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Research Article

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Quality assessment of fresh yogurt marketed in Quetta, Pakistan

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Abstract

Yogurt is coagulated milk product that results from the fermentation of lactose in milk by Lactobacillus bulgaricus and Streptococcus thermophillus. To make a good quality product, raw milk used must be of low bacterial count, free from antibiotics, sanitizing chemicals, mastitis milk and colostrum and the milk also should be free from contamination by bacteriophages. It is more nutritious as compared to milk. One hundred grams of yogurt provide 72 calories, 3.6g protein, 3.4g fat, 4.9g carbohydrates, and 145mg of calcium, 114mg phosphors, 47mg sodium and 186mg potassium. The objective of the study was to investigate the chemical composition of fresh yogurt. The study was conducted in the laboratory of Chemistry Department, Sardar Bahadur Khan Women's University Quetta. Twenty four samples of milk yogurt were collected from different shops and households of Quetta. The chemical composition was determined by pH, acidity%, moisture%, ash%, total solid%, protein%, fat%, lactose%, solid not fat% and syneresis. The data shows that the pH of yogurt collected from households and shops was 5.36 and 5.10% respectively. Acidity of yogurt collected from shops was higher than that of household's yogurt. The moisture content of yogurt collected from households and shops was 85.02 and 80.09% while the syneresis was measured as 21.50 and 9.35ml respectively. Fat and protein% was almost similar. The total solid, lactose and SNF% of household's yogurt were higher than that of shops. The variations in the quality of yogurt were found. It might be due to the quality of milk used, temperature and hygienic conditions during the preparation of yogurt.

Keywords: Fresh yogurt, chemical composition, quality, households, shops, Quetta

Introduction

Yogurt is a sour milk product and is one of the oldest and popular foods in Africa, Asia, Europe and USA because of its nutritive and therapeutic value (Deeth, 1984 and Mahmood *et al*., 2008). According to legend, yogurt was first made by the ancient Turkish people in Asia, (Kurtz, 1981). Yogurt may be made from the milk of cows, sheep, goats, or buffalo (Encyclopedia Britannica, 2009). To make a good quality product, raw milk used must be of low bacterial count, free from antibiotics, sanitizing chemicals, mastitis milk and colostrum and the milk also should be free from contamination by bacteriophages (Thapa, 2000).

Yogurt is more nutritious as compared to milk. It has good amount of calcium, phosphorus, vitamin B2, B6, B12, in addition to protein, zinc, potassium and molybdenum. One hundred grams of yogurt provide 72 calories, 3.6g protein, 3.4g fat, 4.9g carbohydrates, and 145mg of calcium, 114mg phosphors, 47mg sodium and 186mg potassium (Deeth and Tamime, 1980 and Andleeb *et al*., 2008). It is coagulated milk product that results from the fermentation of lactose in milk by *Lactobacillus bulgaricus* and *Streptococcus thermothillus* (Bourlious and Pochart, 1988). Other Lactic Acid Bacteria (LAB) are also frequently used to

produce a yogurt with unique characteristics (Adolfsson *et al*., 2004). Yogurt production can result from the use of starter cultures derived from a previous yogurt batch or from inoculation of milk with a commercially prepared culture. Regardless of starter culture origin, the reduced pH of yogurt should inhibit the growth of acid-sensitive organisms, thus providing the yogurt with antimicrobial qualities (Bachrouri *et al*., 2006 and Akpinar *et al*., 2011).

In Pakistan, majority of the people use plain yogurt. There are no proper guidelines for the preparation of yogurt. During preparation, hygienic conditions and use of quality milk is not observed. The present study was therefore, designed to assess the quality of fresh milk yogurt drawn from household and shops through chemical composition in Quetta city of Pakistan.

Materials and Methods

The study was conducted in the laboratory of Chemistry Department, Sardar Bahadur Khan Women's University, Quetta. Twenty four samples of milk yogurt were collected from different shops and households for analysis of chemical composition to determine the quality collected yogurt.

Results and Discussion

The Chemical composition of analyzed fresh yogurt prepared by shop keepers and at households level is given in **Table 1**.

Table 1: Chemical composition of fresh yogurt

	Households	Shops
pH	5.36±0.08	5.10±006
Acidity%	0.64±0.03	1.21±0.05
Moisture%	85.02±4.42	80.09±3.75
Ash%	0.66±0.04	0.83±0.03
Total solid%	14±2.59	11±1.81
Protein%	2.22.±0.04	2.34±0.04
Fat%	3.60±0.03	3.62±0.04
Lactose%	7.52±0.04	4.21±0.04
Solid not fat	10.4±0.06	7.38±0.04
Syneresis (ml/2hr)	21.50±0.69	9.35±0.47

The data shows that the pH of yogurt collected from households and shops was 5.36 and 5.10% respectively. The difference between pH values might be due to environmental conditions during preparations of yogurt and quality of milk used.

