# Analysis of various physico chemical properties of raw buffalo milk samples marketed in and around Proddatur town, YSR Kadapa district, Andhra Pradesh, India

P. Ramya[*1], A. Jagadeesh Babu[1], E. Tirupathi Reddy[2], Y. Ravindra Reddy[3] and L. Venkateswara Rao[1]

[1]Department of Veterinary Public health and Epidemiology, [2]Dept. of Poultry Science, [3]Dept. of Livestock Production Management, College of Veterinary Science, Proddatu, YSR Kadapa district, Andhra Pradesh
[*]Corresponding Author: E-mail: puttururamya@gmail.com, Ph: 09948877650.

*Journal of Livestock Science (ISSN online 2277-6214) 7: 30-34*
*Received on 21/11/2015; Accepted on 6/1/2016*

## Abstract

Milk is an important source of all basic nutrients for mammals. But milk adulteration s a common phenomenon which leads to economic losses, deterioration of the quality of end products and a risk to consumer safety. Physico chemical analysis is an important tool to monitor the quality of dairy products. The present study was conducted to evaluate physicochemical quality of buffalo milk samples collected from different sources such as dairy farms (DF), chilling centers (CC), dairy shops (DS) and street vendors (SV). Various physico chemical properties of milk were analyzed by EKOMILK ANALYSER. It was found that most common types of adulteration were addition of water, partial skimming or both types together especially in case of samples collected from dairy shops, street vendors whereas the samples collected from dairy farms and chilling centers may safely conclude with standard values for buffalo milk. Highest average value for fat (6.25), protein (18.8) specific gravity (1.031) and Solids Not Fat (10.3) were obtained from the samples collected from dairy farms and chilling centers when compared to dairy shops and street vendors which indicates adulteration of milk with water. The present study concluded that the milk from DS and SV was mainly adulterated with water without any consideration with purity of water which may lead to several health hazards. These findings may be helpful for the concerned governmental regulatory bodies to monitor the quality of commercial milk in the market.

**Key words**: Raw Milk; Chemical analysis; Physical analysis; Buffalo; *Bubalus bubalis*.

# Introduction

Milk is an important source of all basic nutrients and it is a substantial diet in food commodities. Because of its valuable ingredients ideally quantized makes it precious alone or a part of food globally (Mc Graw Hill, 2005). Milk, which is the secretion of the mammary glands is the only food of the young mammal during the first period of its life. The substances in milk provide both energy and the building materials necessary for growth. Milk also contains antibodies which protect the young mammal against infection (Bylund, 1995). An average composition of buffalo milk is 87.2% water, 3.7% fat, 3.5% protein, 4.9% lactose and 0.7% mineral ooxides (Mc Graw Hill, 2005). Milk plays a tremendous role in building a healthy society and can be used as a vehicle for rural development, employment and slowing down the migration of the rural population (Sarwar *et al.,* 2002). It is ideal for microbial growth and the fresh milk easily deteriorates to become unsuitable for processing and human consumption (Dehinenet, 2013). But milk adulteration is a common phenomenon, especially in certain areas of the world where water, starch solution, industrial alkalies and nitrites are common materials added in milk. Milk adulteration leads to economic losses, deterioration of the quality of the end products and a risk to the consumers safety (Mabrook and Petty, 2003). The most common form of milk adulteration has been by adding water to milk which may be polluted with faeces, microorganisms, harmful chemicals and poisonous substances. So the milk will be contaminated with those substances. Also addition of water decrease the milk SNF (Solids Not Fat) contents especially proteins which are very important for normal growth. Furthermore another important type of adulteration is the removal of fat. Skimming of fat inhibit the body from utilization of fat, fat soluble vitamins as A, D, E and K which are very important for biological processes and normal growth of the body (Kartheek *et al.*, 2011).

The physico chemical analysis is an important tool to monitor the quality of dairy products. Although it is very difficult to assure high quality and desirable physico chemical properties of raw milk designed for processing, the quality of raw milk encompasses such milk characteristics as chemical composition, physical properties, microbiological and cytological quality, sensory properties, technological suitability and nutritive value (Czerniewicz *et al.,* 2006). Therefore nutritionally enriched milk and its products with enhanced biological potential and without health risks are generally demanded (Imran *et al.,* 2008). Any change in milk composition is considered as adulteration especially its density/specific gravity (Tarig, 2003).

