

# Periodic Research

## Quantitative Interrelationship between Different Constituents of Cross Bred Cow Milk in Different Stage of Lactation

### Abstract

The experiment was conducted to study the stage of lactation (Early, middle and late) for interrelationship between different constituents of cross bred cow milk. It can be concluded that relationship between the different constituents of milk similar to western breed and slightly higher to Indian breed.

**Keywords:** Milk Constituents, Interrelationship.

### Introduction

Vieth was the first scientist, who recognized that there exists inter relationship between different constituents of milk. These relationship of both physiological and commercial interest and are helpful in

1. The detection of abnormal and adulterated milk.
2. Evaluating the quality of milk pricing.
3. Minimizing the time & money during analysis period.
4. Remove the calculation difficulties.
5. Physiology of milk production

### Aim of the Study

The present investigation was carried out to study the composition and quantitative interrelationship of milk constituents of cross bred cow milk in different stage of lactation namely early, middle and late.

### Review of Literature

Jemila Gurmessa and Achenef Melaku (2012) was study carried out on lactating cross bred Holstein Friesian cows with the objectives of evaluating the effect of stage of lactation, pregnancy, parity and age, on yield, major components (fat, protein, solid not fat, lactose and ash) and pH of milk. The result showed that lactation stage and pregnancy significantly ( $P < 0.05$ ) affected the milk yield whereas milk yield did not show significant variation in different age and parity groups. The highest yield was recorded in mid stage and lowest in late stage of lactation. The yield was higher in non-pregnant than pregnant cows. The fat content of the milk was significantly higher ( $P < 0.05$ ) in early and late than mid stage of lactation. However, fat content was not significantly varying with age, pregnancy and parity. The solid not fat (SNF) and protein contents of the milk were significantly different in pregnancy and age but it was not significantly affected by stage of lactation and parity. The lactose content of the milk was affected significantly ( $P < 0.05$ ) by pregnancy only. But the ash content and the pH of the milk were not affected significantly by stages of lactation, pregnancy, age and parity of the cows.

Anant krishnan, C.P. (1964) Found correlation coefficient between fat and lactose ash content for milk of cows were +0.094-0.002 respectively, indicating there by no association between fat and lactose+ash. They further reported a highly significant correlation between protein and S.N.F are 0.404, 0.561 and 0.293 for the milk of sindhi, Gir and Cross bred cow and 0.408 for the milk of western cows.

Anantkrishnan, C.P. (1964) Found the new type correlation coefficient between casein and albumin content to be +0.52 +0.86 and 0.17 for the milk of Sindhi, Gir and cross bred cow and 0.31 for western bred cow respectively, All these values were found to be statistically significant for the milk of cross bred cows.

Singh, R.P, Singh, M. Rao, Y.S. and Singh, S.N. (1960) obtained the values for Indian cows and are in close occurrence with the values of Richmonds (1920) and Jeness and Pattern (1959).



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Akhand Pratap, Deepak Kumar Verma, P. Kumar and Ajit Singh (2014) was carried out on lactating Holstein Friesian cows with the objectives of evaluating the effect of stage of age, pregnancy, lactation, parity and on yield, and components (fat, protein, solid not fat and lactose) and pH of milk. The lactation stage and pregnancy significantly ( $P < 0.05$ ) affected the milk yield whereas milk yield did not show significant variation in different age and parity groups. The highest yield was recorded in mid stage and lowest in late stage of lactation. The fat content of the milk was significantly higher in early and late than mid stage of lactation. However, fat content was not significantly varying with age, pregnancy and parity. The solid not fat (SNF) and protein contents of the milk were significantly different in pregnancy and age but it was not significantly affected by stage of lactation and parity. The lactose content of the milk was affected significantly ( $P < 0.05$ ) by pregnancy only. But the pH of the milk was not affected significantly by stages of lactation, pregnancy, age and parity of the cows. This study indicated that different factors affect the milk yield and milk components.

J.Kuchtik, K.Šustova, T.Urban, D.Zapletal (2008) was evaluation of the effect of the stage of lactation on milk composition, its properties and the quality of rennet curdling was carried out over the period of three successive years using milk samples ( $n = 162$ ) obtained from a total of 27 ewes of the East Friesian (EF) breed, reared on a small sheep farm in Juřinka in the region of Wallachia. The stage of lactation had a highly significant effect on the contents of all milk components. However, only the contents of total solids (TS), solids non-fat (SNF), fat (F), protein (P) and casein (CN) gradually increased with the advancement of lactation.

## Materials and Methods

In present investigation 45 samples of milk were analyzed for different constituents in different stage of lactation from cross bred cow milk (Jersey X Sahiwal). The lactation period was divided into three stages

- Early after calving to forty days.
- Middle after forty days to one hundred fifty days.
- Late one hundred fifty days to end of lactation.

**The Milk Samples Were Analyzed by A.O.A.C. (1970) .the Constituents of Milk of Different Lactation of Crossbred Cow was As Follows are Given in Table No1-**

S.N.	CONSTITUENT	Early Lactation	Middle Lactation	Late Lactation
1	Specific Gravity	1.031	1.030	1.029
2	Fat %	3.42	4.59	5.45
3	Protein %	3.44	3.80	3.48
4	Casein %	2.59	2.79	2.61
5	Lactose %	4.44	4.38	4.37
6	Chloride %	0.13	0.15	0.13
7	S.N.F %	9.15	9.21	9.04
8	Total Solids %	12.57	13.80	14.49

From the above constituents of analyzed milk certain ratio's and interrelationship were calculated.

