI (kg d-1)	4.41±0.25	4.20±0.19	IS
Concentrate DMC	0.74±0.09	0.87±0.12	IS
Total DMI	9.88±0.48	10.14±0.55	IS
Milk yield (kg d^{-1})	4.93±0.24	5.63±0.31	*
4FCM % (kg d^{-1})	7.18±0.27	7.89±0.15	*
Milk fat (%)	7.20±0.47	6.88±0.39	IS
Solids-not-fat, SNF (%)	10.08±0.16	10.03±0.13	IS
Protein (%)	4.13±0.12	4.32±0.15	IS
SCC (x log10 mL^{-1})	21.640±43.85	16.710±21.31	IS

Total DM intake values for buffaloes were not added to pasture consumption, % 4 FCM; % 4 Fat Corrected milk; SCC; Somatic Cell Count; *P-value<0.05. US: In-significant

al., 2017) who reported that protein increasing in ration did not affect milk fat.

CONCLUSIONS

In this study, based on the data obtained in Table 3, the following main conclusions can be drawn:

1. The use of the concentrate feed mixture (D2) with 19.18% CP in buffaloes enabled the improvement of milk production, and without affecting the chemical composition of the milk.

2. Milk production can be improved up to 0.70 kg (% 12.43) by adding 35 % sunflower cake to the diet of buffaloes in the early lactation period.

3. 1.36% CP differences in the diet positively affected the milk production of buffaloes. In protein-containing diets, it may be recommended to add cereal grains to the farmers for the conversion of ammonia to urea in liver as energy source.

4. Using of sunflower cake should be encouraged on the buffalo's farm.

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