The acidity of yogurt drawn from households and shops was 0.64 and 1.21% respectively. Acidity of yogurt collected from shops was higher than that of household's yogurt. The increased acidity of yogurt from shops may be due to unhygienic conditions.

The moisture content of yogurt collected from households and shops was 85.02 and 80.09% while the syneresis was measured as 21.50 and 9.35ml/2 hrs respectively. Syneresis is the oozing out of water on the surface of yogurt. It is one of the quality parameter for yogurt. The moisture content and syneresis of household's yogurt was higher than that of shops. The higher values of syneresis show that yogurt is of low quality. This may be due to the use of skimmed milk.

The quality of fresh yogurt whether from households or shops did no vary significantly with respect to fat and protein. The fat% of yogurt collected from households and shops was 3.60 & 3.62% while the protein% of households and shop yogurt was 2.22 & 2.34% respectively.

The total solid, lactose and SNF% of household's yogurt were higher than that of shops. The greater total solid values may be due to the removal of cream or addition of adulterants in milk. The total solid, lactose and SNF of yogurt collected from household were 14, 7.52 and 10.4% respectively. The results revealed that the ash% of yogurt taken from shops was higher than that of household. The differences between the mean values of chemical composition of fresh yogurt are shown in **Fig. 1–10**.

Chemical analysis

The chemical composition was determined by pH, acidity%, moisture%, ash%, total solid%, protein%, fat%, lactose%, solid not fat% and syneresis.

Determination of pH

The pH values were determined using a pH meter. 5ml of distilled water was added into 25g of sample. The electrode was immersed in the sample and the pH reading was taken after allowing the meter to stabilize for 1 minute. Prior analysis pH meter was calibrated with buffer solutions.

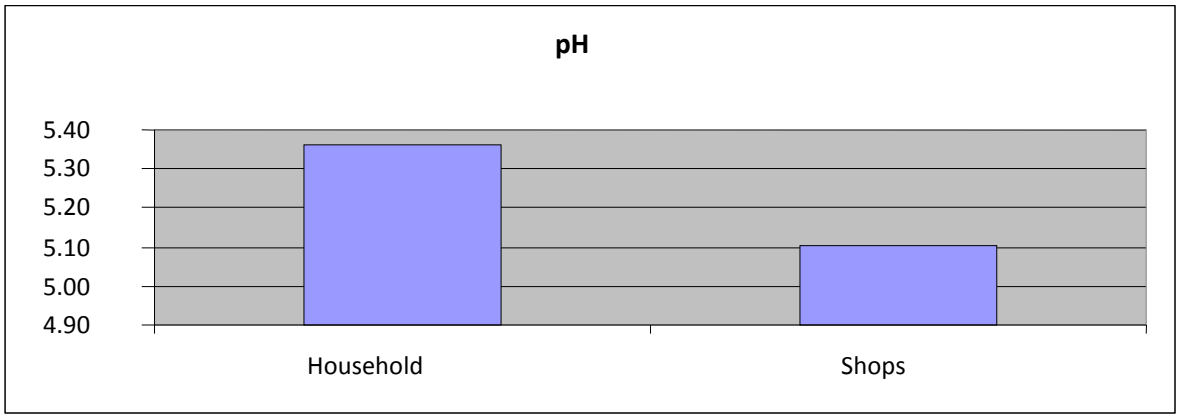

Fig. 1: Difference of mean value of pH of fresh yogurt collected from household and shops

Determination of acidity (%)

Titrable acidity was determined as lactic acid by titrating with 0.1 N NaOH using phenolphthalein as an indicator.

$$\text{Acidity (\%)} = \frac{0.009 \times \text{volume of N/10 NaOH used (ml)}}{\text{weight of sample (g)}} \times 100$$