The present study was performed to throw out a light on the physical examination, chemical composition in buffalo's milk that is marketed in dairy farms, chilling centres, dairy shops and street vendors of Proddatur town in Andhra Pradesh and to evaluate the control measures adopted to prevent adulteration.

# Materials and methods

Collection of samples: A total of 80 raw buffalo milk samples marketed in and around Proddatur town were collected randomly from local street vendors, dairy shops, chilling centre and dairy farms. All the samples were collected in sterilized labeled screw capped jars kept in icebox and immediately transferred to the laboratory of Department of Veterinary Public Health and Epidemiology, College of Veterinary Science, Proddatur YSR Kadapa district, A.P. with a minimum delay, where they were immediately examined or held in the refrigerator at $4^0$C - $8^0$C till further examination.

Physical Analysis: Specific gravity of the milk samples was determined using lactometer.

Chemical analysis: Chemical constituents of the raw milk such as fat, SNF, Protein were determined by EKOMILK Ultrasonic milk analyser. Milk samples (25 ml) were mixed gently 4-5 times to avoid any air enclosure in the milk.

# Results and discussion

The most common form of milk adulteration has been by addition of water to milk or partial skimming. Those forms of adulteration constituted a problem for market milk industry and continue up today. So the chemical examination may act to a certain extent as a check. Market buffalo milk samples were randomly collected from different milk sale points at the vicinity of Proddatur town like Dairy farms (DF), nearby chilling centre (CC), dairy shops (DS) and street vendors (SV) were examined for determining specific gravity and different chemical constituents of raw milk.

Mean specific gravity, fat %, SNF % and protein % of raw buffalo milk collected from different sources are shown in table1.

**Table** 1: Mean specific gravity & other chemical constituents of raw buffalo milk samples collected from different sources:

| Test | Dairy farms | Chilling centers | Dairy shops | Street vendors |
|---|---|---|---|---|
| **No.of samples** | **20** | **20** | **20** | **20** |
| **Specific gravity** | 1.031 | 1.031 | 1.031 | 1.027 |
| **Fat%** | 6.25 | 5.54 | 5.37 | 4.91 |
| **SNF%** | 10.3 | 9.1 | 8.8 | 8.6 |
| **Protein %** | 18.8 | 18.23 | 17.5 | 14.83 |

The above table is showing that the specific gravity of milk samples collected from dairy farms, chilling centers and dairy shops had an average of 1.031. The results in the present study were almost similar to the findings of Asif and Sumaira, (2010), Franciscis *et al.,* (1988), Bacic & Vujicic (1964), Mansour *et al.,* (2012), Perween *et al.,* (2013) whereas lower results were reported by Mohamed (1981), Stanescu *et al.,* (1992), Abdel-Haemeid (2002). Regarding street vendors milk samples, they had an average of 1.027 specific gravity which was higher than the findings of Mansour *et al.,* (2012) i.e 1.029 and much higher than the findings of Imran *et al.,* (2008) and Lateef *et al.,* (2009) who have shown the value as 1.02. All the results obtained in this study were within the range found by Mahamood *et al.,* (2004). These results in buffalo milk samples pointed out that below normal values of specific gravity have been noticed from the milk samples of street vendors. This finding may be attributed to adulteration of milk with water.

The highest fat content was noticed from the milk samples of dairy farms i.e 6.25, which are similar to the results reported by Asif and Sumaira (2010), while the remaining milk samples from the other three different sources showed almost all similar results i.e in the average of 5.27. these results are in agreement with Mansour *et al.,* (2012), Hamdy and Adel-Aziz, (1961), Roy *et al.* (1972), Abdel-Hakiem (1986), whereas higher results were reported by Mohamed (1981) & Mannan *et al.,* (2014) and lower results were reported by Kamel (2000), Adam (2009), Mansour *et al.,* (2012) and Hossain & Dev (2013). In regard to other three sources the fat content of milk samples was 5.27% which are in close agreement with the results found by Kamel (2000), Fundora *et al.* (2001) and Mansour *et al.* (2012). The lowest fat content in the milk samples were shown in the street vendors samples as about 85% of the samples were adulterated by partial skimming or addition of water. In general buffalo's milk is more liable to adulteration than cow's milk as it is rich in fat content which encourage the unscrupulous producers or retailers to remove part of fat content of buffalo's milk. On the other hand, cow's milk is poor in fat content. So that it is less liable to adulteration by partial skimming than buffalo's milk.

