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Chemical composition of raw milk from Cow, Buffalo and Goat of Madhepura district (Bihar)

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Abstract- Milk is considered as a good source of Protein, Fat and Minerals. In the present work, study of chemical composition of milk from Buffalo, Cow and Goat was performed. Milk was collected from 5 dairy farms of Madhepura district and chemical constituents-Protein, Fat, Lactose, Carbohydrate and minerals were measured in the laboratory. It was observed that Protein, Fat and Lactose content were highest in Buffalo milk and lowest in Goat milk. The content of these biochemical substances in Cow milk was in between Buffalo and Goat milk. Similarly, the mineral content i.e. Calcium, Potassium, Phosphorus, Iron, Zinc etc. were also maximum in Buffalo milk and the value of these minerals varies in Goat and Cow milk. The Calcium and Potassium were in more quantity in Goat milk in comparison to the Cow milk but the Iron content was higher in Cow milk in comparison to the Goat milk. On the other hand, Zinc content was higher in Goat milk.

Key words: Protein, Fat, Lactose, Carbohydrate, Minerals

INTRODUCTION

Milk is considered as a nearly complete food since it is a good source of Protein, Fat and major minerals. Also milk and milk products are main constituents of the daily diet, especially for vulnerable groups such as infants, school age children and old age.¹ Several studies have reported the distribution and occurrence of the essential components in various animals' milks.^{2,3} Milk is an excellent source of Protein, Fat, Vitamin A, Vitamin D, Vitamin B2, B12, Niacin and minerals like Calcium, Potassium, Zinc, Iron, Copper, Phosphorus, etc. Major source of milk for human consumption comes from Buffalo, Cow and Goat. Cow and buffalo milk is preferred by adults while Goat milk is preferred for infants. Buffalo

milk is high in fat and solid content in comparison to Cow and Goat milk.

The value of goat milk in human nutrition has so far received very little attention despite its medicinal need for infants.^{4,5} Goat milk protein and fat have many significant differences in their composition from the milk of other mammalian species, especially in relative proportion of their genetic polymorphism.⁶ Goat milk have shorter rennet coagulation time, less resistant to heat treatment, curd firmness is weaker and cheese yield are less which might explain significance differences to cow and other milk in digestion by infants, and patients which traditionally have been explained by the homogenised nature of goat milk fat.^{4,5}

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MATERIALS & METHODS

Cow and Buffalo milk samples were collected in one litre sterilized bottles from 5 dairy firms of Madhepura district and Goat milk were collected from 5 houses of the same area. Cow samples were labelled as CM1, CM2, CM3, CM4, CM5; Buffalo milk was labelled as BM1, BM2, BM3, BM4, BM5 and Goat milk were labelled as GM1, GM2, GM3, GM4, GM5. Milk samples were immediately brought to the laboratory in ice box and stored in refrigerator at 4°C for chemical analysis.

Chemical Analysis: Chemical constituents Protein, Fat, Lactose, Carbohydrate and Ash were determined according to AOAC (1990)⁷. Mineral constituents Calcium, Potassium, Magnesium, Zinc, Copper, Iron, Phosphorus, Manganese, and Cadmium were measured in Ash using atomic absorption spectrophotometer. Phosphorus was estimated colorimetrically in Ash.

RESULT

The chemical composition of milk of Cow, Buffalo and Goat shows major differences in Protein, Fat, Total solid, Lactose contents and Mineral contents. The maximum protein in Cow was observed 31.9gm/kg, in Buffalo 46.2gm/kg and only 30.9gm/kg in Goat. Similarly the fat content was also higher in Buffalo (75.9gm/kg) and minimum in Goat (39.1gm/kg) while in Cow, the maximum Fat content of Cow was recorded as 41.4gm/kg. The Lactose content of Buffalo was also maximum (51.8gm/kg) and minimum in Goat (41.1gm/kg) while in Cow, it was 42.1gm/kg i.e. in between Buffalo and Goat. The mineral content, Calcium, Potassium, Phosphorus, Iron and Zinc were maximum in Buffalo (Ca=1630.1, K=1470.3, P=949.6, Fe=0.986, Zn=4.372)mg/kg while in Goat and Cow, mineral nutrition in some cases were observed variable. The Calcium and Potash content was higher in Goat (Ca=1192.5, K=1964.1)mg/kg and in Cow the Calcium content was (Ca=1156.1, K=1659.8)mg/kg. Zinc content was also higher in Goat milk (3.8mg/kg) in comparison to the Cow milk (3.152mg/kg) but the Phosphate and Iron content were higher in Cow (P=1109.9, Fe=0.689)mg/kg but in Goat the Phosphate and Iron content were (P=938.8, Fe=0.55)mg/kg. The result was tabulated in Table no. 01 to 06.

