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Research Article

Effect of Pregnancy and Dry Period on Raw Milk Quality of Water Buffalo in Chitwan, Nepal

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ABSTRACT

One hundred and fifty four water buffaloes of Chitwan district were used to determine the variations in the composition of raw milk and milk yield due to pregnancy and dry period. Primary data for the study was collected using a well-designed questionnaire. Effect of dry period length and pregnancy were taken under consideration that determines the lactational efficiency. Effect of pregnancy on various milk components was also studied. The components analyzed in milk were fat, protein, SNF, density, lactose, total solid and salt. For better understanding the effect of pregnancy, the data obtained were categorized into two classes: pregnant and non-pregnant. The data thus obtained was analyzed using SPSS version 24. Fresh milk samples were collected and analyzed using milk analyzer in the laboratory. Results of present study unveiled that the salt, protein, lactose and SNF content in milk of non-pregnant buffalo is significantly lower ($p<0.01$) than that of pregnant one. But fat, density and total solid content of milk of pregnant buffalo had no significant difference ($p>0.05$) than that of non-pregnant one. Results also revealed that the length of dry period has significant effect on milk components and total yield. Among all other milk components, salt content in milk shows higher level of significance ($p<0.05$). The significant effect ($p<0.05$) of pregnancy on milk yield is generally observed after the 5th month of gestation.

Keywords: Water buffalo;Pregnancy;Dry period

INTRODUCTION

Asian buffalo or water buffalo is classified under the genus Bubalus, species bubalis. Bu□alo contributes about 12.39% of the total milk produced from all dairy species at global level [1]. On an average 120.15 million tons of milk is produced by buffalo, out of which India and Pakistan contributes 71.7% and 22.71% respectively [2].

Geographically, Nepal is divided into five plains: Terai plain, Siwalik Hills, Lesser Himalaya, Higher Himalaya and Tibetan – Tethys [3]. The ecological diversity of Nepal plays a pivotal role in determining the breed of buffalo to be reared in specific topography.

High producing swamp type and crossbred are raised in Himalayan region, swamp type crossbred with Murrah in hills, and crosses with Murrah or riverine type in plain. About 5,177,998 buffaloes are present in Nepal based on the recent data. Out of the total population of buffalo, only 1,509,512 of them are lactating.

About 1245954 metric ton of milk is produced each year by buffalo which is greater than cow milk produced i.e., 665285 metric ton [4]. Based on recent data, income from agriculture holds 26.8% of national GDP. Out of this 13% of contribution belongs to livestock sector and 6% of income from livestock sector comes from buffaloes [5].

Milk is a good source of protein and other nutrients essential for growth and to provide energy to humans. The composition of buffalo milk is influenced by various factors that can either be animal factors or environmental factors.

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Animal factors like breed and species differences, parity, age, size, pregnancy etc. and environmental factors like season, humidity, and temperature plays an important role in determining the milk yield and composition.

Pregnancy leads to the surge of hormones which is essential for the development of fetus whereas it causes regression of mammary gland [6].

As the fetus continues to grow, larger amount of nutrients is required for the growth and development of fetus. The nutrients are drained from the body pool leaving lower amount of nutrients for milk production. This effect is prominent after 4-5 months of pregnancy [7].

Many researches are being carried out to determine the effects of dry period length on milk parameters in subsequent lactation. The main aim of our study is to determine the effect of pregnancy and lactation length on milk composition and yield. Based on the results it is more beneficial to shorten the dry period length than the traditional system.

Shortening the dry period brings uniformity in feeding throughout the lactation-gestation cycle which will ultimately enhance the production [8]. Dry period length depends on various parameters like parity, level of production, calving interval etc.[9].

MATERIALS AND METHODS

Study area

Field based survey was conducted within milk cooperatives and individual farmers across Chitwan district. The survey was conducted in Tadi, Madi, Bharatpur, Rampur, Sharadanagar, Chanuli, Shivaghat and Padampur area located within Chitwan district, Nepal. Majority of the farmers were found to be rearing buffaloes in semi-intensive system for life sustenance rather than commercial purposes(Figure 1).

Figure 1: Map showing study location: Chitwan district, Nepal.

Sampling techniques and data collection

Primary data were collected by directly interviewing the farmer with the help of well-designed closed ended questionnaire. Data were also collected from various dairy co-operatives located in Chitwan. 154 milk samples of water buffaloes were collected from the farmers and dairy co-operatives located within the study site.

The samples collected were placed within the ice box and transported towards the lab facility. Thus obtained milk samples were homogenized and analyzed in laboratory using AkashgangaMilk Analyzer, AMA-Mini-40 to determine the in milk constituents. The result obtained was interpreted and analyzed to determine the influence of multiple parameters like pregnancy, dry period and lactation length etc., on milk composition.

Data analysis

The data obtained were analyzed using SPSS v24. Independent T-test was done to determine the effect of pregnancy in milk composition. ANOVA test was carried out to determine the relation between dry period, milk composition and total milk yield. Chi-square test is carried out to determine the level of significance.

