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Ahmad Farid Rawan¹, B. T. Kulataev²¹Nangarhar University, Afghanistan²Kazakh National Agrarian University, Almaty**EVALUATION OF MILK COMPOSITION FOR FAT AND BACTERIOLOGICAL QUALITY OF RAW PRE-PROCESSED AND PASTEURIZED MILK IN NANGARHAR PROVINCE**

Abstract. Milk has been part of the human diet for millennia and is valued as a natural and traditional food, consumption of raw milk is associated with many serious human diseases. To determine the bacteriological quality of raw milk, total 150 raw milk samples from three different areas (Serkhrod, Behsod and Jalalabad city) and 40 pasteurized packed milk (Tarang, Every day, Milk pack and Quadrat) were collected from local market. Experiment 1, boiling, alcohol tests and water adulteration for hygienic quality of raw milk, gerber tests for fat concentrations of raw and pasteurized milk were performed. Experiment 2, methylene blue tests were performed to determine the bacteriological quality of raw milk. Water adulteration percentage was higher 2.5% in Jalalabad city milk samples ($P < 0.05$). Fat concentrations in raw milk were 3.8%, 3.7% 4.2% and in pasteurized milk 6%, 6.2%, 3.4% and 5.9% respectively. Milk bacteriological quality (Excellent, Good and fair) of Jalalabad city milk was 50%, 26%, 24% in Behsod region 46%, 30%, 24% and in Serkhrod region 60% ($P < 0.05$), 26% and 24% respectively. Overall results show that pasteurized milk has exogenous fat substances. Serkhrod region milk has excellent bacteriological quality compare to other two districts.

Keywords: Raw milk, fat concentration, Methylene blue, pasteurized milk and bacteriological quality.

Introduction. According to the FAO census of 2003 there are some 3.7 million heads of cattle, the total production of milk is not enough to meet the demands of dairy products. Milk is the lacteal secretion of the mammary glands of a mammal, obtained by the complete milking of healthy cows which contains not less than 8.25% milk solids-not-fat, and less than 3.25% milk fat. The food value of milk depends upon its milk fat and milk solids-not-fat content (Yitayal, 2003). There four types of breeds (Kandahari, Kunari, Watani and Sistani) are exist in Afghanistan, the large farmed cattle such as Kandahari and Sistani are found in Herat in North and Kandahar area, they are known best dairy cattle with estimated lactation yield of 1000–2000 kg respectively. The most common breed is the so called Watani which means ‘native’ and usually black with white spot that can be multi coloured. Its milk production is 3.5 kg/day (FAO, 2003). Milk should have a temperature of +4°C during all operations and delivery to the consumer (Kohler, 2013). Milk can be processed into different milk products. These are: Yoghurt, fermented milk (madila), Cheese, butter and Cream. Milk composition of mammalian species varies widely with reference to genetic, physiological, nutritional factors and environmental conditions. All fresh normal milks are an emulsion of fat in a watery solution (Omo, 2003). Milk is an excellent food for man but it is an ideal medium for the growth of micro-organisms. From the time milk leaves the udder of the animal, unless adequate safeguards are maintained, it may receive bacteria and other micro-organisms from the surroundings. The following pathogenic bacteria are a concern in raw milk that was not pasteurized properly or was contaminated after processing (Early et al, 1998). Raw milk is a perishable item. To preserve this nutritious drink for marketing is a problem for milk trader. The milk trader often fails to maintain its keeping quality after procurement of milk in raw condition from rural area to bring it to urban area. They use some local technique to preserve cow’s milk during transportation but this

technique does not give a satisfactory results. There are documented reports of milk-borne staphylococcal intoxication (Bergdoll, 1979) and colibacillosis (Martin et al, 1986), making processed or raw milk a very important vehicle for several pathogens. Spoilage microorganisms cause degradation of proteins, fats, and carbohydrates and the milk's texture, color, taste, and smell is deteriorated. More than 200 known diseases are transmitted through food by a variety of agents that include bacteria, fungi, viruses, and parasites. According to public health and food safety experts, each year millions of illnesses in the United States and throughout the world can be traced to foodborne pathogens. Estimates that 76 million people get sick, more than 300,000 are hospitalized, and 5,000 die each year from foodborne illness. Milk is a well-known medium that supports the growth of several pathogenic microorganisms (Freedman, 1977). Several bacteria are therefore known to be transmitted through milk (Husu et al, 1990). Sales of unpasteurized milk are rare in countries with a developed dairy industry but it is common in Afghanistan. Information is presently unavailable on the bacteriological quality of either raw or processed milk to which the consumers are exposed in Nangarhar province.