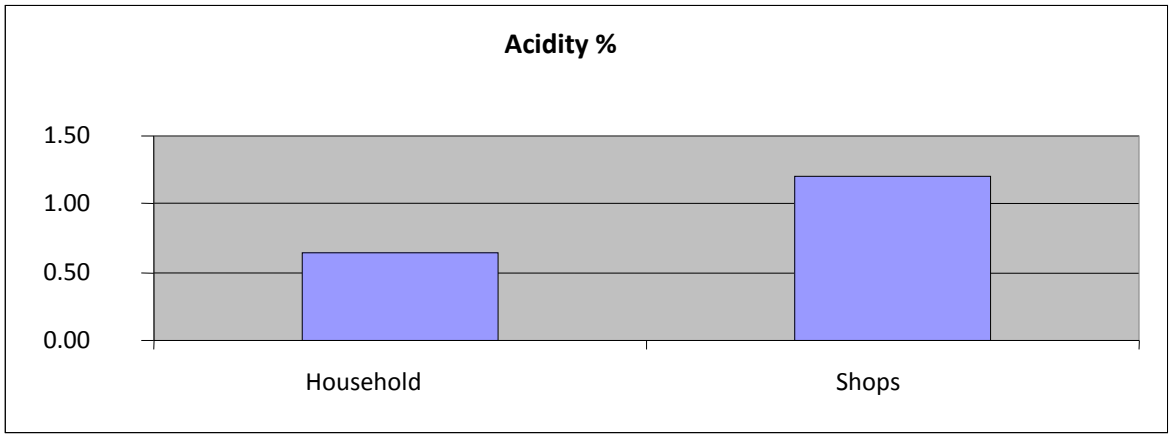

Fig. 2: Difference of mean value of acidity (%) of fresh yogurt collected from household and shops

Determination of moistures (%)

Moisture contents of yogurt were determined by oven dry method and calculation was carried out by using following formula:

$$\text{Moisture (\%)} = \frac{\text{weight of fresh sample - weight of sample after drying}}{\text{weight of sample}} \times 100$$

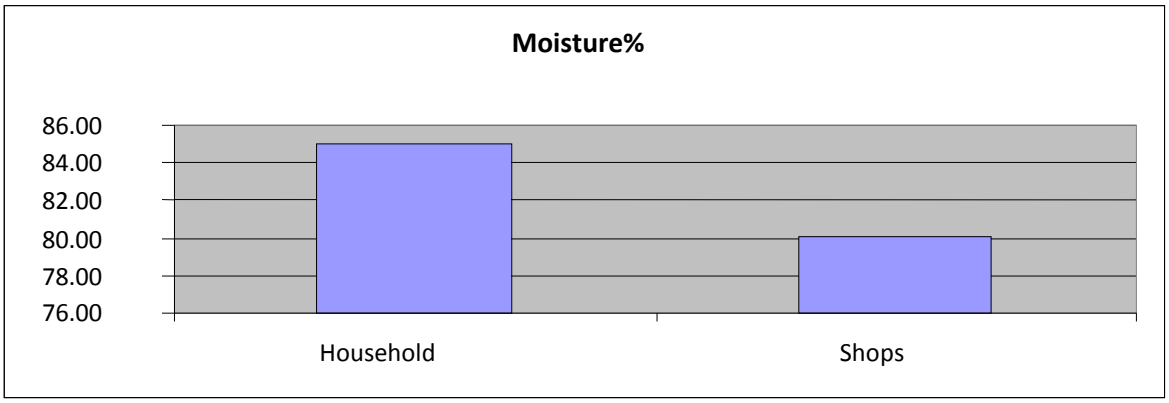

Fig. 3: Difference of mean value of moisture (%) of fresh yogurt collected from household and shops

Determination of ash (%)

Burning method was used for determining the ash content. Yogurt samples were taken separately into pre-weighted crucibles. They were placed in oven at 100°C. Then the crucibles were cooled in desiccators and heated for 15 minutes for incineration. After that the samples were placed in Muffle furnace at 550°C until the white ash was obtained.

Ash contents were determined by following formula:

$$\text{Ash (\%)} = \frac{\text{weight of crucible and Ash-weight of crucible}}{\text{weight of sample}} \times 100$$

