Quality of raw milk supplied to organized milk collection centers of private dairy plant in Nanded district of Maharashtra state

Sonwane Rajkumar Sopanrao

ABSTRACT : The present paper is aimed to analyze the quality of raw milk supplied to organized milk collection centres of private dairy plant in Nanded district of Maharashtra state. The milk samples of Ambachondi, Basmat, Aundha, Balapur, Hingoli and Malegaon was of the best quality and did not contain adulterants.Traces of adulterants like starch, sugar, urea, salt, glucose, formalin and neutralizer adulterants were found in few milk samples.Adulteration practices very in Pimpalgaon location.The tested milk samples indicated the presence of urea, sugar, glucose and formalin.The samples from Aundha and Kurunda location was found adultrant salt.The milk samples of other village locations were also of good quality but location area Pimpalgaon was found to be of substandard in milk quality.Overall conclusion is made of study that the quality of raw milk supplied to organized milk collection centres of private dairy plant in Nanded district of Maharashtra state is appropriate and indicated good nutritional quality of milk.

KEY WORDS : Quality of raw milk, Organized milk collection centres, Adulterants

INTRODUCTION

Indian population is 125 cores but by 2025 it will be reach 175 corers. Our per capita consumption of milk in India is 345 g per day which would increase to 800 g by 2050. If this demand has to be met then India has to produce 540 million metric tons of milk which is three times its present production. The negative aspect of this scenario is that 70 per cent of our population lives in villages and have livestock but by 2050 due to increasing migration and urbanization only 50 per cent people will remain in villages.The challenge is, therefore, is to increase milk production in villages by dairy farmers without increasing the number of milk animals. The first and most important challenge of which is adulteration. The 70 per cent of milk in the country is sold lose. This would increase the chances of adulteration (Sodhi, 2016). Due to an increase in demand supply gap, incidence of adulteration in milk is also rise. The urgent policyattention is needed toincrease the production of milk (Khojre, 2013). The adulteration of milk is not confined to a particular region within a state, among different states in a country and among different countries in the World. Thus, adulteration is a global issue and it is not confined to a particular region, state or country (Karukonda *et al.,* 2017).'Freshly drawn milk has characteristic, but not very

──── **AUTHOR FOR CORRESPONDENCE** ────

Sonwane Rajkumar Sopanrao, Department of of Dairy Science, Yeshwant Mahavidyalaya, **Nanded (M.S.) India**

pronounced, odour which is quite volatile and which practically disappears when the milk is exposed to the air' (Eckels *et al.*,1951). According to Faraz *et al.* (2013) the authors showed that the results of the physical examination, chemical composition, physico-chemical properties and milk adulteration clearly showed that the milk sold at the places surveyed by them was extensively put to the malpractices such as skimming and adulteration of milk with, urea, formalin and cane sugar which was carried out during the handling of milk starting from milking till the receiving by end consumer. Hande (2014) and Jaiswal and Goyal (2016) has also studied composition analysis and identification of common milk adulterants of milk samples.

For reducing potential risk to public health raw milk should be individually assessed and appropriate risk management strategies implemented. Hence, there was an urgent need to conduct the present investigation for safe life of population. Keep in view the objective of the paper was to determine the chemical composition of the of raw milk, to detect ceratin adulterants in the raw milk and to assess incidence of milk adulterants status of the quality of raw milk supplied to organized milk collection centres of private dairy plant in Nanded district of Maharashtra state.

MATERIAL AND METHODS

Milk samples were collected from Nanded district of Maharashtra surrounding village locations were Kurunda, Ambachondi, Varanga Basmat, Aundha, Balapur, Barad, Pimpalgaon, Hingoli. Milk samples: Raw milk samples. Survey was taken in the winerseason. Two samples were taken from each area the result were obtained. Numerical data on dtainedanalzeded for appropriate statistical analysis. Different methods for the detection of milk adulteration as per (Sarkar, 2006).