So it is very important to carry out research work on daily usable cow' milk to evaluate the bacteriological quality and fat concentrations of raw preprocessed and pasteurized milk. We hypothesis that the dairy fresh milk may have exogenous fat to increase its price, which is not good for health.

Materials and Methods

Collections of samples. Totally 150 samples were collected from dairy owners from three different regions (Behsood, Sourkhroud and Jalalabad). 50 samples were collected for each region in 500 ml screw capped sterilized bottles (Borosil). All the possible precaution were taken to avoid external contamination at the time of collection of samples and during processing. The samples were carried into ice box in one hour for analyzing to avoid from high temperature. 10 packs from each brand pasteurized milk (Quadrat, Every day, Trang and milk pak) collected from Jalalabad. All samples analyzed in Pre-Clinic Laboratory, Veterinary Science Faculty.

Lactometer test. Milk sample was mixed gently and poured it gently into a measuring cylinder (300–500 ml), then the lactometer was placed slowly into the milk until it was floating freely. The degree of lactometer was read at the top of the milk.

Clot on boiling test. clot on boiling test was performed according to the method described by (Anon, 1977). For qualitative examination of milk, milk sample was taken in a test tube and heated over a flame the results was recorded as positive or negative. Positive result was confirmed when the tested milk went through coagulation, clotting or precipitation, however, the first clotting due to acid development at 0.21–0.23% lactic acid was not considered.

Alcohol test. Alcohol test was performed according to the method previously described by (Anon, 1977). For rapid determination of elevated acidity of milk, 2 ml of milk sample was taken in a test tube and equal quantity of 70% alcohol was added in the sample and result was recorded as positive or negative. Positive results was confirmed when the level of acid increased and acted upon by the alcohol.

Methylene blue reduction test. Methylene blue test was performed according to the method described by the (Anon, 1977 and APHA, 1992). 10 ml of raw milk sample was taken in sterile test tube and one ml of Methylene blue reagent was added in sample and homogenized by slowly inverting test tube a couple times and then kept in water bath at 37°C. Reduction time was recorded in whole hours between last inversion and complete de-colorization when fourth-fifths of the color has disappeared and result was recorded. The milk biological quality was classified as described by (Alemayehu, 2003).

Excellent. very low bacterial count, its decolorized time is about 8 hours.

Good. low bacterial count, decolorization time is 6-8 hours

Fair. high bacterial count. Decolorization time is below 2 hours.

Poor. very high bacterial count, decolorization time is less than 2 hours.

Gerber Test. Milk samples were simultaneously measured by the method of Gerber method as described by (Fleet and Linzell, 1964). Milk (10 ml) was mixed with chemicals (H₂SO₄ 90% 10 ml; amylalcohol, 1 ml), warmed to 65–70°C and centrifugated at 1000 rpm for five minutes. The volume of liquid fat was measured in g/100 ml from butyrometers.

Results. Boiling and Alcohol tests: to determine the hygienic quality of raw milk boiling and alcohol tests were performed, 7 milk samples of Jalalabad and 9 milk samples of Serkhrod were positive, these samples were discarded and were replaced with other same number milk samples for experiments. Data are not shown. Lactometer: Milk sample was mixed gently and poured it into a measuring cylinder (300–500 ml), then the lactometer was placed slowly into the milk until it was floating freely. The degree of lactometer was read at the top of the milk. Milk samples collected from Serkhrod region added water 1.3%, Behsod region 2 % and in Jalalabad city’s milk was significantly higher 2.5 (P<0.05). Data shown in Figure 1.

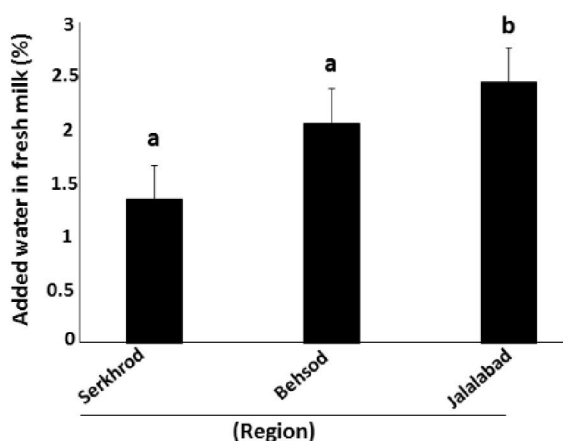


Figure 1 – Raw milk samples were collected from three different regions, Adulteration was checked, the percentage of added water in Jalalabad city’s milk samples were greater (P<0.05) compare to other two regions

