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Study On Comparative Assessment Of Nutritional Parameter In Differentiate Milk Samples.

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.
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Abstract: *There is no scientific evidence to suggest that there is any meaningful difference in the nutritional value of pasteurized and unpasteurized (raw) milk. In addition, vitamin D, which is not found in significant amounts in milk due to presence of calcium. Pasteurization does not affect a person's ability to digest lactose due to the absent of lactase enzyme in milk. The enzyme required to break down lactose, known as lactase, is produced by cells that line the small intestine in the human body. This enzyme is not present in either raw or pasteurized milk for this reason it is necessary to inspect stored milk for microbial growth. Standards for different classes of milk fats and solid not fats (SNF) should be analyzed for detection of nutritional performances following Food Adulteration act (Los Angeles County Board of Supervisors).In this circumstances comparative assessment of nutritional parameter in different milk samples should be required to prevent spoilage microbes in public health perspective. On contrarily it will be a fruitful job to observe their biochemical reaction occurring by their metabolites in Raw, Home Pasteurized and UHT milk samples for comparative assessment measuring with their standard label.*

Keywords: *SNF (Solid Not Fat), Lactase, Bovine Somatotropin, ALP enzyme, Mastitis test.*

Objectives: *Differentiate studies on nutritional parameter analysis from Milk samples (Raw, Pasteurized and UHT) measuring with their standard label in perspective with public health significance.*

I. Introduction

Milk may be defined as the entire lacteal secretion of the mammary gland of mammals obtained by the process of milking during the period following at least 72 hours after calving or until the milk is free from colostrums. Milk is the first food for infant mammals. It is a nutritionally complete food and provides the protein, fat, carbohydrate, vitamins & minerals required to support the growth of the young. On a diet of milk a calf's birth weight doubles in 50 days, while a human infant takes 100 days (Mc Gee, 1991).Milk is a white opaque fluid with some exceptions where it is tinge yellowish particularly in some breeds. Because if it's content of almost essential nutrients (except iron which is very low 0.2 mg per 100g of milk); milk is being used throughout the world for feeding infants and as a supplement to the diets of children and adults. In milk fat along with some fat soluble vitamins (A, D, E & K) are present as an emulsion (colloidal dispersion of one liquid in another immiscible or partially miscible liquid), protein along with some mineral matters in colloidal suspensions, lactose together with some water soluble minerals and vitamins are in the solutions. In terms of nutritional value**,** CDC reported that all of the nutritional benefits of drinking milk are available from pasteurized milk without the risk of disease that comes with drinking raw milk. A study by Claeys *et al.*, (2014) published in Food Control Journal about comparing the composition of different types of milks and also discovered that heating has only a minor effect on the nutritional value of milk fat. They also assumed that the nutritional benefits associated with the consumption of raw milk, including its contribution to the uptake of calcium, phosphor, proteins and essential amino acids (especially lysine), and a number of vitamins, are generally maintained after pasteurization or UHT treatment. Heat treatment is given in some instances to milk where the primary purpose is to alter the physical-chemical state of the protein or mineral system to increase the stability of the milk system accordance with subsequent sterilizing temperatures. This type of treatment is important for manufacture of canned evaporated milk. In addition to the extensive and rigorous safety and quality tests that dairy foods go through before they reach the grocery store, dairy farms and plants must meet stringent federal and local regulations, including those developed by the U.S. Department of Agriculture, the FDA, and other state regulatory agencies. The FDA advises consumers to be alert when they buy milk or milk products.

II. Materials and Methods

1.1. Samples Collection

In the present study two types of milk samples were collected - **Raw milk** samples were collected from 40 (forty) healthy cows of Senowara Dairy farm, Chittagong, and **Pasteurized milk** samples - Farm Fresh, Milk Vita, Aarong and Pran were collected from four UHT milk suppliers -

1.2. Samples Preparation

Raw milk of healthy cows from Senowara Dairy Farm was denoted as Sample RM; half of the raw milk samples were pasteurized in a home pasteurizer and denoted them as HPM. Commercially pasteurized (UHT) milks - Farm Fresh, Milk Vita, Aarong and Pran were denoted as UHT respectively.