Detection of neutralizers in milk:
Rosalic acid test (*soda taste*):

In milk neutralizer like hydrated lime, NaOH, Na_2CO_3 are added which are prohibited for using in milk (1% alcohol) rosalic acid is used in this test. Take 5 ml of milk in a test tube and add 5ml alcohol than add 4-5 drops of rosalic acid. If it is turned pinkish-red, then it is soda positive meaning, the milk quality is adulterated with carbonates or bicarbonate and can't the consumed.

Milk + alcohol + rosalic acid → Redish pink colour

5ml   5ml   4-5 drops
Soda positive milk → Non - consumable.

Test for detection of formalin:

Formalin (40% water solution of formaldehyde is very poisonous though it can preserve the milk for very long time conc. (H_2SO_4) Sulphuric acid is used in this test. Take 10 ml of milk in test tube and half the quantity *i.e.* 5 ml conc. (H_2SO_4) Sulphuric acid is added from the wall of test tube without shaking, violet or blue ring papers at the base of test tube, than formalin is present in milk.

Milk + conc. (H_2SO_4) → violet or blue ring appears
10ml   5ml
Formalin positive milk→ Non - consumable.

Test for detection of sugar inmilk :

Sugar is mixed to increase SNF contents *i.e.* to raise the Lactometer reading of milk which is diluted with water. Take 10 ml milk in test tube and add 5 ml HCl and this test tube in boiling water bath for 5 min. If it turns red in the test tube the sugar is present in the milk as adulterant.

Shake well :

Milk + HCl+ Resorcinol→ turned red in test tube
10 ml   5ml 0.1 g solid dip in hot water
Sugar positive milk→ Non - consumable.

Test fordetection for starch:

Mixing of starch also increases the SNF contents of milk. Take 3 ml milk in test tube and boils it properly. Now cool it to room temperature. Add 2-3 drops of 1 per cent iodine. If it turns Blue, thanmilk contains starch.

Milk + 1 % Iodine → Violet or blue colour
3ml   at room temp   2-3 drops
Starch positive milk → Non - consumable.

Test for detection of urea:

Urea is also added in synthetic milk to raise the SNF value, which degrades the quality of milk making it hazardous for human health. For this test take 5 ml of milk in test tube add 0.2 ml of urease (20 mg /ml) shake well at room temperature and then add 0.1 ml of Bromothymolblue solution (0.5%) appearance of blue colour after 10 -15 min indicates the presence of urea in milk.

Milk + Bromothymol blue→ after 10-15 min blue

Table A: Tests to identify adulteration in milk

Nature of chemical/adulterants	Name of the adulterant	Purpose
Neutralizers	NaOH, Na$_2$CO$_3$, NaHCO$_3$	-To mask the increase in acidity and to prevent - coagulation of milk during heating
Preservatives	Hydrogen peroxide, formalin, Boric acid etc	-To fraudulently elongate the shelf life of milk
Carbohydrate	Sucrose, glucose, starch etc	-To falsely increase the total solids -To mask the addition of water
Salt and fertilizer	Urea, ammonium sulphate, NaCl etc	-To falsely increase the total solids -To mask the addition of water
Detergent	Liquid detergents, washing powder etc	-To emulsify the extraneously added fat or oil

Table B: Common adulterants in milk and impact on health

Adulterant	Diseases caused
Urea	Vomiting, nausea and gastritis
Starch	Stomach diseases
Detergent	The detergent contains sodium, can act as slow poison for those suffering from hypertension and heart ailments.
Caustic soda	Dangerous for people suffering from hypertension and heart ailments. Harms the mucosa of the food pipe, especially in kids
Cane sugar	Decreases the nutritious value of the milk
Formalin	Causes more severe damage to the body like liver damage

colour

5ml   0.1 ml (0.5%)

Urea positive milk → Non - consumable.

