Study on Effect of Crude Protein in Different Stages of Lactation of Holstein Friesian Cow

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List of Acronyms Symbols Used

Abbreviation	Elaboration
%	Percentage
No.	Number
et. al	And his associate
MP	Metabolizable Protein
SSC	Secondary school certificate
HSC	Higher secondary school certificate
CVASU	Chattogram Veterinary and Animal Sciences University

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ABSTRACT

40 Holstein Friesian cows in two farms were selected for the evaluation of the milk production in the 2nd and 3rd lactation and feed them concentrate feed. All the cows were free from any physical deformities and there was no clinical mastitis in this animal, BCS (Body condition score) was almost 3. 20 cows received mixed feed on one farm, whereas 20 cows received company feed on another farm. Chemical analysis of feed samples was DM, Moisture, CP, CF, and EE. The value of Crude protein in the concentrate mixture was 16% and the company feed was 20%. The analysis of all milking data revealed that animals with low protein intake make less milk, whereas those with high protein intake produce more milk than those with low protein intake. The main goal of this study is to establish a relationship between crude protein and milk production in different lactation periods.

Keywords: Crude Protein, Proximate analysis, Lactation period.

CHAPTER 1: INTRODUCTION

In Bangladesh, the livestock industry is one of the key elements of agricultural operations and is essential for economic growth since it ensures food security and fosters the expansion of several ancillary businesses (Goutam et al., 2017). About 20% of the population in Bangladesh relies entirely on livestock, while 75% of rural residents depend on it (Uddin et al., 2016). Due to rising incomes and population growth, the demand for meat and dairy products has been rapidly increasing in Bangladesh and other emerging nations. Compared to meat and eggs, which saw an increase from 10g to 18g daily, milk consumption increased from 22g in 1983 to 32g in 2005 (Jabbar et al., 2010). According to the International Farm Comparison Network (IFCN, 2019), Bangladesh produces 8.08 million tonnes of milk overall, which is lower than the country's annual requirement of 15.04 million tonnes of milk. Bangladesh produces 9.4 million tonnes of milk annually. As a result, it is implied that Bangladesh only meets 63% of the whole need (although IFCN states that it is just 54% of the total required). The basis for farmhouse simulation is milk prices that are down 17% and feed prices that are up 3.7 percent as a result of the Corona epidemic that struck in March. Small families and family farms experienced milk yield reductions of 7.9% and 8.9%, respectively (Uddin et al., 2016). Today, the demand for dairy products, especially milk, meat, and eggs, is increasing daily (Hossain et al., 2022). To ensure a sufficient supply of the MP necessary for dairy cows to produce the most milk and protein, producers frequently provide high CP diets. In Bangladesh, a lack of feed is the primary cause of low livestock productivity (Rahman et al., 1998; Baset et al., 2003; Jahan et al., 2018) at the same time, farmers are unable to create balanced diets, which results in productivity loss. To fulfill the requirement of farmers for concentrate feed, commercial feed industries are marketing branded feeds to cater to the market demand. Ideally, the role of these industries should be to provide high-quality livestock feeds to enhance production by meeting the nutrient requirements of livestock in different stages of growth or production. It is generally known that as dietary CP content rises, the amount of protein that is broken down in the rumen likewise rises. A review of six

Wisconsin dairy farms found nursing cows were fed diets averaging 19.1% CP of DM, with a range of 18.0 to 21.5%, on farms with mean rolling herd averages of 14,140 kg (Gunderson et al., 1998). However, multiple studies found that increasing dietary CP from 16.1–16.7% to 18.4–18.9% had no positive impact on milk and protein production (Cunningham et al., 1996; Broderick, 2003; Leonardi et al., 2003). In this study, 20 cows in 2nd and 3rd lactation were fed a mixture of concentrate and 20 were fed company feed. After the proximate analysis, the CP level of the mixture was found 16% and company fed was 20%. After the collection of milking data the cow that was fed the high CP showed high production and the rest showed lower than the first one. Consequently, the goal of this study was to determine the effect of the CP level of the feed in the 2nd and 3rd lactation periods and measure the production.

CHAPTER 2: MATERIALS AND METHODS

2.1 Experimental site

The experiment was conducted at a Dairy Farm in Lalmai upazila under the Cumilla district in Bangladesh.