1.3. Screening of Raw milk Samples for Mastitis and Somatic Cells

Raw Milk samples collected from **Senowara Dairy Farm** were used to determine whether they were having Mastitis and somatic cells. For this purpose, milk samples were studied details. The California Mastitis Test (CMT) is a rapid, accurate, cow side test that helps to determine somatic cell counts (SCC) of raw milk from a specific cow. Los Angeles County Board of Supervisors has developed the CMT.

1.3.1. California Mastitis Test (CMT):

The test was developed to determine the presence of subclinical mastitis in raw milk sample from individual quarters. The mixture of Sodium Dodecyle Benzosulfonate - 30 gm and Bromocresol purple - 1 gm was used as CMT reagent.

Each teat of the cow was washed with alcohol prior to squire the milk. A small amount of milk sample (approximately ½ teaspoon) from each quarter was collected into a plastic paddle that has 4 shallow cups marked as A, B, C and D. An equal amount of CMT reagent was added to the milk in each cup of the paddle. The paddle was rotated to mix the contents for approximately 10 seconds and score while continuing to rotate the paddle as the reaction disappears within 20 seconds. The test result was read quickly.

1.3.2. Somatic cell count (SCC):

Somatic Cell Count (SCC) is used as an indicator of the quality of raw milk (i.e., its suitability to make high-quality milk products). Somatic cells are primarily white blood cells (i.e., leukocytes). The number of somatic cells may increase as a result of udder infection (e.g., mastitis) or teat/udder injury and varies due to many factors, including the cow's age, lactation stage, season and stress.

Standard Results of CMT Scores (Los Angeles County Board of Supervisors)

Table 1

CMT Score	Avg. Somatic Count (Cells / ml)	Description of reaction
Negative	≤ 100,000	No thickening, homogeneous.
Subclinical	≤ 300,000	Slight thickening. Reaction disappears in 10 seconds.
Clinical	≤ 900,000	Distinct thickening, no gel formation.
Sub acute	≤ 2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
Acute	≤ 8,100,000	Gel is formed, surface elevates, with a central peak above mass.

Table 2

Samples.	CMT Score	Avg. Somatic Count (Cells / ml)	Standard	Description of reaction
RM1	Acute	8,500,000	8,100,000	Gel is formed, surface elevates, with a central peak above mass.
RM2	Subclinical	270,985	300,000	Slight thickening. Reaction disappears in 10 seconds
RM3	Subclinical	278,654	300,000	Slight thickening. Reaction disappears in 10 seconds
RM4	Subclinical	289,765	300,000	Slight thickening. Reaction disappears in 10 seconds
RM5	Negative	80,794	100,000	No thickening, homogeneous
RM6	Clinical	897,654	900,000	Distinct thickening, no gel formation.
RM7	Subclinical	277,239	300,000	Slight thickening. Reaction disappears in 10 seconds
RM8	Negative	100,000	100,000	No thickening, homogeneous
RM9	Acute	8,233,456	8,100,000	Gel is formed, surface elevates, with a central peak above mass.
RM10	Negative	67,894	100,000	No thickening, homogeneous