Test for detection of salt in milk :

Dissolving of salt in milk also increases the CLR of milk. Take in a test tube 5 ml silver nitrate (0.8%) and 2-3 drops potassium dichromate (1%) add 1 ml milk in it and mix it well. If the content in the test tube turns yellow in colour then the milk contains salt in it.

Milk + silver nitrate + potassium dichromate → yellow colour in test tube

1ml   5ml (0.8%) 1 %   2-3 drops

Salt positive milk → Non - consumable.

Chemical tests:

Fat %:

In the present study the Gerber's method was used for the determination of fat per cent of milk (FSSAI , 2012).

Solids not fat %:

Solid not fat was determined by the following formula (Harding, 1995).

Solid not fat (%) = Total solid (%) – Fat (%) (FSSAI,2012).

Acidity %:

The acidity of milk can be determined by acid base titration. The milk was taken in a beaker and measured. Few drops of phenolphthalein indicator were added in to the milk. Then NaOH (N/10) was added drop by drop from a burette. Volume of base was recorded on the appearance of pink colour and calculation was made as follows (FSSAI, 2012).

$$\text{Acidity \%} \frac{\text{No. of ml of N/10 alkali used x 0.009}}{\text{Weight of milk in g}} \times 100$$

RESULTS AND DISCUSSION

Fresh milk samples collected samples and were analyzed for their chemical composition as well as various milk adulterants like starch, sugar, urea, salt, glucose, formalin and neutralizer. Traces of adulterants like starch, sugar, urea,salt, glucose,formalin and neutralizer adulterants were found in very few raw milk sample in present study are summarized in Table 1. Adulteration practices vary in Pimpalgaon of Nanded district.

The tested samples of milk indicated the presence of urea, sugar, glucose and formalin similar results recorded by Rao *et al.* (1977). The samples from Aundha and Kurunda location was found adultrant salt. Our finding in agrrment with Arora *et al.* (2004) reported thatout of total milk samples collected from organized and

unorganized sector 0.6 per cent samples showed positive test for salt. Other reason for positive case of salt adulteration might be due to incidence of mastitis. Farmermostly using salt and sugar as adulterants was to increase the SNF content of milk. An increased salt content was found tobe associated with mastitis infection *i.e.* increase in Na and Cl content of milk due to inflammation of mammary epithelium (Dhakal, 2005).

Aundha and Pimplgaon was found adultrant formalin observation in agrrement with Bansal and Singhal (1991) reported that addition of formalin and also in agrrement with Lingathurai *et al.* (2009) found that various preservatives like formalin and some antibiotics are also added in milk to increase its shelf-life. These adulterants, preservatives and drugs in milk cause very serious health related problems.

The samples from Varnga and Barad found starch and one sample from Varnga indicated the presence of neutralizer same findings of Farazetal *et al.* (2013) has statetd that neutralizers such as carbonates, bicarbonates and various alkalis are generally used to mask the pH and acidity values of badly preserved milk passing it off as fresh milk.

The milk sample from Ambachondi, Basmat, Aundha, Balapur, Hingoliand Malegaon was free from any harmful adulterants. Rajesh Pavan *et al.* (2016) in their study also reported that no samples were adultered with starch, cane sugar.

Milk is a good source of different nutrients and considered as complete diet.The major constituents of milk like, fat, total solid, solid not fat and acidity were determined. The results are given below:

Fat %:

The data revealed that the mean per cent of fat of milk from location area L_1 to location area L_{10} was 6.20, 5.80, 6.90, 6.90, 7.50, 8.20, 6.60, 6.60, 4.50, 5.60, 8.90 and 3.8 per cent, respectively. The fat content of pure milk was 5.50 to 6.30 per cent and in accordance with normal value. Statistically the mean percentages of fat of milk were found significantly different (P<0.05) the fat content of pure milk was 6.30 per cent and in accordance with normal value.The fat per cent of milk samples was found much higher when compared with the fat per cent of pure milk. Fat is a valuable component of milk. It is extensively used in dairy products. High values per cent of fat in analyzed milk samples may be resulted from no adulteration of milk with water.