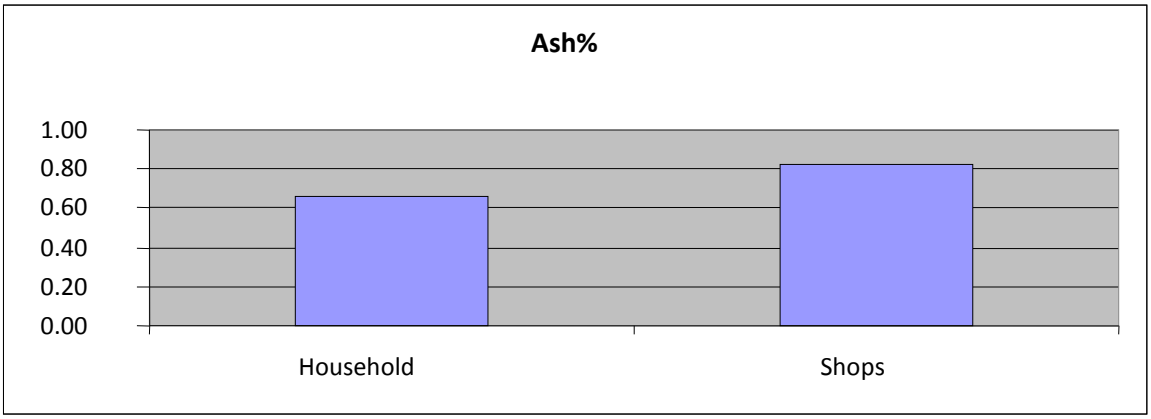

Fig. 4: Difference of mean value of ash (%) of fresh yogurt collected from household and shops

Determination of total solid (%)

Total solids content was determined in the laboratory oven at 105°C for 24 hours. Total solids were determined by following formula:

$$\text{Total solids (\%) (wt/wt)} = \frac{\text{weight of dry sample}}{\text{weight of wet sample}} \times 100$$

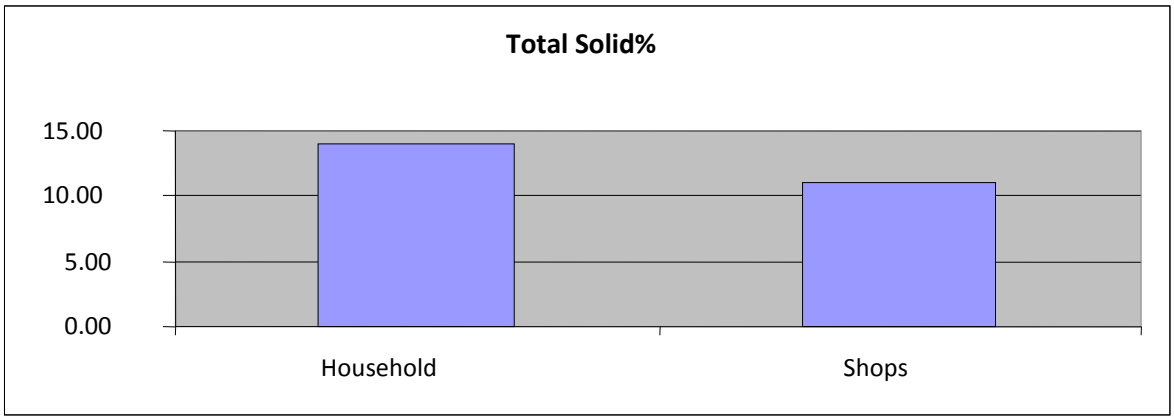

Fig. 5: Difference of mean value of total solid (%) of fresh yogurt collected from household and shops

Determination of protein (%)

Protein was determined by titrating previously neutralized yogurt samples with 0.1N NaOH using phenolphthalein indicator and 40% formalin solution. Protein% was calculated by multiplying the volume of NaOH used with formol factor i.e. 1.91.

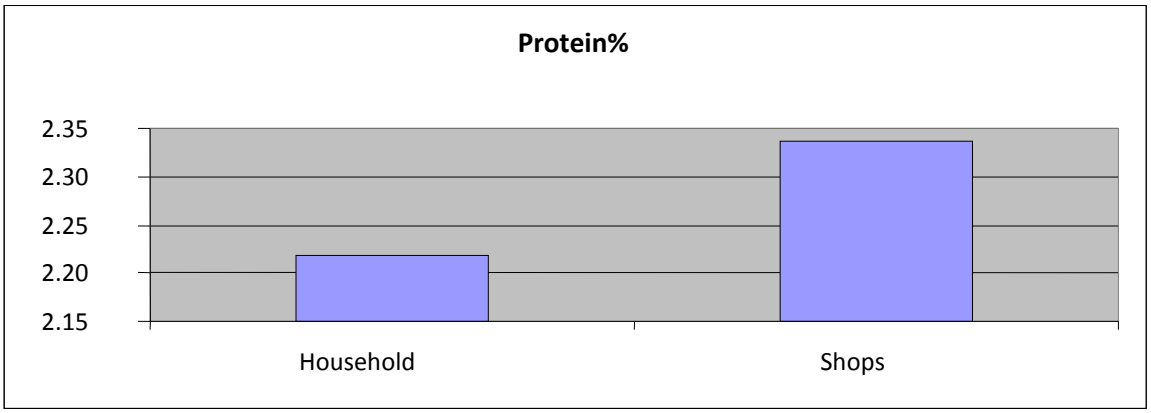

Fig. 6: Difference of mean value of protein (%) of fresh yogurt collected from household and shops

