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# Qualitative and Quantitative Analysis of Different Milk Sources for Concerning the Human Health

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## Research Article

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**ABSTRACT**

This study was designed to elaborate the physical and chemical condition of the milk supplied to the Bahawalpur city. A total of thirty samples were collected from the various sources and were processed for the determination of physical condition, chemical composition and adulterations. The results indicated that the water was added in higher amounts in all the samples. 10% samples from milk shops were found adulterated with vegetable oil. No samples were found to adulterate with, starch, urea, formalin, detergent, ammonium sulphate etc. The chemical composition of the milk samples from milk shops, tea shops and households were acidity %(0.14 ± 0.02,0.12 ± 018,0.12 ± .016); protein%(2.79 ± 0.38,2.68 ± 0.37,2.79 ± 0.36); pH% (6.74 ± .046.72 ± .062,6.70 ± 0.61) ; Fat%(4.01 ± 0.68,3.13 ± 0.0.87,2.82 ± 0.81) Solid-Not-Fat(7.92 ± 0.82,6.97 ± 1.08,6.34 ± 0.98) and total solids (14.2 ± 7.99,10.10 ± 1.88,9.16 ± 1.75) respectively. The adulteration observed mostly in Milk shop sample, hence the study clearly brought the fact that milk from all resources had adulterated samples frequently with addition of water and vegetable oil.

## INTRODUCTION

Milk and dairy product adulteration came into global concern [1]. Possible reasons behind it may include demand and supply gap, perishable nature of milk, low purchasing capability of customer and lack of suitable detection tests [2]. The motivation for food fraud is economic, but the impact is a real public health concern [3,4]. Milk adulteration detection techniques need to be very specific and rapid [5]. Milk powder is the second most likely food item being in the risk of adulteration after olive oil [6]. Adulterants in milk mainly include addition of vegetable protein, milk from different species, addition of whey and watering [7]. Milk contains more than 100 substances that are either in solution, suspension or emulsion in water, the important being casein-the major protein of milk, lactose-milk sugar, whey and mineral salts. The composition of milk varies considerably with the breed of cow, stage of lactation, feed, season of the year, and many other factors [8-10].

Commercial urea is added to milk to increase non-protein nitrogen content [11]. Similarly, melamine is added to increase protein content falsely [12]. Formalin, Salicylic acid, Benzoic acid and Hydrogen peroxide act as preservatives and increase the shelf life of the milk [4]. Detergents are added to emulsify and dissolve the oil in water giving a frothy solution, which are the desired characteristics of milk [13]. The ingestion of melamine at levels above the safety limit can induce renal failure and death in infants [14]. Excessive starch in the milk can cause Diarrhea and accumulated starch in the body may prove very fatal for diabetic patients [13]. Urea in milk overburdens the kidneys as they have to filter out more urea content from the body [15].

## MATERIALS AND METHOD

Milk samples were collected from thirty different regions of Bahawalpur City. The samples were collected in 250 ml screw capped sterilized bottles. Milk samples were collected and analyzed for the presence of adulterations from the month of February 2017 to April 2017. The raw milk samples were analyzed for physical appearance, quality and presence of adulterants. The adulteration tests were done using by chemical method. The tests included were for organoleptic, APT, COB, starch, sugar, urea, salt, $H_20_2$, protein, water, formalin, pH, acidity, Fat, LR.

For Statistical Analysis, means were compared using one-way analysis of variance (ANOVA) and Turkey's post hoc-test using Minitab release 16. The level of significance was determined at $p<0.05$.

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Parameters includes Organoleptic, APT, COB, Acidity, PH, $H_2O_2$, SNF, TS, Protein, Sugar, Sorbitol, Formalin, Urea, Salt, Detergent, Ammonium Sulphate, Vegetable Oil, Fat and LR.

In Organoleptic test, the perishability of milk and the nature of milk production and handling procedures, the changes in color, development of off-flavors/odors or taste impairments is tested simply by seeing, smelling, swirling, sipping, and/or swallowing. APT is based on instability of the proteins when the levels of acids are increased and acted upon by the alcohol. In COB when normal milk is heated it does not form clots. However if milk is abnormal, milked from diseased animals rich in colostrum, very high in salts or high in acidity (>0.30% lactic acid) forms clots or curdies on gentle boiling. Such milk cannot stand the heat treatment in the milk processing. Test for Acidity is done to measure percentage of acidity in milk and to check the quality of raw milk. Test for Protein is used for determination of proteins in milk. Test for SNF and TS is done for determination of milk solids non-fat (MSNF) and total solids in liquid milk for material balance. $H_2O_2$ was determined by using per oxide strips and done to check the peroxide value in raw milk. pH is a conventional, measurement of the acidity, alkalinity of a solution at a specified temperature; it is mainly carried out on aqueous solutions but also sometimes directly on food stuffs, emulsions and non- aqueous liquids such as oils. Test for Sugar is done to detect of adulteration of sucrose in the fresh milk. Test for Starch includes detection of adulteration of flour/starch in the fresh milk. Sorbitol increases the specific gravity of milk to increase lactometer reading, it has been done for detection of adulteration of sorbitol in the fresh milk. Formalin test is done for detection of adulteration of formalin. Test for Urea is done because urea is added in the raw milk by supplies in order to increase the SNF. Test for Salt (NaCl) has done to measure percentage of salt as NaCl in milk. Detergent test for detection of residues in the fresh milk, Test for Fat was determined by Gerber method to determine fat content in liquid milk .Lactometer reading is done to check the fat and quantity of any other materials in the milk.