In the present study the milk samples from dairy farms and dairy shops gave an average SNF value as 10.3 and 8.8 respectively which seem to be in fairly close agreement with those reported by Kamel (2000), Mansour *et al.* (2012), Hossain and Dev (2013). Higher results were reported by Khan *et al.* (1999). In regard to milk samples from chilling center and street vendors the SNF value are 9.1 and 8.6 respectively which are fairly in close agreement with Mansour *et al.* (2012), Kamel (2000). Higher results were reported by Abdel-Hameid (2002) and Mannan *et. al.* (2014), while lower results were reported by Khan *et al.* (1999) and Adam (2009). The SNF value of milk samples from dairy shops and street vendors in the present study are below the normal value of buffalo milk. The variations in the results obtained here and those recorded by previous investigators could be attributed mainly to adulteration of milk by addition of water (Harding, 1995).

Highest protein content were reported in the milk samples brought from dairy farms, chilling centers and nearby value was reported from the samples collected from dairy shops. These results were in close agreement with the results reported by Cherryl *et al.* (2014). Lower results were reported by Imran *et al.* (2008), Asif and Sumaira (2010), and Hossain and Dev (2013) whereas higher results were reported by Fundora *et al.* (2001), Braun and Stefanie (2008) and Mannan *et al.* (2014). The decrease in protein content might be due to the addition of water as addition of water decrease the SNF percentage along with protein percentage (Kartheek *et al.* 2011).

# Conclusion

All the tested parameters were nearer to normal values in buffalo milk samples collected from dairy farms and chilling centers when compared to dairy shops and street vendors which indicates that adulteration of milk with water or they might have done the skimming or both together. It would be of great interest if further investigations are carried out to examine other organic and inorganic components of milk. The study will create awareness among the producers and policy makers.

