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QUANTITATIVE ANALYSIS OF CASIEN BY PRECIPITATION FROM THE VARIOUS MILK POWDER SAMPLES & DETECTION OF METALS IN MILK POWDER SAMPLES

***Dr. Anita P. Patil**

PG Department of Zoology and Research Centre Loknete Vyankatrao Hiray Arts, Science and Commerce, College, Panchavati, Nashik-422003 Affiliated to SPPU, Pune (MH), India-422003.

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***Corresponding Author**
Dr. Anita P. Patil
PG Department of Zoology and Research Centre Loknete Vyankatrao Hiray Arts, Science and Commerce, College, Panchavati, Nashik-422003 Affiliated to SPPU, Pune (MH), India-422003.

ABSTRACT

The present research deals with the separation of casein from milk samples from various commercial milk samples of cow, buffalo and goat milk. The milk samples were analysed in laboratory for casein estimation by commercial precipitation method. Further the samples were further processed for inorganic qualitative analysis to investigate the various metals present in the milk samples by routine chemical analysis. After qualitative analysis of these milk samples, these three samples viz. cow, buffalo and goat milk samples were investigated by Energy Dispersion Spectroscopy (EDS) technique, to get the exact composition of metals present among these samples. From EDAX analysis it was observed that the cow, buffalo and goat milk samples contain large of transition metals in various concentration. The transition metals observed in these samples are Cr, Mn, Ni, Fe, Zn, Co, Cu & Cd. Further more the qualitative investigation of milk samples was investigated to find out the casein present in the various milk samples. From this investigation it was found that the cow milk samples contain 7.8 g of casein, the buffalo milk sample contains 4 g and goat milk sample contains 6.4 g of casein. From overall comparison it can be seen that cow milk sample contains more percentage of casein in contrast to buffalo and goat samples.

KEYWORDS: Milk powder, casein, EDS, qualitative and quantitative estimation.

1.0 INTRODUCTION

The milk is an essential requirement for healthy growth of human being and animals. Essentially milk completes the diet of nearly all mammals. Milk is a multinutrient fluid and it is the primary source of nutrition for human & many of the animals. It consists of 80% of proteins. The protein in the milk is classified into casein and whey protein. Milk protein consists of 80% of casein and 20% whey protein. The function of casein is to provide energy to human body. The name of casein is related to the family of phosphoproteins. These proteins are commonly found in the mammalian milk. In every country around the world, the demand of milk is very high due to its high protein value and essential growth constituents.

The prime sources of milk are cow, milk and goat, but additionally now a day's milk also can be preserved in the form of powder to get utilized further as per the requirement. There are huge important milk products, which are essentially made up from milk. Hence the quality of milk utilized to prepare these different milk products is very important.[1-5]

According to the research, in addition to the casein, protein, fats etc. there some transition elements are also present in the milk, some of them are beneficial for healthy growth of animals but at the same time some elements might not be useful to the animals including human being. Hence, the metals which are present in the all the sources of milk must be rectified, so that their advantages and disadvantages can be explore. In most of the research work the quantitative measurements of milk sample is investigated. But, for comparative assessments the quantitative and qualitative investigation is very useful to draw some important conclusions regarding the composition of milk form various sources like cow, buffalo and goat milk composition.[6-10]

The present research deals with quantitative determination of milk samples to analysed the casein by co-precipitation method. The various milk samples such as cow milk, goat milk and buffalo milk samples that availed from the market. The technique of precipitation of casein is used to predict the protein content in the milk samples. At the same time, all the milk samples were investigated by energy dispersive spectroscopy technique to get exact elemental composition from the tested milk samples. Furthermore, all the milk samples were also subjected for qualitative analysis to confirm the elements present over milk samples. From the present investigation it is found that all the tested milk samples viz. cow, buffalo and goat samples contain approximately similar number and identical transition elements. The

advantages and disadvantages of these elements are discussed in the present investigation.[11-16]

2.0 MATERIALS AND METHODS

a) Collection of milk samples

All the various milk samples utilized in the present investigation such as cow milk, goat milk and buffalo milk samples were availed from the local market. The milk samples were used of high quality and FDA approved industries.