## RESULTS AND DISCUSSION

Results of present study showed **(Table 1)** that the unclear general appearance observed higher in milk shops and lower in tea shops. Concerning the consistency observed higher (87%) in the tea shops milk samples and lower (31%) in households. A result regarding the taste of the milk was found higher (87%) in the milk shops as compared to households (50%) and tea shops (80%). The maximum off taste (50%) was observed in the household's milk samples. It may be due to the various adulterants like vegetable oil, powder and sugar. Similar finding was observed in 2005, abnormal color, higher consistency, and smell and its presence were poor.

**Table 1.** Physical examination of milk samples collected from milk shops, tea shops and households.

| Examination | Milk shops | | Households | | Tea shops | |
|---|---|---|---|---|---|---|
| General appearance | Good | Off | good | off | Good | Off |
| | 60% | 40% | 50% | 50% | 40% | 60% |
| Consistency | Normal | Watery/thin | Normal | Watery/thin | Normal | Watery/thin |
| | 20% | 80% | 70% | 30% | 13% | 87% |
| Taste | Off taste | Good taste | Off taste | Good taste | Off taste | Good taste |
| | 13% | 87% | 50% | 50% | 20% | 80% |

### Milk Composition

***Mean protein value:*** Value of milk shops, tea shops and household were observed 2.79, 2.68, and 2.57 respectively **(Table 2)**. The milk protein contents among the various sources was non-significant (P>0.05). Mean values for fat milk observed are 4.01, 3.13, and 2.82 for milk shops, tea shops and household respectively **(Table 2)**. The fat content among various sources was significant (P>0.05). The highest value of milk fat was observed in milk shops (4.0) as compared to others and lowest was observed in household (2.82). The mean pH values of milk samples collected from milk shops, tea shops and households are 6.74, 6.72, and 6.70, respectively.

***Mean acidity value:*** Value of milk shops, tea shops and household were observed 0.146, 0.129, and 0.124 respectively, **(Table 2)**. The acidity content among different sources was significant (P>0.05). Mean values of SNF observed were 7.92, 6.97, and 6.34 respectively **(Table 2).** The SNF content among various sources was significant (P>0.05). The mean value of total solids was observed 14.2, 10.10, and 9.16 in milk shops, tea shops and households respectively. The total solids contents among various sources was non- significant (P>0.05). The high value of total solid was observed in milk shops as compared to others.

**Table 2.** Chemical composition of milk samples collected from Milk shops, Tea shops and Household.

| Constituents | Milk shops | Tea shops | Household |
|---|---|---|---|
| | Mean+stDev | Mean+SD | Mean+SD |
| Protein | 2.79 ± 0.38 | 2.68 ± 0.37 | 2.79 ± 0.36 |
| Fat | 4.01 ± 0.68 | 3.13 ± 0.0.87 | 2.82 ± 0.81 |
| Acidity | 0.14 ± .021 | 0.12 ± 0018 | 0.12 ± .016 |
| Solid-not-Fat | 7.92 ± 0.82 | 6.97 ± 1.08 | 6.34 ± 0.98 |
| Total solids | 14.2 ± 7.99 | 10.10 ± 1.88 | 9.16 ± 1.75 |
| pH | 6.74 ± .043 | 6.72 ± .062 | 6.70 ± 0.61 |

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Thirty specimens were taken from Different sources and check the adulteration in all samples. Results demonstrated that 97% to 98% of the milk specimens gathered from various sources showed water expansion in them. Vegetable oil adulteration was available is 10% in all milk samples. No specimens were found to be adulterated with urea, starch, and salts ammonium sulphate **(Table 3)**.

**Table 3.** Adulteration in milk samples.

| Samples | Sugar | Starch | Water | Formalin | Urea | Vegetable Oil | Detergent | Ammonium Sulphate | Salt |
|---|---|---|---|---|---|---|---|---|---|
| **Milk shops samples** | 0 | 0 | 10(100%) | 0 | 0 | 5(50%) | 0 | 0 | 0 |
| **Household samples** | 0 | 0 | 10(100%) | 0 | 0 | 0 | 0 | 0 | 0 |
| **Tea shops samples** | 4(40%) | 0 | 10(100%) | 0 | 0 | 5(50%) | 0 | 0 | 0 |

## CONCLUSION

From the above study it is concluded that the collected milk samples were adulterated with common adulterants like water and oil in milk shops and households. Thus it was found that so collected milk samples had varied proportions of common adulterants which might be harmful to human health. Bahawalpur City was extensively put to malpractices such as skimming and adulteration of milk with water and vegetable oil. The variation among three studied sources may be due to variation in breed, maintenance of animals and feeding habits etc. This is harmful to human health. That's why the control measures should be taken for controlling the adulteration in milk. The governments must be regulating all these prohibited practices in Bahawalpur City. Governments may need to make initial investments in the dairy sector to stimulate private-sector investments. The consumers must be more active against milk adulteration going on in whole city. It is important to have quality control system that regularly check and ensure that only good quality milk is sold. At the government level serious measures must be taken to avoid distribution and availability of such poisonous milk for good health insurance.

## CONFLICT OF INTEREST

Authors have no conflict of interest.

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