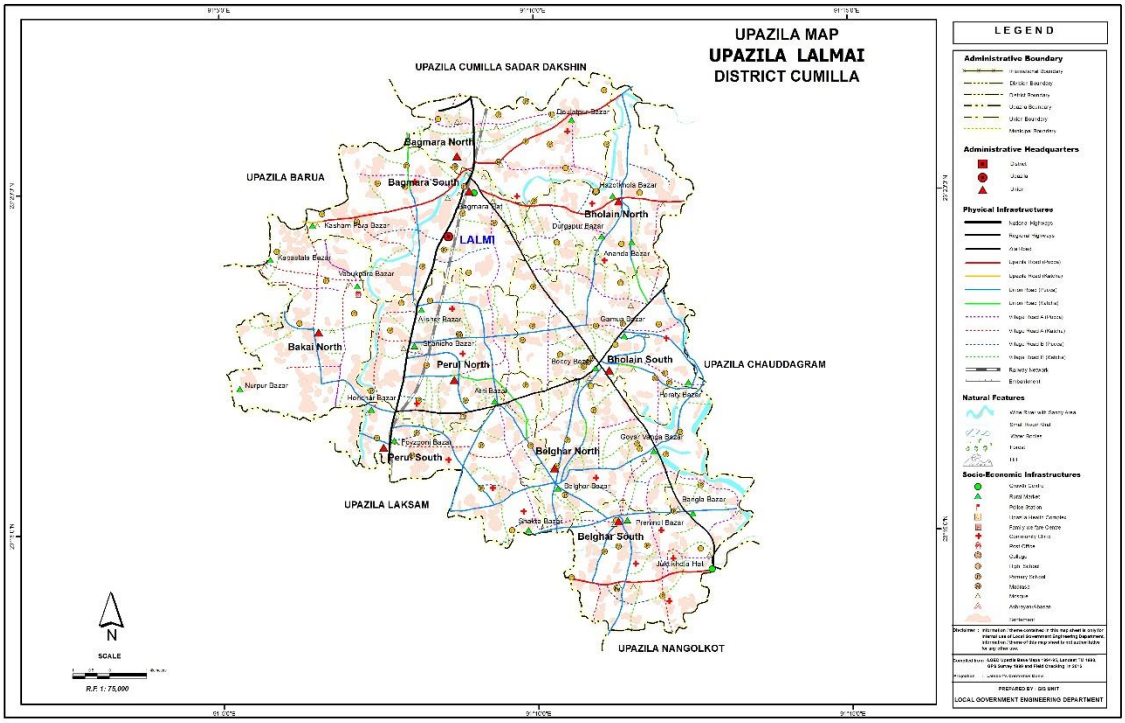


Figure 2: Demographic area of experimental site.

2.2 Cow selection

20 cows were selected which were in 2nd lactation and 20 cows were in 3rd lactation. All the cows were the same breed of Holstein Friesian. BCS was found 3. All of them are free from any physical and genetic deformities and free from clinical mastitis.

2.3 Feed quality (nutritive value) analyses

Crude protein and dry matter were among the proximate analyses performed on the samples in accordance with AOAC's 2005 methodology. Results of the Proximate analysis are given below in the table –

Table 1: Proximate analysis of Feed

Serial No	**Proximate Component of mixture feed**	**Result Percentage(%)**	**Proximate Component of company feed**	**Result Percentage(%)**
1.	Dry Matter	88.00	Dry Matter	88.00
2.	Moisture	12.00	Moisture	12.00
3.	Crude Protein(CP)	16.00	Crude Protein(CP)	20.00
4.	Crude Fiber(CF)	16.00	Crude Fiber(CF)	9.00
5.	Ether Extract	3.00	Ether Extract	5.00

2.4 Feeding System

All the cows were provided this mixture of concentrate 3kg in the morning and 3 kg in the evening and provided green grass as their requirement. It was given to them after milking.

2.5 Milking procedure

All the cows were milking by hand. After collection of the milk, the milk was measured and noted.

2.6 Milk production

The milk production scenario is given below after feeding.

