

RESULTS AND DISCUSSION

A total of 50 milk samples were tested in duplicates. All tests were carried out at average room temperature (29°C). The results are summarized into 3 categories. Group I shows the presence of carbohydrates(starch, sucrose, skim milk powder and glucose); group II shows the presence of salts (acidity, alkalinity, neutralizers and sodium chloride) and group III shows the presence of other compounds formalin, hydrogen peroxides and detergents.

Determination of the extent of different adulteration in milk samples:

Results of group I adulterants are summarized in Table 4.1

Starch is easily available at cheaper rates in various forms such as wheat flour, corn flour and commercially manufactured starch. Being cheaper it is sometimes added in the milk by adulterators to raise the SNF. As evident from the table that all samples tested were found negative for starch. In order to raise the lactometer reading of milk, which was diluted with water, sugar or cane sugar is commonly added to milk, it was observed that with only one positive (2 %) for sucrose while 44% samples were positive for both glucose and skimmed milk, which could be used to either increase the weight or relative mass of natural milk. The results of the present study are in agreement with the findings of Sinha 2012 who observed 50 milk samples out of 71 samples contaminated with glucose and skim milk powder. Addition of skim milk powder to pure milk is an offence according to law. Cheap SMP is usually added to increase the SNF (solid not fat) value of diluted milk. Presence of glucose may indicate that it was used to mimic the natural sweetness of milk.

Table 4. 1: Adulteration status of milk using Group I Adulterant.

Sl. No	Adulterants	Starch	Sucrose	Glucose	Skim Milk Powder
1	No. of Samples Positive	0	1	22	22
2	No. of Sample Negative	50	49	28	28
3	No. of Sample Positive (%)	0	2	44	44
4	No. of Sample Negative (%)	100	98	56	56
5	Cumulative Percent	100	100	100	100

Results of group II adulterants are summarized in Table 4.2

It is clear from the Table 4.2 that 12 % of the milk samples tested were positive for acidity whereas 28 % samples were found positive for alkalinity test. In these samples the extent of adulteration with sodium chloride were 32%. This adulterant was also detected by Waldekar *et al.*, 2011 from 8% samples in summer and 3% in winter season among a total of 120 samples analysed in 3 different seasons. Sodium chloride or common salt may be used as cheap preservatives which may increase the shelf life of fresh milk. Sodium chloride is also used to interfere with lactometer reading. It has also been reported that high level of chloride in milk could affect the acid base balance in body and may develop regression loss of acquired immunity, kidney problem, speech and sensory disturbances. Ayub *et al.*, (2007). Addition of neutralizer was found to be negative in all the sample collected. Urea considered one of the toxic adulterant commonly found across the country was also found to be negative in all the samples collected. Urea which is a toxic substance is used to give false positive measurements of protein content in milk. Neutralizers are usually added to prevent curdling thus, increasing the shelf life of milk.

They could be added in the form of caustic soda, sodium bicarbonate, sodium carbonate, etc. Urea is added to increase the consistency and whiteness of milk. Its presence overburdens the kidneys and is very harmful and may even lead to renal failure Singh *et al.* (2011). It also leads to problems related to eyesight, headache and diarrhoea in children. Urea is also reported to cause increase in facial hair of women and children (Baumgartner *et al.* 2005). In a study carried out in Hyderabad 60% of the samples showed presence of urea. In a similar study in Dehradun (Kandpal *et al.*, (2012), shockingly 100% of the samples, unpackaged or packaged, were adulterated with urea. In another study, only 10% of the samples from Gurgaon had detectable quantity of urea and it was absent in samples from Delhi, Faridabad and Noida (Roy *et.al* 2017). In the present study, urea was absent in all the samples which is in conformity with the report of Roy *et al.*, 2017.

Table 4.2 Adulteration status of milk using Group II Adulterant.

Sl. No	Adulterants	Acidity/Alkalinity	Neutralizers	Sodium Chloride	Urea
1	No. of Samples Positive	6/14	0	16	0
2	No. of Sample Negative	30	50	34	50
3	No. of Sample Positive (%)	40	0	32	0
4	No. of Sample Negative (%)	60	100	68	100
5	Cumulative Percent	100	100	100	100

Results of group III are summarized in Table 4.3

Table 4.3 shows that all the samples are negative of hydrogen peroxide and formalin. Thirty per cent of milk samples were positive for detergents. Presence of detergents found in milk samples may be due to low maintenance of milk tanks and containers. Detergents have also been previously reported in milk samples of other regions such as Dehradun (Kandpal, 2012) and Hyderabad. In a nationwide study conducted by FSSAI in 2012, almost 8.4% of the samples were found to be adulterated with detergents. Adulteration with detergents is usually an incidental contamination which is due to negligence. Improper washing and cleaning of utensils that are used for milk collection by milkman generally leads to appreciable amount of detergents in milk. However at times it is intentionally used to emulsify and dissolve the oil in water giving a frothy solution and the characteristic white colour of milk. Detergents are also usually added to increase the SNF value of milk. Studies have reported that consumption of milk adulterated with detergents leads to food poisoning and gastrointestinal complications. In addition, some detergents contained dioxane, a carcinogenic agent (Handford *et al.*, 2016)

Table 4.3 Adulteration status of milk using Group III Adulterant.

Sl. No	Adulterants	Formalin	Hydrogen peroxide	Detergent
1	No. of Samples Positive	0	0	15
2	No. of Sample Negative	50	50	35
3	No. of Sample Positive (%)	0	0	30
4	No. of Sample Negative (%)	100	100	70
5	Cumulative Percent	100	100	100