Table 1- Chemical Composition of Cow Milk (g/kg)

S. No.	Sample No.	Protein	Fat	Total Solid	Lactose	Carbohydrate	Ash
1	CM1	31.5	40.3	121.3	42.1	52.8	6.5
2	CM2	31.2	40.6	120.5	41.8	52.1	6.2
3	CM3	30.8	41.4	119.7	40.9	51.9	6.3
4	CM4	31.7	40.9	122.4	41.3	53.1	6.6
5	CM5	31.9	41.2	123.2	42.5	52.4	6.9

Table 2- Chemical Composition of Buffalo Milk (g/kg)

S. No.	Sample No.	Protein	Fat	Total Solid	Lactose	Carbohydrate	Ash
1	BM1	45.3	75.02	157.5	51.05	45.4	7.6
2	BM2	44.9	74.8	156.8	50.7	45.1	7.4
3	BM3	44.5	74.3	155.9	50.4	44.8	7.1
4	BM4	45.8	75.3	158.1	51.5	45.9	7.7
5	BM5	46.2	75.9	158.8	51.8	46.2	7.9

Table 3- Chemical Composition of Goat Milk (g/kg)

S. No.	Sample No.	Protein	Fat	Total Solid	Lactose	Carbohydrate	Ash
1	GM1	30.4	38.5	116.5	40.4	43.1	6.3
2	GM2	30.1	38.1	115.9	40.1	42.8	6.1
3	GM3	29.8	37.8	115.4	39.8	42.5	5.9
4	GM4	30.6	38.7	116.9	40.8	43.5	6.6
5	GM5	30.9	39.1	117.3	41.1	43.8	6.8

Table 4- Metal content of Cow milk (mg/kg)

S. No.	Sample No.	Ca	P	Fe	Zn	K	Mg	Cu	Mn	Cd
1	CM1	1153.4	1108.3	0.683	3.146	1655.5	134.2	0.142	0.056	0.086
2	CM2	1151.7	1107.6	0.681	3.142	1653.8	133.8	0.140	0.055	0.085
3	CM3	1149.5	1106.8	0.680	3.139	1651.1	133.3	0.139	0.054	0.083
4	CM4	1154.7	1109.1	0.687	3.149	1657.6	134.7	0.145	0.057	0.088
5	CM5	1156.1	1109.9	0.689	3.152	1659.8	135.3	0.147	0.059	0.090

Table 5- Metal content of Buffalo milk (mg/kg)

S. No.	Sample No.	Ca	P	Fe	Zn	K	Mg	Cu	Mn	Cd
1	BM1	1625.3	948.2	0.980	4.366	1467.1	284.2	0.212	0.076	0.118
2	BM2	1623.9	947.4	0.976	4.361	1465.6	283.7	0.210	0.075	0.116
3	BM3	1621.1	946.1	0.974	4.357	1463.2	283.3	0.208	0.073	0.113
4	BM4	1627.8	948.9	0.983	4.369	1468.7	284.8	0.215	0.078	0.121
5	BM5	1630.1	949.6	0.986	4.372	1470.3	285.6	0.219	0.080	0.125

Table 6- Metal content of Goat milk (mg/kg)

S. No.	Sample No.	Ca	P	Fe	Zn	K	Mg	Cu	Mn	Cd
1	GM1	1188.7	936.5	0.50	3.2	1958.7	136.4	0.261	0.046	0.078
2	GM2	1186.5	935.2	0.48	3.0	1955.3	135.9	0.258	0.044	0.076
3	GM3	1183.2	934.3	0.47	2.7	1951.4	135.2	0.256	0.041	0.075
4	GM4	1190.3	937.4	0.53	3.5	1960.5	136.8	0.265	0.049	0.080
5	GM5	1192.5	938.8	0.55	3.8	1964.1	137.3	0.268	0.052	0.081

CONCLUSION

Milk is considered as complete food and a good source of Protein, Fat and major minerals. To access the chemical composition of Cow, Buffalo and Goat milk present work was undertaken. It was observed that Protein, Fat and Lactose content were highest in Buffalo milk and lowest in Goat milk. The content of these biochemical substances in Cow milk was in between Buffalo and Goat milk. Similarly, the mineral content i.e. Calcium, Potassium, Phosphorus, Iron, Zinc etc. were also maximum in Buffalo milk and the value of these minerals varies in Goat and Cow milk. The Calcium and Potassium were in more quantity in Goat milk in comparison to the Cow milk but the Iron content was higher in Cow milk in comparison to the Goat milk. On the other hand, Zinc content was higher in Goat milk.

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