RESULTS AND DISCUSSION

Effect of pregnancy on raw milk quality

Fat content in the milk of pregnant and non-pregnant buffalo was found to be 6.15±0.21 and 6.44±0.24 respectively. The study revealed that fat content of pregnant buffalo showed no significant difference (p=0.384) than non-pregnant one. So there is no effect of pregnancy on fat content of milk based on our result.

The result was also supported by Sharma [10]. The fat level shows a constant increase over the advancing post-conception weeks. This increment in fat content of milk may be due to the decreasing milk yield resulting in more concentration of fat [11].

Protein content of the milk was significantly different ($p<0.05$) in pregnant cases. The higher protein content in pregnant animal can be co-related with the increase in the rate of anabolism of major nutrients to feed the fetus. Similar findings were also obtained by Casoli, Dell'Aquila[12,13] in sheep.

Pregnancy is an only factor that significantly ($p<0.05$) affects the composition of lactose in the milk. Lactose is the main constituent determining the milk volume (Table 1). The finding of our study was in line with the result of Mech[14].

Table 1: Mean in major milk components in pregnant and non-pregnant buffalo.

Components	Non-pregnant (N=85)	Pregnant (N=69)	Sig.
Fat (%)	6.44 ± 0.24	6.15 ± 0.21	0.384

SNF (%)	7.93 ± 0.13	8.48 ± 0.93	0.001
Density(kg/m^3)	1024.77 ± 0.54	1014.71 ± 11.79	0.397
Protein (%)	2.79 ± 0.04	3.0 ± 0.03	0.001
Lactose (%)	4.17 ± 0.07	4.45 ± 0.05	0.002
Salt (%)	0.59 ± 0.010	0.64 ± 0.007	0
Total solid (%)	14.37 ± 0.33	14.64 ± 0.23	0.498
Mean ± Standard Deviation			

There is no significant difference ($p>0.1$) in the milk density of pregnant and non-pregnant buffalo. But milk density is affected by various other factors like temperature, processing of milk etc. The variation in fat content is known to be the main reason of change in milk density [15].

SNF content is higher in the milk of pregnant buffalo than the non-pregnant one ($p<0.05$). SNF content in the milk raises initially upto 8-10 weeks and then decreases gradually advancing pregnancy.

The result of our research is also supported by the findings of Khan [16]. SNF content of milk is altered by various factors like nutrition, age, disease, stage of lactation etc.

Effect of dry period on raw milk quality

The result showed that with the increase in length of dry period, total yield goes on decreasing ($0.05<p<0.1$). Dry period of length 60 days is must to maintain the milk production in subsequent lactation. Sørensen&Enevoldsen, Wilton, Madsen and Rastani[17-20] also suggested that dry periods of around 30 to 35 days resulted in decreased milk yield in the next lactation compared to cows with dry period of 60 days.

Shorter dry period leads to decrease in production during subsequent lactation because of reduced mammary epithelial cell turnover and reduced secretory capacity [21].

Similarly the longer dry period will result in greater feed costs with no income as it is in non-secretory stage. So it is must to maintain accurate dry period length so as to provide sufficient time for regeneration of mammary gland.

Dry period length also varies according to parity, calving interval, level of milk production, management practices etc.

There is no significant effect ($p>0.05$) of dry period length on fat content of buffalo milk. Similarly a non-significant increase in milk fat percentage was reported in dairy cows by Santschi [22] in the cattle with shortened or no dry period.

Similar to our results, Kuhn [23] also reported that short dry period was beneficial for fat percentage in the subsequent lactation of Jersey cows.The research depicted that only the salt content of milk shows significant difference with variation in length of dry period ($p<0.5$) Table 2.

Table 2: Effect of dry period on milk composition and yield.

Components	0-2.5 months (N=36)	3-5 months (N=79)	5 months above (N=35)	Sig.
Total yield (liters)	1357.64 ± 409.42	1334.87±523.25	1248.57 ± 391.61	0.0573
Fat (%)	6.88 ± 2.30	6.42 ± 1.89	6.41 ± 1.97	0.0503
SNF (%)	8.07 ± 1.07	8.30 ± 0.98	8.29 ± 1.15	0.0523
Density(kg/m3)	1024.84 ± 3.51	1013.43 ± 112.54	1025.49 ± 4.18	0.0682
Protein (%)	2.82 ± 0.38	2.93 ± 0.35	2.93 ± 0.42	0.0549
Lactose (%)	4.24 ± 0.56	4.36 ± 0.53	4.36 ± 0.62	0.0542
Salt (%)	0.608 ± 0.082	0.62 ± 0.078	0.63 ± 0.09	0.0489
Total solid (%)	14.49 ± 2.92	14.73 ± 2.32	15.17 ± 2.61	0.0514
Mean ± standard deviation				

CONCLUSION

On the basis of findings of our research, it can be concluded that pregnancy affects all the constituents of milk but SNF, protein, lactose and salt are affected most. The dry period length shows significant effect only on salt content of milk.In our country, buffaloes are reared by the farmers as a subsidiary occupation to sustain rural livelihood. So commercialization of this business is must to enhance the national economy of our country as the income from agriculture holds a major position in national GDP. Buffalo breeds are known for their high

efficiency to utilize low-quality roughages and sustain in poor-quality husbandry practices.

Hence further research should be conducted using large sample size for precise result and for validation of present result.

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