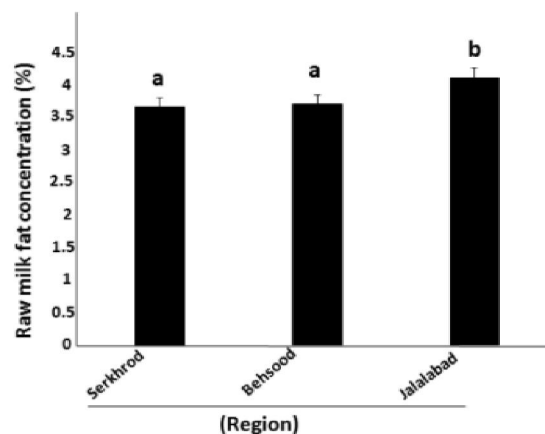


Figure 2 – Fat concentration were analyzed in raw milk in three different regions, the fat concentration of Jalalabad city was higher 4.2% (P<0.05)

Gerber test: Gerber test was performed on collected milk samples, fat concentration of Jalalabad city’s milk samples were higher 4.2% (P<0.05) compare to Behsod 3.7% and Serkhrod 3.8% (Figure 2). Fat concentration of pasteurized Milk Pak, Qudrat, Tarang and Every day were 3.4%, 5.9%, 6% and 6.2% respectively, the fat concentration of Tarang was significantly high 6.2% (P<0.05) data shown in Figure 3. **Methylene blue test:** The purpose is to determine the quality of milk before pasteurization. This test is particularly applicable to raw milk. The test involves determination of time required for the disappearance

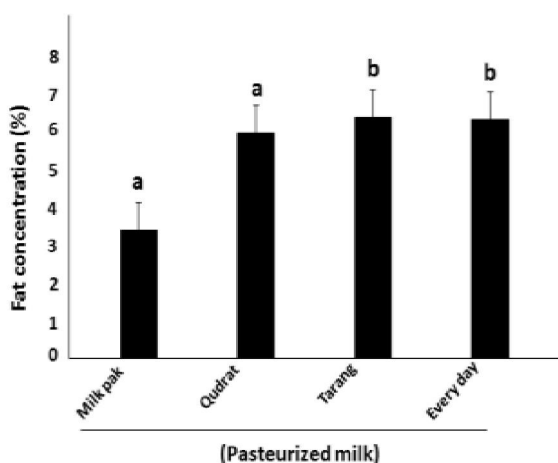


Figure 3 – Fat concentration were analyzed in four brand pasteurized milk (Milk pak, Qudrat, Tarang and Every day), the fat concentration of Every day was higher 6.2% (P<0.05)

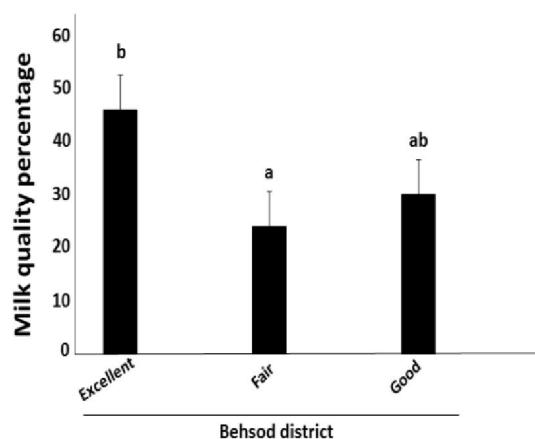


Figure 4 – Bacteriological quality of raw milk were analyzed by methylene blue tests. The quality was categorized as excellent, good, and fair. The percentage of excellent quality was 46% (P<0.05)

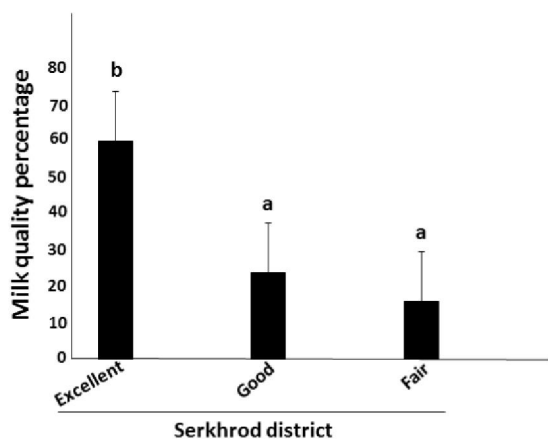


Figure 5 – Bacteriological quality of raw milk were analyzed by methylene blue tests. The quality was categorized as excellent, good, and fair. The percentage of excellent quality was 60% ($P<0.05$)

