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QUALITY OF MILK SOLD IN WEST GARO HILLS, MEGHALAYA

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Abstract: Meghalaya is deficient in milk production. Government of India has taken initiatives to promote the dairy sector, yet Meghalaya could only contribute around 6.6% of the total amount of milk produced by the North-Eastern States. Hence, to shorten the gap between the demand of milk and shortage of supply, the sellers are tempted to adulterate the milk as a result 96% of the milk were found non-confirmatory during the National Survey of Milk Adulteration by FSSAI (Food Safety and Standard Authority, Govt. of India).Very less work had been done to access the quality of milk in remote areas like Garo Hills, Meghalaya. So, it becomes very important to check the quality of milk in this area. Thus, a study had been done to check the physic-chemical characteristics of milk, microbial load and detection of adulterants in the milk sold in Garo Hills. It was found that all the milk samples were adulterated with water, had cane sugar in one sample and the microbial load been higher in all the samples.
Keywords: quality, milk, lactoscan, microbial load, adulterants.

1. Introduction

According to FSSAI, milk will be used only for actual "Milk" defined as *"means the normal mammary secretion derived from complete milking of healthy milch animal, without either addition thereto or extraction there from, unless otherwise provided in these regulations and it shall be free from colostrum.*[1]

Milk is one of the daily requirements in the diet of infants, children and adults. With the increase in population, milk consumption and demand is increasing day by day. But the production of milk is not sufficient enough to meet the demand of the increasing population. The per capita availability of milk is 83gms per day (Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India).[2] Though, Government of India has taken initiatives to promote the dairy sector, yet Meghalaya could only contribute around 6.6% of the total amount of milk produced by the North-Eastern States in 2013-14.[3] Hence, to shorten the gap between demand and supply, people resort to ideas like adulteration, which may include addition of water to increase the quantity of milk.[4]Besides this, some may extract the fat to sell it separately, or use it for making other dairy items like

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cream, ghee etc. Additives like sugar, vanaspati, detergents etc are also added to maintain the SNF, while a preservative like formalin is added to increase the shelf life of milk.[5]

The motive of adulteration of milk is also monetary profit, but in the process, the innocent consumers are cheated. The adulterants not only reduce the quality of milk but also bring in various health issues, like food borne diseases if the water added was insanitary, heart problems and intoxication caused by formalin etc.[6-8]

The concept of adulteration and contamination had been there since time immemorial, but not much work had been done, to check its status in the country like India. It was not until 2011, that FSSAI (Food Safety and Standards Authority of India) came up with the survey of milk adulteration in India, was found that around 68.7% of the milk samples collected from all over India (28 states and 5 union territories) were non-conformity. Meghalaya too had unsatisfactory result, and recorded having 96% non-confirmatory milk samples. [5]

To check the problem of adulteration, Government of India, came up with various new programmes, and many researchers have worked on various methods to detect adulteration. The techniques involved were ELISA, HPLC, spectroscopy etc. But these techniques were too sophisticated and beyond the reach of the common people.[9] Hence, FSSAI came up with the publication of DART (Detection of Adulterants with Rapid Test). It was a manual containing a series of rapid test which helps in detection of adulterates at home and in the laboratory. The tests are simple and the chemicals used are found at home and in a simple laboratory.[10]

2. Methodology

The quality of milk was checked by accessing three parameters of milk: physico-chemical parameters, microbial load of the milk and presence of adulterants.

The milk was sampled from the local market of three different sites of West Garo Hills and all the selected food items were unbranded and the ones sold loose. The sampling procedure and the following methodology of detection tests were replicated three times.

Physicochemical characterisation of milk:

The physic-chemical characters of milk like Fat, SNF, Density, temperature, Proteins, Lactose, added water, salts etc were observed using the Lactoscan analyzer.[11]

Microbial load in milk: (Aneja, 2014)

Bacterial count, Coliform count, Yeast and Mould counts were done using pour plate technique. All the samples were replicated three times. Media used for total bacterial count

was Nutrient Agar, For Coliform count was Eosin-Methylene Blue (EMB) agar and for Yeast and Mould Count was peptone yeast dextrose agar.[12]

Detection of adulterants in milk:

The following methodology is based on DART (Detection of Adulterants with Rapid Test) manuals prescribed by FSSAI.[10]

Table 2.1: Methodology as prescribed by FSSAI

Food item		Adulterant	Rapid test	Inference
1. Milk	a)	Water	Milk was dropped in a polished surface.	Pure milk would either stay or flow slowly leaving a white trait behind.
	b)	Detergent	5-10 ml of sample was mixed thoroughly with an equal amount of water.	If milk was adulterated with detergent, it would form a dense lather. Pure milk would form a very thin foam layer due to agitation.
	c)	Formalin	10 ml of milk was taken in a test tube and 5 ml of conc. Sulphuric acid was added on the sideways of the tube without shaking.	If a violet or blue ring appeared at the intersection of the two layers, then it showed the presence of formalin.
	d)	Vanaspati	10 drops of hydrochloric acid were added to 3 ml of milk. 1 teaspoon of sugar was then added. After 5 minutes, the mixture was examined.	The red colouration indicated the presence of vanaspati in milk.
	e)	Sugar	2 ml of hydrochloric acid was added to 3 ml of milk in the test tube. The test tube as heated after adding 50 mg of resorcinol.	The red colouration indicated the use of sugar in the milk.
	f)	Boric acid	20 drops of hydrochloric acid were added to 3ml of milk in a test tube and the contents were mixed thoroughly. A yellow paper-strip was dipped and removed after 1 minute.	A change in colour from yellow to red, followed by the change from red to green, by addition of one drop of ammonia solution indicated that boric acid was present in milk.
	g)	Removal of fat	The lactometer reading would go below 26.	Indicated that the milk was thin, fat had been removed or water had been added.