RM11	Negative	87,596	100,000	No thickening, homogeneous
RM12	Subclinical	199,876	300,000	Slight thickening. Reaction disappears in 10 seconds
RM13	Negative	76,892	100,000	No thickening, homogeneous
RM14	Negative	84,676	100,000	No thickening, homogeneous
RM15	Negative	99,305	100,000	No thickening, homogeneous
RM16	Clinical	879,343	900,000	Distinct thickening, no gel formation.
RM17	Sub acute	2,657,865	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM18	Sub acute	2,776,543	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM19	Negative	99,847	100,000	No thickening, homogeneous
RM20	Subclinical	298,788	300,000	Slight thickening. Reaction disappears in 10 seconds
RM 21	Sub acute	2,567,898	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM22	Sub acute	2,665,933	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM23	Subclinical	234,660	300,000	Slight thickening. Reaction disappears in 10 seconds
RM24	Negative	76,543	100,000	No thickening, homogeneous
RM25	Sub acute	2,577,681	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup
RM26	Acute	8,245,678	8,100,000	Gel is formed, surface elevates, with a central peak above mass.
RM27	Sub acute	2,656,443	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM28	Negative	87,652	100,000	No thickening, homogeneous
RM29	Sub acute	2,567,768	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM30	Negative	80,765	100,000	No thickening, homogeneous
RM31	Acute	8,123,987	8,100,000	Gel is formed, surface elevates, with a central peak above mass.
RM32	Subclinical	255,632	300,000	Slight thickening. Reaction disappears in 10 seconds
RM33	Negative	97,654	100,000	No thickening, homogeneous
RM34	Subclinical	277,984	300,000	Slight thickening. Reaction disappears in 10 seconds
RM35	Sub acute	2,699,832	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM36	Negative	89,987	100,000	No thickening, homogeneous
RM37	Clinical	899,349	900,000	Distinct thickening, no gel formation.
RM38	Sub acute	2,633,458	2,700,000	Thickens immediately, begins to gel, levels in the bottom of cup.
RM39	Negative	65,432	100,000	No thickening, homogeneous
RM40	Acute	8,346,342	8,100,000	Gel is formed, surface elevates, with a central peak above mass.

In this method verified results were studied then mastitis negative samples, denoted for rejection. Following the tested mastitis samples should to take for Pasteurization by dint of Home Pasteurizer machine. Recommended samples should to take for Pasteurization process due to presence of Mastitis causing Microorganisms of milk.

Every Raw milk samples (RM) were selected for pasteurization and derived as Home Pasteurized samples (HPM) .Then ALP analysis was applied in clinical DGKC method to verify proper and ideal pasteurization procedure among the raw, Pasteurized and UHT milk samples. Then qualitative tests are represented by Fat%, SNF%, Protein%, Lactose% and Calcium% in milk according to its contents by scanning of samples in Milk scanner. Then estimation of milk components of three categorized milk samples was used to comparative study of analytical reports that received from Milk scanner.

Fig.1 Determination of Milk Components.

Fig .2 Analytical Reports from Milk Scanner

III. Results

Cows naturally produce bovine somatotropin (bST) in their pituitary gland; it directs how energy and nutrients are used for growth in young cattle and for milk production in lactating cows. Dairy farmers may choose to use ribosomal bST to help cows produce more milk. So here research was followed on basis of discussion about experimental differences on nutritional values due to presence of Bovine somatotropin and Alkaline phosphatasee degradation in Pasteurized and UHT milk. When milk is pasteurized at 63ºC for 30 min in pasteurizer or 72ºC for 15 seconds in heat exchanger, continuous flow pasteurizers, all pathogenic bacteria destroyed, there by rendering milk safe for human consumption. Simultaneously various enzymes present in milk, and which might affect its flavor, are destroyed. In order to determine quality control assurance, research works were performed by qualitative test among the three categories of samples raw, Pasteurized and UHT milk samples.

Standard Milk sample Components (Los Angeles County Board Supervisor)

Table 3:

Fats	3.6
SNF	8.5
Protein	2.5
Lactose	5.0
Calcium	0.7

Table 4

Raw milk samples:

Samples	Fats µgm /ml	SNF µgm /ml	Protein µgm /ml	Lactose µgm /ml	Calcium µgm /ml
RM1	4.13	7.79	2.18	4.15	o.89
RM2	4.10	7.71	2.13	4.11	o.85
RM3	4.15	7.74	2.10	4.13	o.85
RM4	4.10	7.79	2.16	4.19	o.89
RM6	4.15	7.72	2.14	4.14	o.87
RM7	4.12	7.74	2.19	4.15	o.81
RM9	4.23	7.76	2.12	4.10	o.86