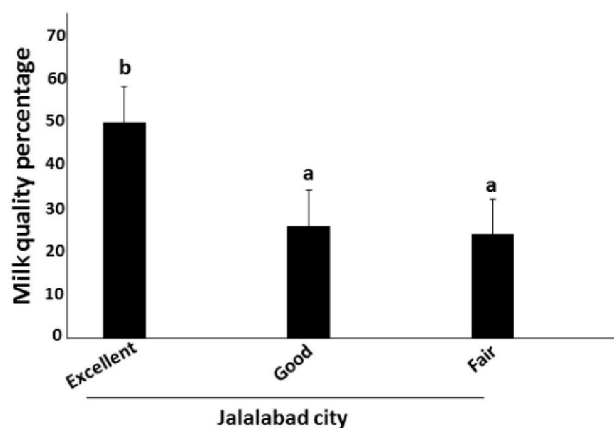


Figure 6 – Bacteriological quality of raw milk were analyzed by methylene blue tests. The quality was categorized as excellent, good, and fair. The percentage of excellent quality was 50% ($P<0.05$)

of color when methylene blue thiocyanate solution is added to raw milk. Methylene blue tests were performed on collected milk samples. In Behsod, milk bacteriological quality was categorized as Fair, Good and Excellent, the results of methylene blue tests were 24%, 30% and 46% respectively, the bacteriological quality of Excellent was higher ($P<0.05$) data shown in Figure 4. In Serkhroddistrict, milk biological quality of milk samples were 16%, 24% and 60% respectively (Figure 5) and in Jalalabad city, 24%, 26% and 50% respectively (Figure 6).

Discussion. Hygienic condition of raw milk were determined by clot on boiling and alcohol tests as described previously (Anon, 1977). Raw milk refer to a dairy product that has received no heat treatment to destroy pathogens or spoilage organisms. Michigan was the first state in the US to require pasteurization. A recent survey conducted by state agriculture departments found that 29 states currently allow some form of on-or off-farm raw milk sales but only 13 permit retail sales (Oliver et al. 2009). In Nangarhar province, raw milk from multiple cows are mixed together and stored in a container which is dangerous because outsourced milk is not produced as required for healthy milk. In the present study, Methylene test was performed on raw milk, Behsod region' milk has low percentage of excellent quality of milk compare to other two district which seem the farmers of mentioned area have low sanitation. Previous studies shown, raw milk can be contaminated with pathogens even when sourced from clinically healthy animals (6). Even milk that appears to be of good quality may contain pathogens (5,7). In another study, there are at least 4 different mechanisms by which raw milk becomes contaminated by pathogens: direct passage from the blood (of the cow) into milk (systemic infection), mastitis (udder infection), fecal contamination (external contamination of milk from the environment during or after milking or contamination from human skin (8). Raw produced under sanitary conditions still contains many bacteria, therefore it must be treated properly before consumption (Alemayehu, 2003).

In present study, the percentage of Fair quality (high count of bacteria), water adulteration were higher in Jalalabad city's milk compare to other two regions. In previous study shown, it is possible that the number of organisms (pathogens) present is too low to be detected by the test method but the numbers may be sufficient to cause illness. There might have been very low initial umbers of a pathogen which were below the limits of the test method at the time of sampling but the pathogen might grow if milk was stored improperly (John, 2015). In an updated report covering the 6-year period from 2007 to 2012, the average number of outbreaks associated with nonpasteurized milk was 4-fold higher during this 6-year period (average 13.5 outbreaks/year) than that reported in the previous review of outbreaks during 1993–2006 (10). Larger framed cattle such as the Kandahari and Sistani are found in Herat, in the North and Kandahar area. The kandahari and Kunari are known to be amon the best dairy cattle with estimated lactation yields of 1000–2000 and 900–1100 kg respetively. Watani breed cow, the milk production is given as 3.5 kg per day with 3.5–4% fat (John, 2007). An old survey, carried out in 1969, gave some

interesting data on fat concentrations for the various local breeds 3.3–4.1 (Kestiar et al, 1969). In the present study, fat concentrations of raw milk is 3.5–4% which support the above studies.

Previous study reported, that pasteurized milk (every day) had chromium in it which has hazardous effect in pak milk. The iron concentration of every day, Tarang and qudrat milk were 1.170 ± 0.019 , 1.004 ± 0.000 and 0.020 ± 0.003 respectively. Its high intake leads to serious disorders. Iron typically damage cells in the heart, liver and elsewhere, which can cause substantial adverse effects, including coma, shock, liver failure, adult respiratory distress syndrome (Cheney et al, 1995). A study reported, that the fat concentrations of pasteurized Milk pak (3%) and Every day (3.2%) were observed (Adeela et al, 2014). In the present study, the fat concentrations of pasteurized Milk pak and Every day were 3.5 and 6.2% respectively, which are not agree with Adeela et al, 2014.

Conclusion. The study showed that the raw fresh milk do not have exogenous fat, raw milk quality of Serkhrud region was greater than other two regions, Every day pasteurized milk had more exogenous fat than other three brands.

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