3. Results

Table 3.1: Physico-chemical characteristics of milk

Labels	Temp.	Fat	SNF	Density	Protein	Lactose	Water	FP	Ash
1	34.4	04.4	10.1	35.8	03.7	05.5	00.0	-0.656	0.8
2	36.5	04.8	09.6	33.6	03.5	05.3	00.0	-0.624	0.8
3.	35.6	04.2	09.2	32.5	03.3	05.1	00.0	-0.621	0.8

Table 3.2: The average microbial counts readings of three replicates

Milk Sample	Total Bacterial Count			Yeast and Mould Count			Coliform Count		
Dilutions	10^{-4}	10^{-5}	10^{-6}	10^{-4}	10^{-5}	10^{-6}	10^{-4}	10^{-5}	10^{-6}
Sample Site I	101	35	3	22	1	0	0	0	0
Sample Site II	105	37	4	23	2	0	0	0	0
Sample Site III	103	33	5	21	1	0	0	0	0

Readings of microbial count:

Calculation:

The number of bacteria per ml of the original suspension/ sample I $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{35\ colonies}{1ml \times 10^{-5}} = 35 \times 10^5$ bacteria/ ml of the sample I

The number of yeast per ml of the original suspension/ sample I $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{1\ colony}{1ml \times 10^{-5}} = 10^5$ yeast/ml of the sample I

The number of bacteria per ml of the original suspension/ sample II $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{37\ colonies}{1ml \times 10^{-5}} = 37 \times 10^5$ bacteria/ml of the sample II

The number of yeast per ml of the original suspension/ sample II $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{2\ colonies}{1ml \times 10^{-5}} = 2 \times 10^5$ yeast/ml of the sample II

The number of bacteria per ml of the original suspension/ sample III $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{33\ colonies}{1ml \times 10^{-5}} = 33 \times 10^5$ bacteria/ml of the sample III

The number of yeast per ml of the original suspension/ sample III $= \frac{Number\ of\ colonies (average\ of\ 3\ replicates)}{Amount\ plated \times dilution}$

$= \frac{1\ colony}{1ml \times 10^{-5}} = 10^5$ yeast/ml of the sample III

Detection of adulterates in milk:

Table 3.3: The results of the rapid detection tests of adulteration in milk

Food item	Adulterant	Sample site								
1. Milk		I			II			III		
	i. Water	+	+	+	+	+	+	+	+	+
	ii. Detergent	-	-	-	-	-	-	-	-	-
	iii. Formalin	-	-	-	-	-	-	-	-	-
	iv. Sugar	+	+	+	-	+	-	-	-	-
	v. Boric acid	-	-	-	-	-	-	-	-	-
	vi. Removal of fat (Lactometer reading)	**32**	**23**	**20**	**26**	**21**	**18**	**28**	**22**	**20**
	vii. Synthetic milk	-	-	-	-	-	-	-	-	-
	viii. Starch	-	-	-	-	-	-	-	-	-

4. Discussion

The study revealed the milk from all the three sites did not have any harmful adulterate. The Sample Site I had the best quality of milk. The only adulterate found was cane sugar. Cane sugar is usually is used to mask extra water or to elevate total solids in the milk.[13] Consumption of excess sugar leads to dental caries,[14]obesity, elevated level of cholesterol level in body, and also causes Type I and Type II diabetes. [15] Addition of water in Label 2 and 3, lead to low lactometer reading. The fat level was also low in these two labels. Economically, it is a loss for the consumers who are buying the milk for a balanced diet. According to the European Commission Overview of Microbiological Criteria for Dairy Products, the microbial load for raw cow milk should be 5×10^4cfu/ml,[16] hence the bacterial

and yeast and mould load in all the samples were higher. One positive inference was made that though the milk was diluted with water, still it did not have unhygienic water containing coliform. Hence, the health risk is minimal. The milk fat and solid not fat (SNF) of all the three samples confirm to the Fssai standards, according to which Milk fat of cow milk should be not less than 3.2% in all the parts of India, while the SNF should not be less than 8.3%.[17]

5. Conclusion

People in remote areas have very little information regarding the quality of food they are consuming. Very less work has been done to check the quality of milk either. Thus, making a way for the adulterators to cheat the innocent people for money. It is evident from a place like Garo Hills, where the milk had been diluted with water, making way for substitutes like cane sugars to increase the SNF, and also increase in microbial load which may be due to addition of water So now, when FSSAI has come up with the initiative to check adulteration in food, we should support it, follow the manuals published by them to check the adulterates in our household items, and create awareness among the common people so that they use the manuals and be safe from dangerous adulterates and contaminants in food.

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