RM12	4.00	7.71	2.10	4.12	o.82
RM16	4.13	7.76	2.20	4.18	o.89
RM17	3.90	7.78	2.26	4.15	o.86
RM18	3.81	7.71	2.10	4.10	o.80
RM20	4.01	7.77	2.15	4.10	o.80
RM21	4.12	7.76	2.25	4.14	o.81
RM22	4.15	7.74	2.13	4.19	o.87
RM23	4.01	7.71	2.10	4.10	o.83
RM25	4.00	7.73	2.31	4.14	o.85
RM26	3.96	7.79	2.10	4.18	o.85
RM27	4.13	7.75	2.15	4.11	o.82
RM29	3.76	7.71	2.42	4.10	o.80
RM31	3.95	7.65	2.10	4.10	o.82
RM32	4.10	7.70	2.16	4.15	o.81
RM34	4.00	7.61	2.12	4.18	o.81
RM35	4.12	7.74	2.10	4.11	o.87
RM37	4.15	7.68	2.32	4.10	o.89
RM38	4.01	7.79	2.11	4.16	o.80
RM40	4.00	7.70	2.16	4.11	o.85

Table 5:

Pasteurized samples:

Samples	Fats µgm /ml	SNF µgm /ml	Protein µgm /ml	Lactose µgm /ml	Calcium µgm /ml
HPM1	3.06	7.50	2.88	4.01	o.87
HPM2	3.51	7.55	2.80	3.98	o.82
HPM3	3.32	7.51	2.86	3.90	o.81
HPM4	3.25	7.50	2.84	4.04	o.88
HPM6	3.42	7.50	2.81	4.00	o.82
HPM7	3.17	7.50	2.80	4.01	o.87
HPM9	3.34	7.54	2.85	4.00	o.89
HPM12	3.09	7.59	2.87	3.96	o.83
HPM16	3.38	7.51	2.81	4.05	o.85
HPM17	3.04	7.57	2.80	4.00	o.80
HPM18	3.48	7.55	2.86	3.95	o.87
HPM20	3.39	7.50	2.83	4.11	o.84
HPM21	3.22	7.50	2.89	4.01	o.82
HPM22	3.16	7.50	2.85	3.96	o.89
HPM23	3.26	7.54	2.82	4.00	o.87
HPM25	3.26	7.58	2.80	4.18	o.84
HPM26	3.38	7.51	2.86	4.11	o.80
HPM27	3.09	7.55	2.84	4.05	o.89
HPM29	3.04	7.52	2.89	4.00	o.81
HPM31	3.00	7.50	2.82	4.02	o.85
HPM32	3.06	7.51	2.80	3.99	o.88
HPM34	3.38	7.56	2.81	4.08	o.84
HPM35	3.21	7.53	2.88	4.11	o.83
HPM37	3.34	7.56	2.83	3.90	o.85
HPM38	3.24	7.50	2.85	4.00	o.81
HPM40	3.00	7.50	2.82	4.05	o.80

Table 6:

UHT samples:

Samples	Fats µgm /ml	SNF µgm /ml	Protein µgm /ml	Lactose µgm /ml	Calcium µgm /ml
UHT 1	3.51	7.84	3.03	4.01	0.85
UHT 2	3.50	7.81	3.00	4.05	0.80
UHT 3	3.50	7.86	3.01	4.01	0.83
UHT 4	3.57	7.80	3.03	4.00	0.81
UHT 5	3.55	7.81	3.00	4.05	0.85

Fats:

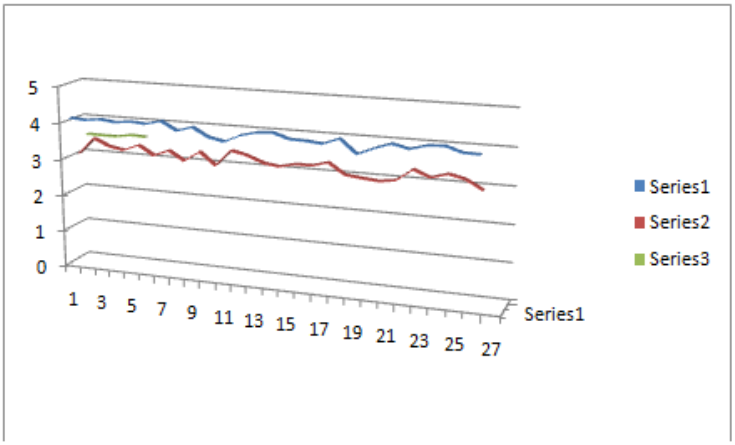

Fig.3 Series1 is followed by the highest fat% determined in raw milk.
Series 2 is followed by the lowest fat% recommended form in pasteurized milk.
Series3 is followed less break down of fat than recommended form in pasteurized milk.

SNF:

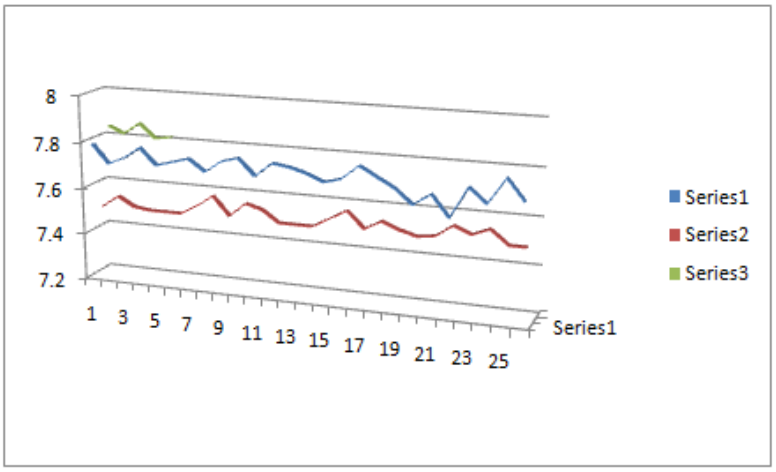

Fig.4 Series1 is expressed by the SNF% determined in raw milk.
Series 2 is followed by the decreased SNF% recommended form in pasteurized milk.
Series3 is followed by increased SNF% than recommended form in raw milk.

Protein:

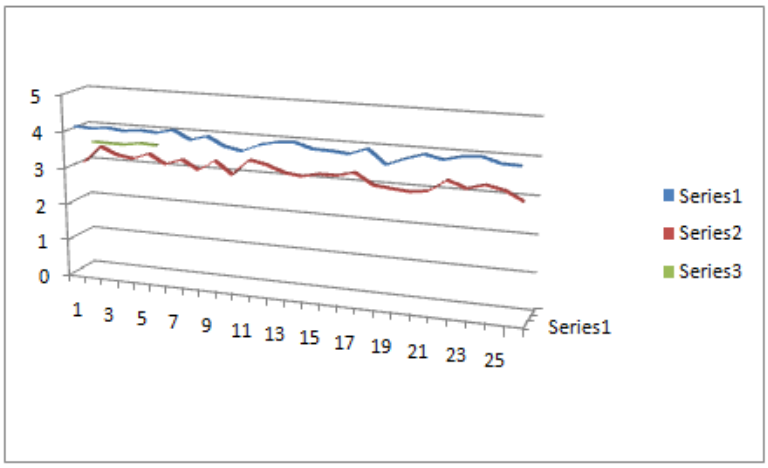

Fig.5 Series1 is followed by the Protein (casein) % present in raw milk.
Series 2 is followed by the decreased Protein (casein) % determined in pasteurized milk.
Series3 is followed by increased Protein (casein) % than recommended form in pasteurized milk

Lactose:

