

## Physiochemical and Environmental Factors Responsible for Change in Milk Composition of Milking Animal

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### Abstract

The study was designed to evaluate the different factors which are responsible for milk composition. Total 80 samples from different species in different seasons were collected and analyzed for fat, Protein, Lactose, Acidity and pH. The average value of cow milk fat, protein and lactose was 3.79, 2.98, 4.55. For buffalo milk these values are 6.13, 3.28, 4.98 for goat and sheep these values are 3.74, 3.02, 4.45 and 6.69, 4.37, 4.51 respectively. These values were somewhat different from standard values due to season effect, nutrition habit of animal, lactation stage of animal etc. In the early lactation fat and protein decrease and lactose concentration increases, where as in the late lactation fat and protein increases and lactose decreases. The lactose content was less, in winter in comparison to summer where as the protein content was high in winter in comparison to summer.

**Keywords:** Breed, fat, protein, lactation, lactose, standard values

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### I. Introduction

Milk is a white liquid produced by the mammary glands of mammals. It is the primary source of nutrition for young mammals before they are able to digest other types of food. Early-lactation milk contains colostrum, which carries the mother's antibodies to the baby and provide immunity to the young ones. (1)

Milk is a very complex, naturally possessing many chemical and physical components. All milks contain the same kind of constituents but in varying amount. Within a given species, genetic factors and environmental conditions such as the climate and the stage of lactation influence the composition. (2)

### II. Material And Method

(a) **Collection of sample** : About 80 raw milk samples of different species were collected from February 10 to march 11, in which 20 samples were of cow, 20 buffalo samples, 20 sheep's and 20 were of goat samples. These samples were collected from different areas of Bikaner district of Rajasthan.

20 raw milk samples were collected in each season (winter, summer) of same cows to find out the effect of seasons.

Another 20 raw milk samples of those cows which were in different lactation stage were collected, to find out the effect of lactation stage.

(b) **Chemical Analysis:** The process of chemical analysis of milk samples was based on ISI standard methods. For the chemical analysis of milk Fat, Gerber method was used (IS 1224-1958) (3). Protein in the milk samples was estimated by Kjeldahl's Method (ISI Handbook of food analysis Part-I, 1980). (4) Lactose was estimated by Fehling solution (ISI Handbook of Food Analysis Part-11, 1981). (5). The pH value was measured by using digital pH meter (Labtronics Model No. LT11). Acidity was measured by titration method (ISI Handbook of Food Analysis Part-11, 1981) (5) in terms of lactic acid percentage. All these readings were cross checked by Milkoscan (FT 120).

### III. Results And Discussion

A study was conducted in *Bos frontalis* cow to find out the effect of lactation period in milk composition. The fat content changes from 7.72 to 10.25%, Total solid was 20.94 to 22.62%, where as total protein (6.31-6.78%) SNF (13.40-13.70%), lactose (4.36-4.60) were very less affected by stage of lactation. (6)

M.J.Auldish *et al* suggested that animals which fed on TMR(total mixed rasan) has shown less variation in composition of milk as compared to paster fed animal(cow).(7)

R.C.laben concluded that milk composition is affected by many environment and inherited factors. Overfeeding will not affect the milk protein and total SNF content but underfeeding will reduces the milk yield,SNF and protein content of milk.(8)

R.B. Sharma *et al* concluded that season also affects milk composition. SNF and TS content varied among seasons being highest in winter (8.983% and 13.639%) followed by summer (8.835% and 13.403%) and lowest in rainy season (8.444% and 12.888%).(9)

A study was conducted on Holstein Friesian cow by M. Joksimović-Todorović *et al*.In the first 60 days of lactation during spring and summer period. A higher rate of milk fat was recorded in spring (3.25±1.26%) in relation to summer (2.62±0.49%) and protein content in milk was 3.15±0.21%) and in summer it was(2.75±0.23%) the lactose content varied slightly and ranging from 4.45±0.54% in spring to 4.03±0.24% in summer period.(10)

Raw milk samples of goat was collected from Sep 08 to Aug 09 by Ramona Lancu .He studied that composition of goat milk affect with change in season, it might be due to change in feeding habit with season. The pH value was highest in summer and lowest in spring and winter. The lactose content was low in spring and winter as compared to summer and autumn where as the protein content was highest in winter and lowest in summer. (11)

The deviation from standard values of milk constituent can be seen in our study. Several factors are responsible for this change; one of them may be stage of lactation. In the early stage of lactation Protein decreases and lactose concentration increases, where as in the late lactation fat and Protein increases and lactose decrease.

Studies show another factor which is responsible for milk composition is effect of season. In spring and winter lactose content becomes lowand protin becomes high, and viseversa in summer.SNF becomes highest in may,June.

Feeding habit is not very much effective for the change in milk composition, but slight effect can be seen for the animal which fed on TMR(total mixed rasan)compare to pasture fed animals.if we overfed the animal, it will not affect the milk composition but underfeeding reduses milk yield,,SNF and protein of milk.

Disease specially mestatis also affect the milk composition. All the contents; protein, fat, SNF decreases in diseased animal.

#### IV. Tables

**Table1. Milk composition analysis, per 100 grams (12,13)**

Constituents	Unit	Cow	Goat	Sheep	Water buffalo
Water	g	87.8	88.9	83.0	81.1
Protein	g	3.2	3.1	5.4	4.5
Fat	g	3.9	3.5	6.0	8.0
Saturated fatty acids	g	2.4	2.3	3.8	4.2
Monounsaturated fatty acids	g	1.1	0.8	1.5	1.7
Polyunsaturated fatty acids	g	0.1	0.1	0.3	0.2
Carbohydrate (Sugars i.e. Lactose)	g	4.8	4.4	5.1	4.9
Energy in Calories	kcal	66	60	95	110
Energy in Joules	kJ	275	253	396	463
Cholesterol	mg	14	10	11	8
Calcium	mg	120	100	170	195

**Table 2 chemical analysis of different milk samples**

S.NO	TYPES OF MILK	FAT±SD	PROTEIN±SD	LACTOSE±SD	pH±SD	ACIDITY±SD
1	COW	3.79±0.202	2.98±0.373	4.55±0.721	6.75±0.176	0.15±0.019
2	BUFFALO	6.13±0.861	3.28±0.030	4.98±0.445	6.75±0.086	0.14±0.020
3	GOAT	3.74±1.97	3.02±0.590	4.45±0.520	6.68±0.109	0.15±0.026
4	SHEEP	6.69±2.286	4.37±0.932	4.51±0.647	6.71±0.127	0.18±0.114

**Table 3 chemical analysis of different milk samples of cow in different season**

S.NO	SEASON	FAT(Mean)	PROTEIN(Mean)	LACTOSE(Mean)
1	Winter	4.2	3.5	4.7
2	Summer	3.9	3.3	4.9

**Table 4 chemical analysis of different milk samples in different Lactation stage of cow**

S.N O	LACTATION STAGE	FAT(Mean)	PROTEIN(Mean)	LACTOSE(Mean)	pH(Mean)	ACIDITY(Mean)
1	Early lactation	3.3	3.2	4.9	6.60	0.150
2	Middle lactation	4.2	3.5	4.6	6.75	0.144
3	Late lactation	4.9	3.6	4.4	6.80	0.150

### Conclusion:

Different agencies have decided the milk composition of different species, but still several factors are responsible for milk composition. These include Breed of the animal, lactation stage, feeding habit and season of milking.

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