Table 2: Production of milk in different lactation periods in 16% CP

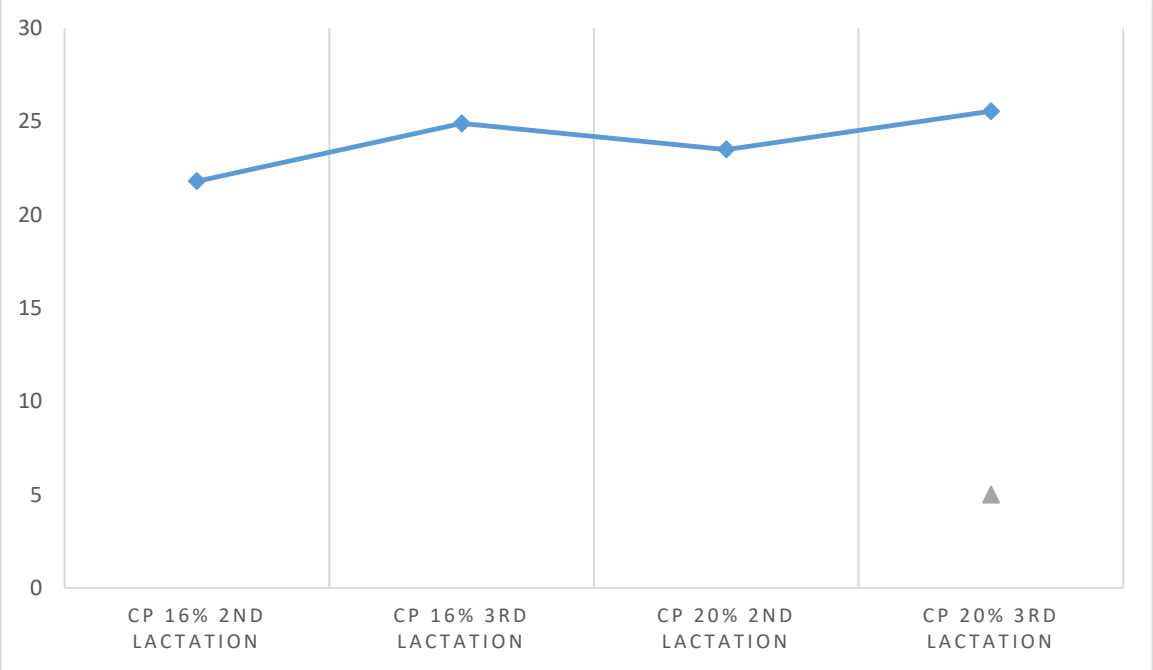
No of Cow	**2nd lactation Stage milk production(Average)**	**No of Cow**	**3rd lactation Stage milk production(Average)**
1	18.5	1	25.5
2	18.5	2	25.0
3	20.0	3	22.5
4	19.0	4	24.0
5	20.0	5	25.0
6	21.0	6	26.0
7	20.0	7	26.0
8	21.5	8	25.5
9	20.0	9	24.5
10	19.5	10	25.0
Total 10 Cows' average milk production	**21.8**	**Total 10 Cows' average milk production**	**24.9**

Table 3: Production of milk in different lactation periods in 20% CP

No of Cow	**2nd lactation Stage milk production(Average)**	**No of Cow**	**3rd lactation Stage milk production(Average)**
1	23.5	1	27.0
2	24.0	2	25.0
3	24.0	3	27.0
4	23.0	4	28.0
5	24.5	5	26.0
6	22.5	6	25.0
7	25.0	7	24.5
8	24.0	8	25.5
9	22.0	9	24.0
10	22.5	10	23.5
Total 10 Cows' average milk production	**23.5**	**Total 10 Cows' average milk production**	**25.55**

CHAPTER 3: RESULT

The result of the proximate analysis of the feed is given in Table 1 and the milk production of 40 dairy cows is shown in Table 2 and Table 3. The mean value of milk production of cows is shown in this table. After analysis of all the milking data, the result was found that the animal that was fed 20% of the protein produced 23.5L milk in 2nd lactation and 25.55L milk in 3rd lactation. And the animal which was fed 16% protein produced 21.8L milk in 2nd lactation and 24.9L milk in 3rd lactation. Which is shown in graph 1. So it could be said that high protein produces more milk than low protein.



Graph 1: Production curve in different stages of lactation.