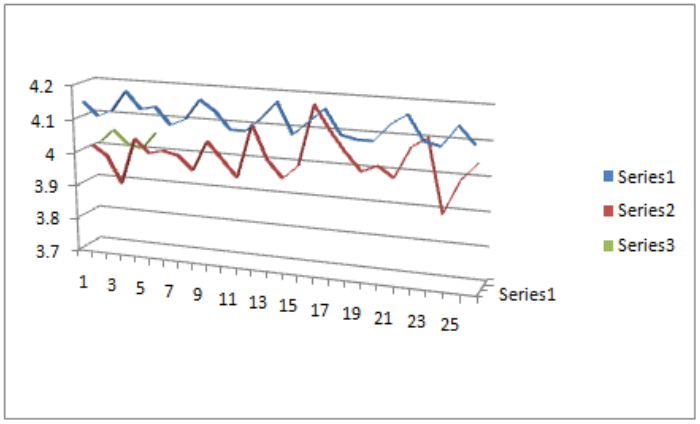

Fig.6 Series1 is expressed by the Lactose% determined in raw milk.
Series 2 is followed by the Lactose% at fluctuated form in pasteurized milk and contains on average equal value of raw milk.
Series 3 is followed by decreased Lactose% than recommended form in raw milk.

Calcium:

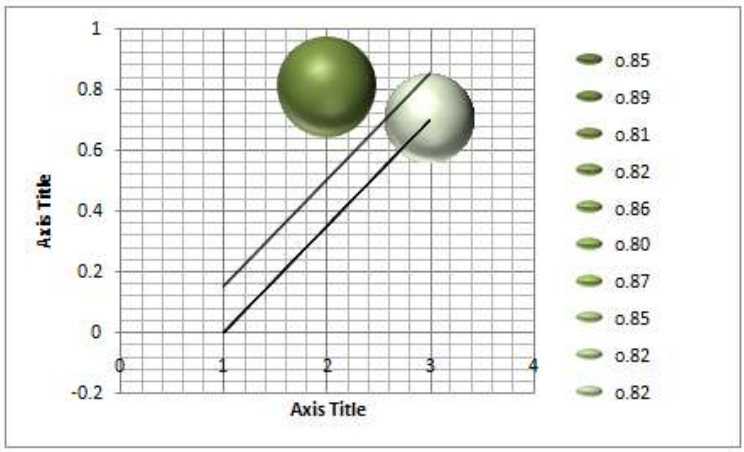

Fig.7 Calcium% is on average verified in 0.82-0.85 range for all samples.

Graphical presentation of total values in nutritional parameter**:**

Raw milk**:**

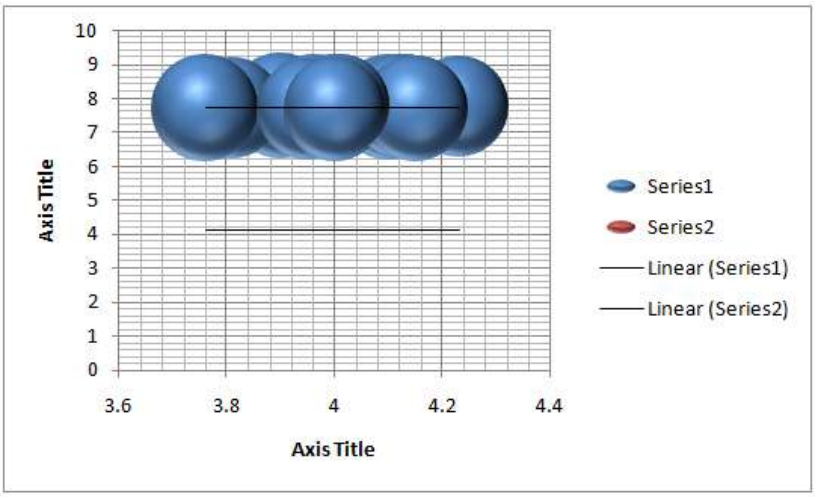

Fig.8 Parameter% is on average verified in 3.6-4.4 range for raw milk samples.