Determination of fat (%)

Yogurt samples were tested for fat by Gerber method. 10ml of sulphuric acid with 1.082 specific gravity was taken in butyrometer followed by 11.3g sample of yogurt. 1ml of isoamyle alcohol was taken in the end. After mixing properly the butyrometer was placed in the centrifuge machine at 1100rpm. The reading of separated fat was directly noted on the scale of butyrometer and expressed as percentage.

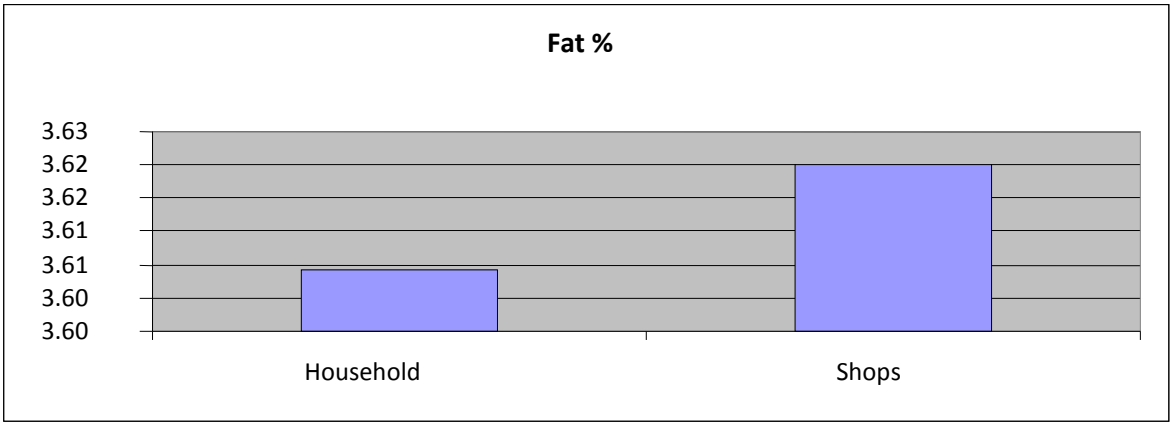

Fig. 7: Difference of mean value of fat (%) of fresh yogurt collected from household and shops

Determination of lactose (%)

Lactose content was determined by subtracting the sum of proteins%, fat% and ash% from total solids% i.e.

Lactose (%) = TS % - (Protein % + Fat % + Ash %)

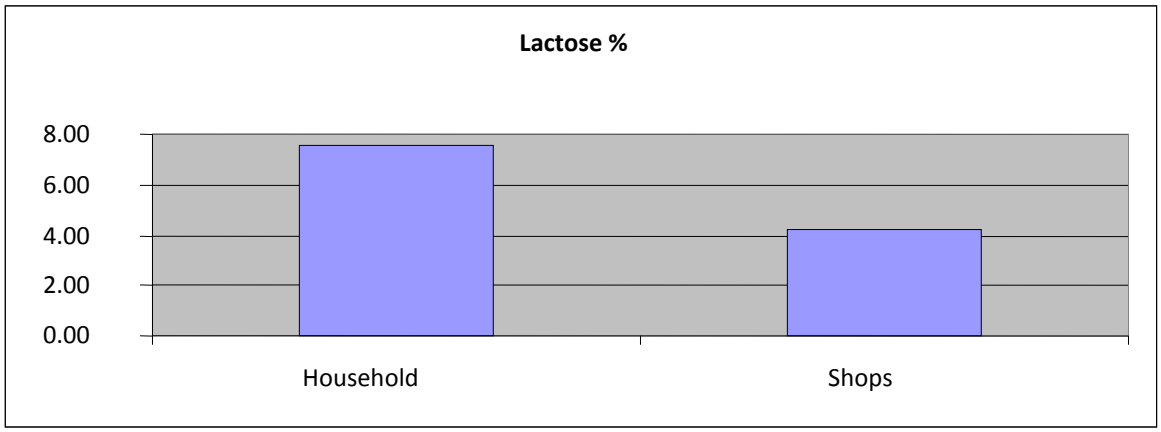

Fig. 8: Difference of mean value of lactose (%) of fresh yogurt collected from household and shops

Determination of solid not fat (%)

The solid not fat was determined by subtracting fat from total solids. i.e.