Figure 1: Collected milk samples.

b) Sample preparation for EDAX analysis

The purchased milk samples from were directly used for EDS analysis. Before processed to EDAX analysis these all milk samples were calcined at around 100^0C to remove any moisture content present in theses milk samples. Nearly 0.5 g of samples was utilized for EDAX analysis. The samples were packed in tight glass vessel and sent for analysis.

c) Qualitative analysis of casein

The collected milk samples are filtered for the removal of insoluble impurities like dirt, dust etc. The filtered 120 ml of milk samples are taken in a 250 ml beaker and it was heated to 60°C then cooled to room temperature. The milk samples were treated with 11 ml of 5% acetic acid, followed by continuous stirring. The samples are kept for 10 minutes and undisturbed. The casein molecules in the milk samples begins to precipitate at the bottom of the beaker, because due to the negative charge in the milk permits the dispersion of casein in

it, when the positively charged acid is added to the milk samples, it neutralizes the negatively charged casein. The milk samples reached to the pH 4.7 the precipitate was formed. This is known as acid casein. It is filtered through the cheese cloth, and the collected samples are dried and weighed accurately.

3.0 RESULTS AND DISCUSSIONS

a) Energy Dispersive X-Ray Spectroscopy (EDAX)

Energy dispersive spectroscopy is widely used to detect elemental composition of compounds. In the present research all the milk samples i.e. cow sample, buffalo samples and goat samples. These all samples consists of several transition elements such as Cr, Mn Fe Co, Ni Cu Zn. The elemental composition was resolute between 5 to 8 KeV. The elemental chromium resolute at 4.5 KeV, Manganese at 5.9 KeV, iron at 6.4 KeV, cobalt at 7.0 KeV, nickel at 7.4 KeV, Copper at 8.0 KeV in all the samples. While elemental zinc resolute at 9.0 KeV only in goat milk samples. The quantitative estimation of all the milk samples and the particular elements and their percentage is as shown in table 1, table 2 and table 3 respectively for cow milk, buffalo milk and goat milk samples.

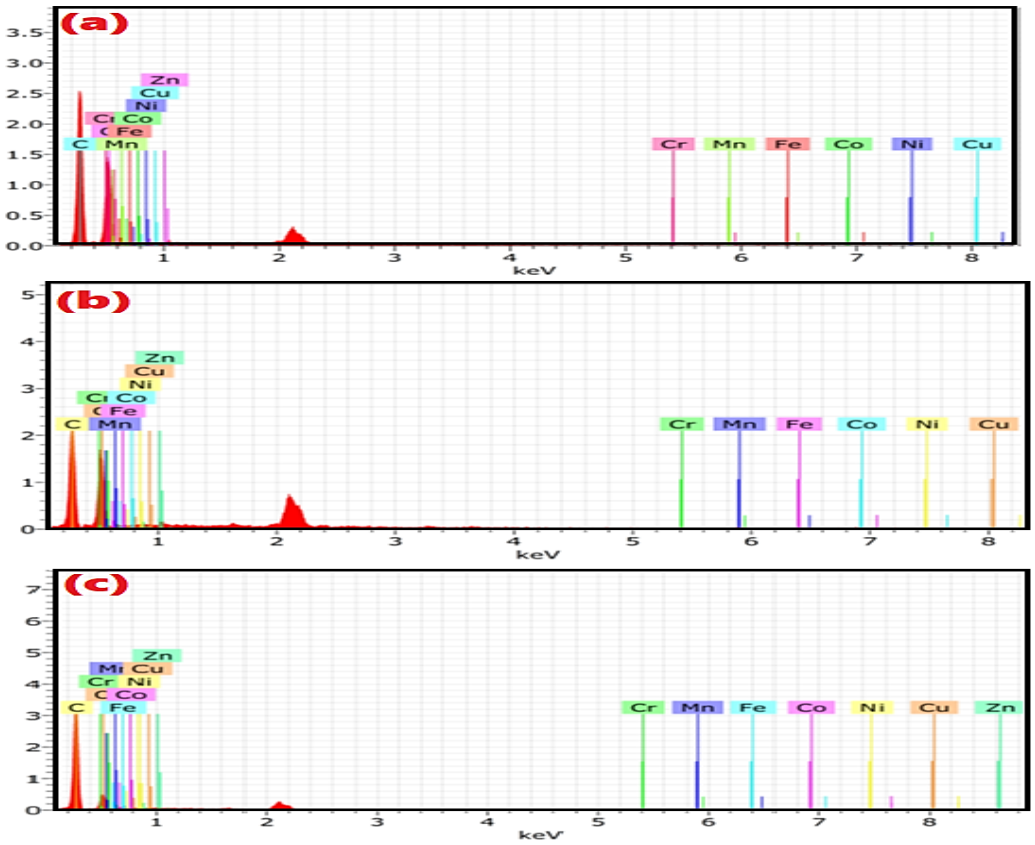

Figure 2a Energy Dispersive X-Ray Spectroscopy (EDAX) spectrum of cow milk, 2b EDAX spectrum of buffalo milk, 2c EDAX spectrum of goat milk.