Home Pasteurized milk**:**

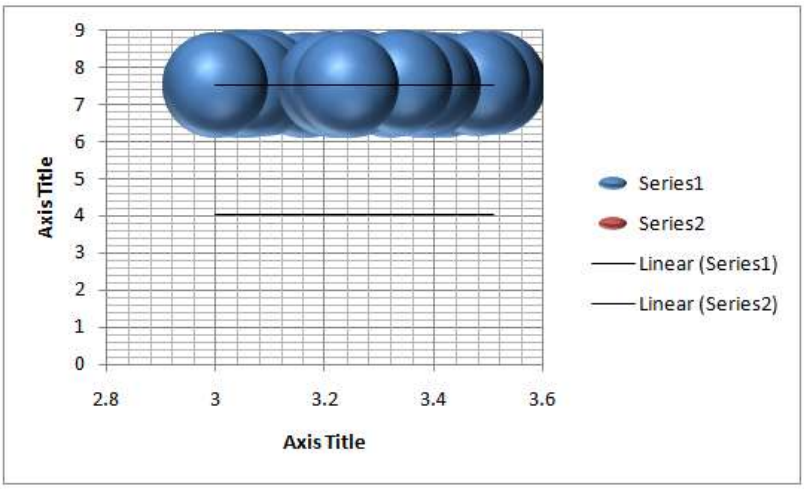

Fig.9 Parameter% is on average verified in 2.8-3.6 range for Home pasteurized milk samples.

UHT:

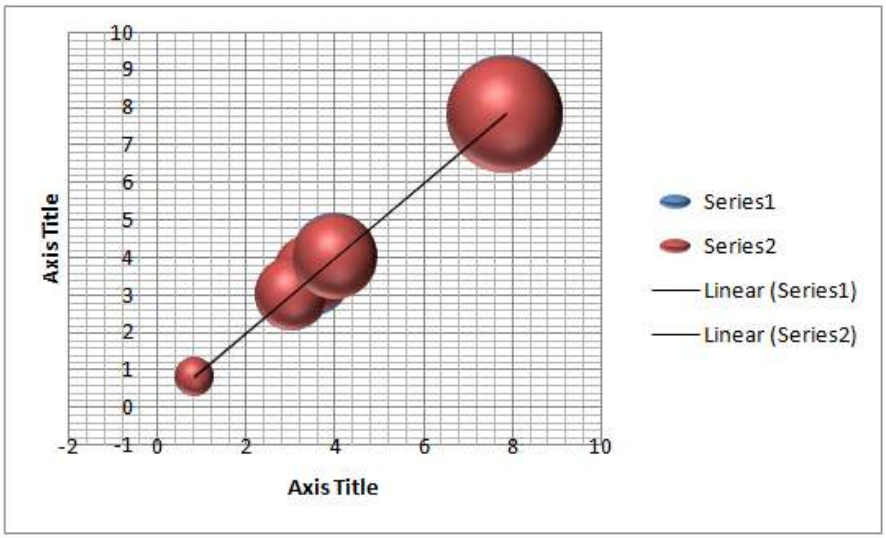

Fig.10 Parameter% is on average verified in 0-8 range for UHT milk samples.

Standard:

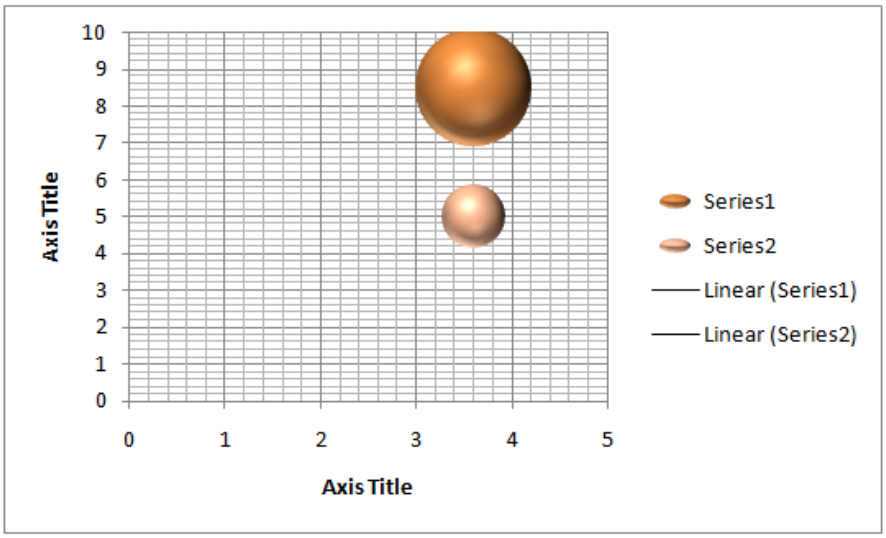

Fig.11 Parameter% is on average verified in 0-4 range for Standard values.