SNF (%) = TS % - Fat %

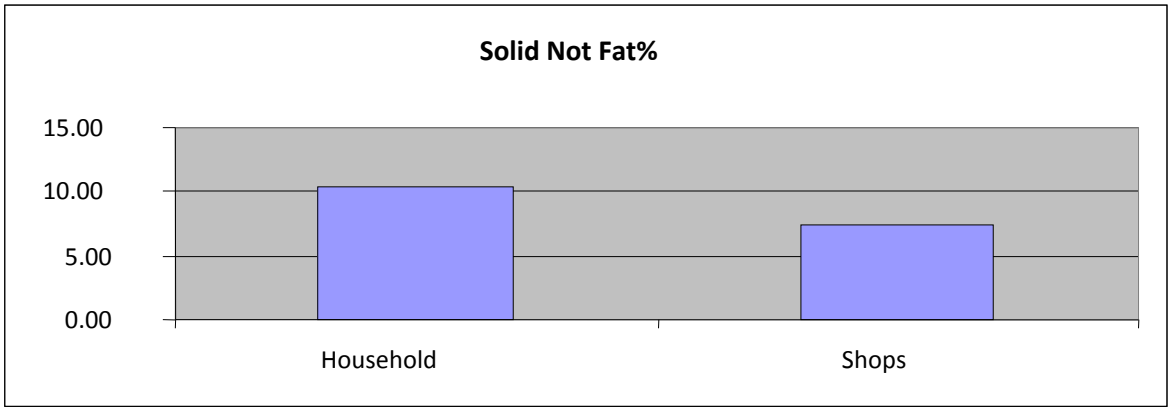

Fig. 9: Difference of mean value of SNF (%) of fresh yogurt collected from household and shops

Determination of syneresis (%)

Five ml of yogurt was centrifuged at 5000rpm for 20 minutes at 4°C and separated whey was measured after 1 minute. Amount of whey separation was expressed as volume of separated whey per 100 ml of yogurt.

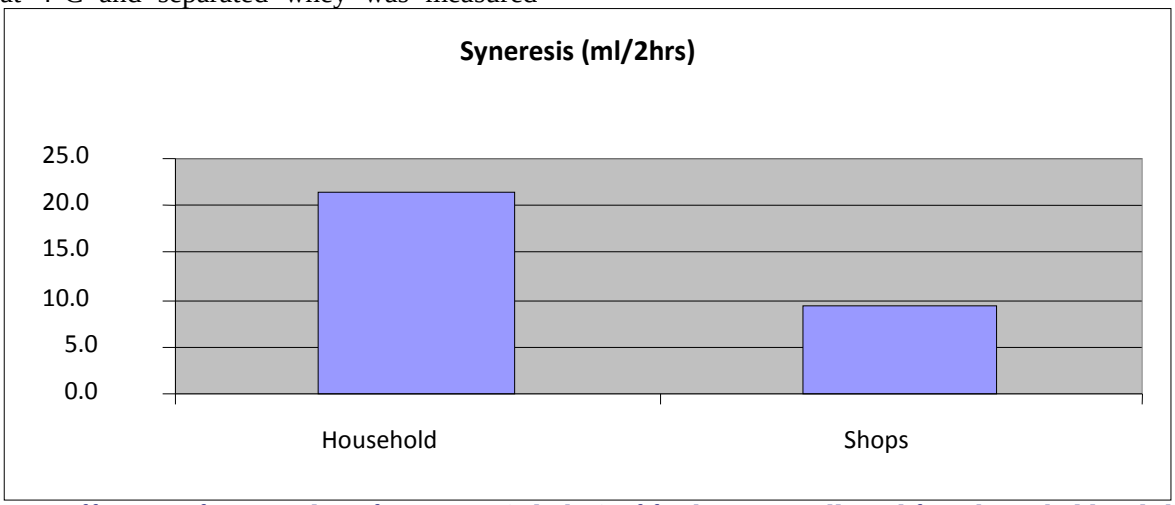

Fig. 10: Difference of mean value of syneresis (ml/2hrs) of fresh yogurt collected from household and shops

Conclusion

The variations in the quality of yogurt were found. It might be due to the quality of milk used, temperature and hygienic conditions during the preparation of yogurt and use of different starter culture at shops and households level.

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