Solid not fat % :

The data revealed that the mean per cent of solid not fat (SNF) of milk from location area L_1 to location area L_{10} was 9.10, 9.0, 9.20, 9.00, 9.50, 8.90 8.60, 8.70, 9.40 and 8.50 per cent, respectively. Statistically the mean percentages of SNF of milk were found non-significantly different (P>0.05).The SNF per cent of pure milk was 9.06 per cent and in accordance with normal value. The SNF per cent of milk samples was found no much lower when compared with the SNF per cent of pure of milk. It represents that the all constituents present in raw milk. The high values of SNF may be due no addition of water.

Acidity % :

Titetrable acidity of milk is a measure of freshness of milk. High quality milk must have acidity less than or

Table 1: Incidence of adulterants of raw milk from different places of organized milk collection centres of private dairy plant in Nanded

Area L_1 to L_{10}	Fat %	S.N.F.%	Temp °C	Acidity % LA		Adultrants						
				B B	AB	Starch	Sugar	Urea	Salt	Glucose	Formalin	Neutralizer
Kurunda	6.20	9.10	15	0.126	0.117	-	-	-	+	-	-	-
Ambachondi	5.80	9.00	13	0.126	0.117	-	-	-	-	-	-	-
Varanga	6.90	9.20	12	0.126	0.117	+	-	-	-	-	-	+
Basmat	7.50	9.00	18	0.126	0.117	-	-	-	-	-	-	-
Aundha	8.20	9.50	16	0.126	0.117	-	-	-	+	-	+	-
Balapur	6.60	8.90	17	0.126	0.117	-	-	-	-	-	-	-
Barad	4.50	8.60	17	0.126	0.117	+	-	-	-	-	-	-
Pimpalgaon	5.60	8.70	29	0.126	0.117	-	+	+	-	+	+	-
Hingoli	8.90	9.40	18	0.126	0.117	-	-	-	-	-	-	-
Malegaon	3.80	8.50	16	0.126	0.117	-	-	-	-	-	-	-

(BB=beforboling, AA= after boiling. L_1 to L_{10} =Locations)

equal to 0.14 per cent reported by Popescu and Angel (2009). The data showed that the mean per cent of acidity of milk from location area L_1 to location area L_{10} ranged from 0.117 to 0.126. Statistically the mean percentages of acidity of milk were found non-significantly different (P>0.05). The acidity per cent of pure milk was 0.15 per cent and in accordance with normal value. High values of acidity than normal indicate the poor quality of milk regarding its freshness. While acidity values close to normal milk indicate the better quality of milk regarding freshness.

Conclusion:

The results obtained during this work on the quality or raw milk in Nanded district of Maharashtra survey and tests indicated that the treaces of milk adulterated with starch, sugar, urea, salt, glucose, formalin and Neutralizer. Which have harmful impact on human health. So adulteration can be prevented. The practice of adulteration would itself be minimized.We conclude the quality of raw milk supplied to organized milk collection centres of private dairy plant in Nanded district and appropriate for consumption. The milk samples of Ambachondi, Basmat, Aundha, Balapur, Hingoli was of the best quality. The quality of this milk was appropriate according to the standards prescribed by food quality authority (FQA) of India. The milk samples of other villages were also of good quality buttraces of adulterants found in present work. Pimpalgaon location was found to be of substandard quality. Overall conclusion is made that supplied to organized milk collection centres of private dairy plant of Maharashtra surrounding villages locations appropriate and the major constituents of milk like fat and solid not fat no as much lower than the pure milk which indicated the good nutritional quality of milk.

Rcommondations:

NDDB should bring all dairy producer farmers to stimulate the awareness among farmers for quality milk production, adulteration test and other quality control test of raw and marketed milk at village level condition in Marathwada regrion of Maharshtra state.

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