### Protein –Fat Relationship

under this relationship, protein –fat No and casein –fat No. were calculated. Protein –fat no was calculated by following formula given by Timpe (1939) as

**Protein Fat No** = Protein % - (0.35Xfat %) and for

**Casein Fat number** Vanslyke (1927) formula was employed.

**Casein Fat number** = Casein % -0.4 (fat % -3)

### Lactose Chloride Relationship

Under this relationship Koestler No., lactose chloride No., C.M.S. and K(Kopatschak) constant were calculated by following formula

Koestler No = Chloride % /Lactose % X100 (Koestler1922)

Lactose chloride No = Lactose % +13.5X chloride % (Davies1931)

C.M.S= Lactose % + 196 X Chloride % (Mathieu & Ferre1914)

K. constant = (Chloride % + Lactose %) X 44 (Kopatschak1922)

### Fat- S.N.F. Relationship

Under this relationship S.N.F/Fat ratio and S.N.F/Fat No were calculated by following formula  
 S.N.F/Fat ratio=S.N.F%/Fat% (Lythgoe 1931)  
 S.N.F/FatNo= S.N. F%-(0.4)(Fat-3) (Jacobson1936)

Data were statistically analyzed as described by Snedecor and Cochran (1994).

### Result and Discussion

The Quantitative inter relationship between different constituents of cross bred cow milk in different stage of lactation are presented in Table No-2-As regards of the effect of stage of lactation on Protein fat No and Casein fat No clearly reveals a decreasing trends with advancing lactation because of regular increase of fat content of cow milk with the advance lactation as per shown in Table No-01.This clearly indicates that there is a positive correlation between these two constituents of milk. The higher value for middle and late lactation is due to the higher chloride percentage as compare to early lactation. Lactose chloride No indicate that there is a slight decrease in values an increase of stage of lactation.Our finding are slightly lower than that of Singh ,R.(1966) for Indian cow.C.M.S. No decrease and towards the end of lactation.

This is due to the decrease in lactose content with advance lactation. K. Constant lowering with advancing the stage of lactation. The reason was the presence of higher percentage of chloride in advancing the period of lactation with decline lactose content. It means that lactose and chloride constituents of milk bear a negative correlation with each other. Our findings lower to that of Singh, R. (1966) reported for Indian cows. Same correlation has also been reported by Anantkrishnan, C.P. (1964). From the table No-2 this clearly indicates that with the advance stage of lactation there is a decline in the SNF-Fat ratio. This is because of increasing fat percentage as advancing of lactation period. Our values for SNF-fat ratio are not in agreement with those of Singh, R. (1966) for Indian

cow milk to same stage of lactation. This variation is due to higher fat content in Indian cow as compare to cross bred cow milk while the trends is closely similar to the finding are those worker reported lowering of this ratio with advance stage of lactation. SNF-Fat No shows that a similar trend as SNF-Fat ratio. SNF-Fat No of early lactation has been found higher to that of middle and late lactation. The progressive decrease in S.N.F-Fat No. is also due to proportionately higher increase in fat content than SNF percent. These findings are agreement with these of Singh, R.P.et.al. (1960) for Indian cow milk and Jemila, G. and Achenef, M. (2012) for Holstein Friesian cross bred Cows milk.

**Table No-2**  
**Showing the Quantitative Inter Relationship between Different Constituents of Cross Bred Cow Milk in Different Stage of Lactation .**

S.N.	Quantitative interrelationship	Early Lactation	Middle Lactation	Late Lactation
1	Protein Fat No	2.23	2.19	1.58
2	Casein-fat No	2.36	2.09	1.64
3	Koestler No.	2.97	3.45	3.18
4	Lactose chloride No	6.22	6.42	5.57
5	C.M.S. No	7.02	7.25	7.11
6	K. Constant	200.23	199.47	199.69
7	SNF-Fat	2.73	2.13	1.69
8	SNF-Fat No	8.98	8.57	8.06

### Conclusion

It can be concluded that relationship between the different constituents of milk of cross bred cow milk under Indian conditions similar to that of western breeds and slightly higher values to the milk of Indian cow.

### Suggestion

It is suggested that extensive work should be conducted in India for analysis and determination of relationship constants for different cross bred cow milk for their establishment.

### References

1. A.O.A.C. (1970) : Official methods of analysis. Association of analytical chemists. Washington, D.C.
2. Anant krishnan, C.P. (1964) : Indian Journal of Dairy Science, 16(4).
3. Jemila Gurmessa and Achenef Melaku (2012): Effect of Lactation Stage, Pregnancy, Parity and Age on Yield and Major Components of Raw Milk in Bred Cross Holstein Friesian Cows, World Journal of Dairy & Food Sciences 7 (2): 146-149.
4. Singh, R., Singh, M., Rao, Y.S. and Singh, S.N. (1960): Indian Journal of Dairy Science.
5. Snedecor, G.W. and Cochran, W.G. (1994): Statistical methods. Oxford and IBH Publication Co. New Delhi.
6. Akhand Pratap, Deepak Kumar Verma, P. Kumar and Ajit Singh (2014) IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) Volume 7, Issue 2 Ver. I (Mar-Apr. 2014), PP 112-115
7. J. Kuchtik, K. Šustova, T. Urban, D. Zapletal (2008) Czech J. Anim. Sci., 53, 2008 (2): 55-63