Table 1: Elemental composition of cow milk sample by EDAX.

Elements	An	Series	Unn.c (wt.%)	Atom.C (at.%)	Sigma (wt.%)
C	6	K-Series	47.35	55.85	6.90
Co	27	L-Series	1.19	0.29	0.51
Zn	30	L-Series	1.04	0.22	0.15
Ni	28	L-Series	0.70	0.17	0.38
Cr	29	K-Series	0.52	0.14	0.13
Cu	24	L-Series	0.36	0.08	0.28
Mn	25	K-Series	0.00	0.00	0.00
Fe	26	K-Series	0.00	0.00	0.00

Table 2: Elemental composition of buffalo milk sample by EDAX.

Elements	An	Series	Unn.c (wt.%)	Atom.C (at.%)	Sigma (wt.%)
O	8	K-Series	48.84	43.25	7.39
C	6	K-Series	47.35	55.85	6.90
Co	27	L-Series	1.19	0.29	0.51
Zn	30	L-Series	1.04	0.22	0.15
Ni	28	L-Series	0.70	0.17	0.38
Cr	29	K-Series	0.52	0.14	0.13
Cu	24	L-Series	0.36	0.08	0.28
Mn	25	K-Series	0.00	0.00	0.00
Fe	26	K-Series	0.00	0.00	0.00

Table 3: Elemental composition of goat milk sample by EDAX.

Elements	An	Series	Unn.c (wt.%)	Atom.C (at.%)	Sigma (wt.%)
C	6	K-Series	75.75	83.36	10.45
O	8	K-Series	18.40	15.20	3.65
Cr	24	L-Series	3.86	0.98	1.79
Fe	26	L-Series	1.56	0.37	0.86
Zn	30	L-Series	0.25	0.05	0.08
Co	27	L-Series	0.14	0.03	0.18
Cu	29	L-Series	0.04	0.01	0.12
Mn	25	L-Series	0.00	0.00	0.00
Ni	28	L-Series	0.00	0.00	0.00

b) Casein estimation by co-precipitation method

The milk samples were investigated for casein estimation. The casein from all the milk samples was investigated by co-precipitation method. The flow chart below showing estimation of casein from the tested milk samples of cow, buffalo and goat.