IV. Discussion

Based on our findings, the risks of consuming raw milk instead of pasteurized milk are well established in the scientific literature, and in some cases can have severe or even fatal consequences. The potential benefits on the other hand, are still unclear leaving with a large uncertainty about the potential benefits of raw milk. So a clear understanding of the microbial hazards from consuming raw milk should be subjected for nutritional analysis due to enzymatic degradation. Completing CMT test and assuring Somatic cell count, selected raw milk samples (RM) were pasteurized by home pasteurizer in research laboratory. After pasteurization the proportion of samples were derived another sample, named Home pasteurized milk samples (HPM).Enzyme Linked Alkaline Phosphatase Test is used to determine that all retail products (UHT) have been pasteurized properly by examining the products for alkaline phosphatase enzyme, which is normally destroyed during the pasteurization process. This procedure is used to must obtain a reading of less than 10µ lit. In the beginning of research all collected samples were screened for determining the level of different composition (Fat, Solid Not Fat, Protein, Lactose, Calcium proportion) which showed in table- 4, 5, 6. During research after home pasteurized process of milk every parameter decreased in µgm /ml where as ulltra heated milk samples contains increased parameter than HPM samples.The UHT samples contains decreased parameter than RM samples showed figure one to six (3-8).These analytical parameter showed varifying pasteurization procedure resulted fluctuating milk components in between HPM and UHT samples. Graphical presentation of total values in nutritional parameter is on average verified in 3.6-4.4 range for raw milk samples where as parameter % is on average verified in 2.8-3.6 range for Home pasteurized milk samples in decreased label. The significance outcome of this research proved that prior to pasteurization and UHT treatment the nutrient molecules were compact due to presence of high label of ALP enzyme and Bovine somatotropin hormone. During pasteurization and UHT treatment rapid degradation of enzyme occurred free forms of molecules which may easily breakdown by lactase, lipase and mineral co factor in human gut for proper digestion. So following the procedure nutrient molecules were verified almost same in every samples as RM, HPM and UHT milk. But due to presence of high label of ALP enzyme, Bovine somatotropin hormone and microbial loads, nutrient label of raw milk showed increasing proportion than others.

V. Conclusion

Before the invention and acceptance of pasteurization, raw milk was a common source of the bacteria that cause tuberculosis, diphtheria, severe streptococcal infections, typhoid fever, and other food borne illnesses. These illnesses killed many people each year, especially young children. In the 1900s many mothers recognized this risk and would boil milk at high temperature (212°F) before giving it to their infants and young children. Many studies have shown that pasteurization does not significantly change the nutritional value of milk. Pasteurized milk is rich in proteins, carbohydrates, and other nutrients. After Pasteurization or UHT treatments homogenized cells must be kept at low temperatures to prevent autolysis and kept in an isotonic solution to prevent osmotic damage. One of the oldest applications of homogenization is in milk processing, where the aim is to prevent or delay the natural separation of cream from the rest of the emulsion. The fat in milk normally separates from the water and collects at the top. Homogenization is the process of breaking up that fat into smaller sizes so that it no longer separates from the milk, allowing the sale of non-separating 2% and whole milk. This is accomplished by forcing the milk at high pressure through small orifices. When soft solids are milled in a liquid, this can also be seen as a form of homogenization. Heat slightly affects a few of the vitamins found such as thiamine, vitamin B12, and vitamin C but milk is only a minor source of these vitamins. It's true that the heating process of pasteurization does inactivate some enzymes in milk; the enzymes in raw animal milk are not thought to be important in human health. Some nutrients are somewhat reduced in raw milk, but the United States diet generally has plenty of other sources of these nutrients.

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