## References


1) Abdel-Hakiem, E.H. (1986). Sanitory conditions of milk, fermented milk. Kareish cheese and butter manufactured in Assuit province. M.Sc. Thesis, Fac.Vet.Med., Assuit Univ., Egypt.
2) Abdel-Hameid, K.G. (2002). Studies on the Sanitory conditions of raw milk in Qena Governorate. M.Sc. Thesis, Fac.Vet.Med., Assuit Univ., Egypt.
3) Adam, A.A.H. (2009). Milk adulteration by adding water and starch at Khartoum state. *Pakistan Journal of Nutrition*, **8(4):** 439-440.
4) Asif, M. and Sumaira, U. (2010). A comparative study on the Physico chemical parameters of milk samples collected from buffalo, cow, goat and sheep of Gujarat, Pakistan. *Pakistan journal of Nutrition*. **9(12):** 1192-1197.
5) Bacic, B. and Vujicic, I. (1964). Study of total solids in milk. *Let. Mauch. Rad. Polijopriv. Fak-Novom |Sadu, 8.*
6) Braun, P.G. and Stefanie, P.E. (2008). Nutritional composition and chemico physical parameters of water buffalo milk and milk products in Germany. Milchwiss. *Milk Science International*, **63:** 70-72.
7) Bylund, G. (1995). Dairy Processing hand book. Tetra pak Processing Systems AB S-221 86 Lund, Sweden, pp:436.
8) Cherryl, D.M., Chakravarthi, M.K., Reddy, Y.R. and Idira, D. (2014). Physico chemical quality of raw milk samples in Andhra Pradesh. *Indian Journal of Animal Production and Management.* **30(3-4):** 23-25.
9) Czerniewicz, m., Kielczewska, K. Karuk, A. (2006). Comparision of some physic chemical properties of milk from jolstein-friesian and Jersey cows. *Polish Journal of food and Nutrition sciences*., **15(1):** 61-64.
10) Dehinenet, G., Mekonen, H. and Ashenafi, M., Emmanuelle. (2013). Determinants of raw milk quality under a small holder production system in selected areas of Amhara and Oromia National Regional states, Ethiopia. *Agriculture and Biology Journal of North America.* **4(1):** 84-90.
11) Franciscis, D.G., Intrieei, F. and Mincione, b. (1988). Milk products from buffaloes, In proceedings of 2nd World Buffalo Congress, New Delhi, December 12-16. **2(2):** 641-652.
12) Fundora, G.O., Lezcano, M.E., Montejo, O., Pompa, A. and Enriquez, N. (2001). A comparative study of milk composition and stability of Murrah river buffaloes and Holstein cows grazing star grass Cuba. *Journal of Agricultural Sciences*, **35:** 219-222.
13) Hamdy, A. and Abdel-Aziz, M. (1961). The composition of milk from sheds in Cairo. Agricultural Research Review, Cairo **39:** 201.
14) Harding, F. (1995). Milk quality 1stEd, blackie Academic and Professional, Chapman and Hall, Newyork, London, Tokyo, Madras.
15) Hossain, M.B.and S.R. Dev. 2013. Physico chemical characteristics of various raw milk samples in a selected dairy plant of Bangladesh. *International Journal of Engineering and Applied Sciences*. **1(3):** 91-96.
16) Imran, M., Khan, H., Hassan, S.S. and Khan, R. (2008). Physico chemical properties of various milk samples available in Pakistan. *Journal of Zhejiang University Science B.*, **9(7):** 546-551.
17) Kamel, A.M. (2000). Studies on raw milk quality in Kafr El-Sheikh. M.Sc. Thesis, Fac.Vet.Med., Tanta Univ., Egypt.
18) Kartheek, M., Smith, A.A., Muthu, A.K. and Manavalan, R. (2011). Determination of adulterants in food: a review. *Journal of Chemistry Pharmacy and Research*, **3:** 629-636.
19) Khan, M., Rajah, K.K. and Haines, M. (1999). Quantities techniques in the measurement of milk adulteration in Peshawar, Pakistan. *International Journal of Dairy Technolgy*, **52:** 20-25.
20) Lateef, M., Faraz, A., Mustafa, M.I., Akthar, P. and Bashir, M.K. (2009). Detection of adulterants and chemical composition of milk supplied to canteens of various hospitals in Faisalabad city. *Pakistan Journal of Zoology Supplementary Service*, **9:** 139-142.
21) Mabrook, M.F. and Petty, M.C. (2003). A novel technique for the detection of added water to full fat milk using single frequency admittance measurements. *Sensors and Actuators B: Chemical.* **96:** 215-218.
22) Mohamed, A.M. (1981). Study on the status of raw market milk. M.Sc. Thesis, Fac.Vet.Med., Alex Univ., Egypt.
23) Mahamood, F., Niazi, S.B., Raza, A. and Khokhar, M.Y. (2004). Physico analytical studies on commercial milk samples. *Journal of Chemical Society of Pakistan.* **26(3):** 212-216.
24) Mannan, H., Mohammad, A.H., Mahboubeh, S., Fatemeh, Z.M., Ghazaleh, M., Naficeh, S., Mohammad, R.O. and Behrooz, J. (2014). Physico chemical characteristics of various milk samples. *Scholars Academic Journal of Pharmacy* **3(3):** 327-331.

25) Mansour, A.I.A., El-Loly, M.M. and Ahmed, R.O. (2012). A preliminary Detection of physical and chemical properties, inhibitory substances and preservatives in raw milk. *Internet Journal of Food Safety*, **14:** 93-103.
26) Mc Graw Hill, (2005). Concise Encyclopedia of science and technology. 5th ed. 1402.
27) Perween, R., Bhutto, A., Ara, D., Shaukat, S.A. and Ul Haq, Q. (2013). Elucidation of physic-chemical characteristics and mycoflora of bovine milkavailable in selected areas of Karachi, Pakisatan. *Journal of Applied Science and Environmenatal Management*, **17(2):** 259-265.
28) Roy, N.K., Nagpal, D.C. Dadana, T.D. and Sharma, G.S. (1972). Electrical conductance of milk from buffalo and cattle of Indian origin. I. correlation with fat and S.N.F. *Milchwissenschaft* **27:** 634-637.
29) Sarwar, M., Khan, M.A. and Mahr-Un-Nisa, Z.I. (2002). Dairy Industry in Pakistan: A scenario. *International Journal of Agriculture and Biology*, **4:** 420-428.
30) Stanescu, V., Stanescu, U., Savu, C. and Mihaiu, M. (1992). The determination of the physic chemical quality indices of raw milk after milking and the influence of various factors. *Lucrari-Stifince, Universitatea-de Stiinte Argonomics, Bucuresti-Seria-C, Medicina-Veterinara.* **35:**119-129.
31) Tarig, M. (2003). Milk products and their role in human feeding and health, EL Bustan press Alexandria University Egypt.