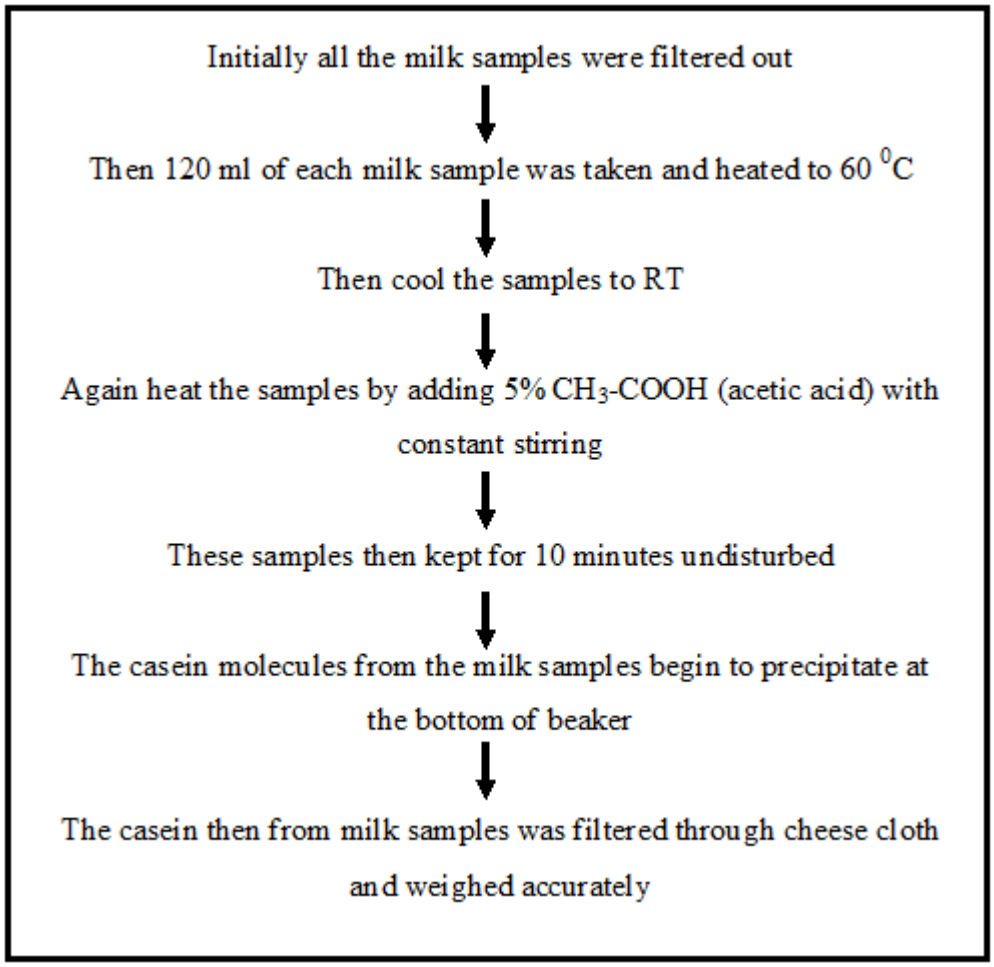

Figure 3: Flow chart showing the procedure to estimate casein from milk samples.

c) Qualitative Analysis of Casein

The yield of casein precipitated from the various milk samples of goat milk, cow milk and buffalo milk contains 6.4 g, 7.8 g and 4 g respectively gm and 5.5 gm respectively. This shows that the casein precipitated from the cow milk contains more amount of casein protein than the goat and buffalo milk samples. The lower amount of casein in the buffalo milk is may be due to the more fat content in it and adulterer with water or any other substance. This study clearly indicated that the amount of casein precipitated from the cow milk was higher than that of the other milk samples. The quantitative analysis of casein precipitated from the various milk samples provide the ample scope to the cottage cheese manufacture.

The amount of casein obtained in the analysis is as depicted in Table 4, while the diagrammatic presentation is as shown in figure 4.

Table 4: Amount of casein obtained from various milk samples.

Entry	Samples	Yield of casein (grams)
1.	Cow Milk	7.8
2.	Buffalo Milk	4
3.	Goat Milk	6.4

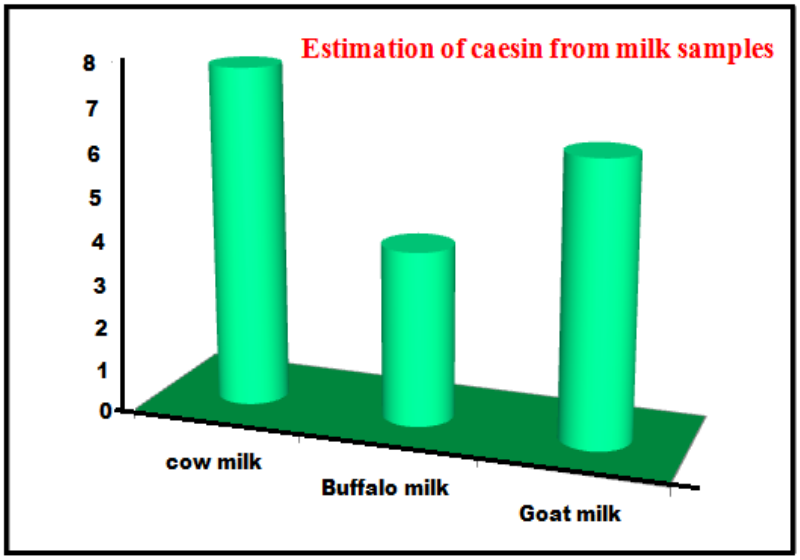

Figure 4: Diagrammatic presentation of estimation of casein from milk samples.

4.0 CONCLUSIONS

The present research work deals with the quantitative and qualitative estimation of milk powder samples. In the present investigation three samples of milk powder samples i.e. cow, buffalo and goat milk samples were studied for estimation of casein and metals present within the samples. From energy dispersive spectroscopy it can be concluded that, the large number of transition metals like Cr, Mn, Ni, Fe, Zn, Co, Cu and cadmium are present in all the milk samples. The milk samples were further investigated for amount of casein present in the milk samples. From the estimation of milk samples it was observed that cow milk sample has more amount of casein (nearly 7.4 g in 120 ml milk) as compare to buffalo and goat milk samples, which contains 4 g and 6.4 g of casein in 120 ml of milk samples. The lower amount of casein in the buffalo milk is may be due to the more fat content in buffalo milk and the milk may adultered with water or any other substance.

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