CHAPTER 4: DISCUSSION

For dairy cows to produce the most milk and protein, producers frequently provide high CP diets to ensure a sufficient supply of the MP (Colmenero et al., 2006). Table 1 displays the proximate analysis of cattle diets. The main raw material for poultry, which makes up between 50 and 60 percent of the whole ration is maize. Maize is farmed primarily in Bangladesh's northern region and is utilized in the formulation of livestock feed. According to Mojisola (2005), maize grains included 8.96% crude protein, 4.09% crude fiber, 1.33% ash, 1.48% crude fiber, and 7.15% moisture. In this study the main component of the concentrate was maize. The by-product of soybean that is created after oil extraction is soybean meal. It is a healthy protein source with less than 1% fat (Kamal et al., 2020). Kamal et al. (2020) analyzed soybean meal consisted of 88–89% dry matter (DM), 39%–41% crude protein (CP), and 1%–2% ether extract (EE). Here also used soybean meal as a source of protein. The result of this study was seen in the lactation period which was 2nd and 3rd and the CP percentage in feed was 16 and 20. Results showed that high CP has high production. A similar study was found by Frank et al. 2002 said that high CP results in high milk production and low CP has low production. They used 13% of CP in feed and found low production. However, the results of Cunningham et al. (1996) and Leonardi et al. (2003) are not similar to this study, which claimed that increasing dietary CP from 16.5 to 18.5% and from 16.1 to 18.9%, respectively, had no effect on dairy cows milk yield. In contrast, Broderick (2003) showed a linear increase in milk production when dietary CP was raised from 15.1 to 16.7 and 18.3%; however, milk output increased from 33.0 to 34.1 kg/d only with the first CP increment, supporting this study. But Milk yield grew at a noticeably slower pace at higher dietary CP concentrations than at lower dietary CP concentrations, according to Huhtanen and Shingfield (2005) and Ipharraguerre and Clark (2005) which support this author and the study showed that there were no remarkable changes in the milk production in CP 16% and 20%. According to

Dinn et al. (1998), milk production can be increased by feeding meals supplemented with protected methionine and lysine which promotes the production of milk and milk proteins just as much as feeding diets with 16.7 or 15.3% CP was not fully similar to this study. For diets using soy protein as the principal protein supplement, methionine has been demonstrated to be the first-limiting AA (Casper and Schingoethe, 1988). There are disagreements in the literature about the impact of methionine supplementation on milk output. In a lactation study, Yang et al. (1986) found that adding 15 g/d of methionine to a diet that already contained 15.1% CP resulted in a reduction in milk production. When soybean meal was used in place of heat-treated soybean meal in a different study with the same design, amount of methionine supplied, and identical dietary CP, the milk output increased (Illg et al., 1987). When dietary CP was either 15.7% or 16.2% and 17 g/d of methionine was added, no improvement in milk output was seen (Overton et al., 1998). Kalscheur et al. 1999 proved that Dietary CP reduction also resulted in a 1.1 kg/d decrease in milk output and a roughly 100 g/d decrease in milk protein yield. In many tests, substituting soybean meal for maize grain in particular, CP for NFC led to differences in the composition of meals with lower and greater protein levels (Leonardi et al., 2003) which support to this study.

CHAPTER 5: LIMITATION

The limitation of this study was small sample size and conducted with only two farms, so there was no significant data to give a complete idea about that upazila. The farmers do not maintain record books properly. If more farms could be included, then the whole upazila could be considered. When there is an opportunity in the future, the entire upazila can be worked on.

CHAPTER 6: CONCLUSION

This study was highlighted only two lactation periods. After study the result was found in 3rd lactation production rate was comparatively higher than 2nd lactation. And another result was found high CP provided high production. Most of the farmers are unaware of the protein content of their dairy feed and now they are moving towards scientific farming. They feed them in the morning and afternoon based on their body weight and production. More work needs to be done on cattle feed in future.

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BIOGRAPHY

I am **Majharul Islam**, son of Abdul Karim and Hasina Begum from Chauddagram Thana under the Cumilla district. Currently doing my graduation in Doctor of Veterinary Medicine (DVM) at Chittagong Veterinary and Animal Sciences University. I completed my Secondary School Certificate Examination (S.S.C) from Mia Bazar Latifunnecha High School in 2014 and my Higher Secondary School Certificate Examination (H.S.C) from Comilla Victoria Govt. College in 2016. As a veterinarian, I enjoy serving animals and I want to spend the rest of my life serving dumb animals.