

QUALITY OF YOGHURT MADE FROM BUFFALO MILK AND RETENTATE AS AFFECTED WITH THE FORTIFICATION WITH SKIM MILK POWDER AND RETENTATE POWDER.

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ABSTRACT

Yoghurt was made from buffalo milk in the presence of different levels of skim milk powder and retentate powder . The retentate was also used in making yoghurt by reconstituting it to obtain the same composition of buffalo milk , and by the fortification with different concentrating of skim milk powder and retentate powder . yoghurt made from buffalo milk in the presence of 1% retentate powder was the best from the chemical , microbiological and organoleptic points of view . Meanwhile, the yoghurt made from retentate in the presence of 3% retentate powder was shown to be the best among the groups made from retentate.

INTRODUCTION

There has been a phenomenal increase in the production of fermented milk in developed countries. Yoghurt is a very popular flavorful and healthful dairy product in Egypt. Its production and consumption is growing continuously due to its therapeutic properties beside its high nutritive value (Karagul *et al.*, 2004). The health promoting properties of live lactic acid bacteria in yoghurt include protection against gastrointestinal upsets, enhancement of digestion of lactose by maldigesters, decreasing the risk of cancer, lower blood cholesterol, improving the immune response and helping the body to assimilate protein, calcium and iron (Perdigeon *et al.*, 1998; Marona and Pedrigo, 2004).

Ultrafiltration (UF) is the most fascinating technology which have been recently introduced for application in the dairy industry, not only to improve the traditional dairy products but also to create new products.

Therefore, this work was carried out to investigate the effect of manufacturing yoghurt from UF. The resultant products were stored at 5 C for 14 days ,and all of the measurements were carried out while fresh and after 7 and 14 days.)

MATERIALS AND METHODS

Fresh buffalo's milk and cream were obtained from the Dairy Department, faculty of agriculture, Mansoura University. Skim milk powder ".moisture: 4% fat: 1.25% used in this work was made in Poland by " VARIMEX". Retentate powder: { protein: 69.8% lactose:17.2 % ash: 7.2% moisture: 4.4% fat: 1.4%} was used. yoghurt starter (*S. salivarius* subsp. thermophilus and *L. delbrueckii* subsp. *bulgaricus*) was obtained from the Dairy Dept., Fac. of Agric., Mans. Univ.,. All portions were inoculated with 3.0% yoghurt starter. Fat and total solids (T. S) were estimated by the method described by British Standard Institution's (B. S. I) Method (1955). pH

measured by a digital pH-meter Janway 3010 – England. Total volatile fatty acids (T. V. F. A) were estimated according to Kosikowski (1982). Total nitrogen (T. N), soluble nitrogen (S. N), non-protein nitrogen (N. P. N) and titratable acidity (T. A) were estimated as described by Ling (1963). The curd tension is determined by using the method of Chandrasekhare et. Al (1957). Yoghurt stored at 4 -5 °C and examined for total bacterial count (T. C), moulds and yeasts (M & Y), coliform bacteria and staphylococci as mentioned in the Standard Methods for Examination of Dairy Products (1985). Lipolytic and Proteolytic bacterial count were carried out as described by Chalmers (1962).

RESULTS AND DISCUSSION

Table (1) The Chemical composition of buffalo milk fortified with different levels of skim milk powder or retentate powder.

| Test Treatment | T.S% | Acidity% | pH | F% | T.V.F.F.A Mg/100g | T.N% | S.N% | N.P.N% |
|----------------|------|----------|-----|-----|-------------------|------|-------|--------|
| Control | 15 | 0.13 | 6.6 | 6 | 1.20 | 0.56 | 0.077 | 0.0196 |
| T1 | 15.9 | 0.16 | 6.5 | 5.6 | 1.22 | 0.63 | 0.084 | 0.0210 |
| T2 | 17.2 | 0.19 | 6.3 | 5.2 | 1.64 | 0.7 | 0.091 | 0.0224 |
| T3 | 18.1 | 0.20 | 6.2 | 4.6 | 1.66 | 0.77 | 0.098 | 0.0238 |
| T4 | 16.3 | 0.14 | 6.5 | 5.4 | 1.21 | 0.7 | 0.084 | 0.0231 |
| T5 | 17.8 | 0.17 | 6.4 | 4.8 | 1.23 | 0.84 | 0.084 | 0.0245 |
| T6 | 18.9 | 0.18 | 6.3 | 4.3 | 1.25 | 0.98 | 0.105 | 0.028 |

Control: Buffalo milk

T1: Buffalo milk+1% Skim milk powder.

T2: Buffalo milk+2% Skim milk powder

T3: Buffalo milk+3% Skim milk powder

T4: Buffalo milk+1% Retentate powder.

T5: Buffalo milk+2% Retentate powder .

T6: Buffalo milk+3% Retentate powder

Table (2) The Microbiological properties of buffalo milk fortified with different levels of skim milk powder and retentate powder.

| Test Treatment | T.C 10 ⁶ x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
|----------------|-----------------------|-----------------------------|------------------------------|-----------------------|--------------------------|--------------------------|
| Control | 55 | 8 | 11 | 3 | - | - |
| T1 | 46 | 6 | 10 | 2 | - | - |
| T2 | 54 | 3 | 6 | 1 | - | - |
| T3 | 63 | 9 | 5 | - | - | - |
| T4 | 45 | 7 | 12 | 1 | - | - |
| T5 | 34 | 4 | 16 | - | - | - |
| T6 | 35 | 3 | 13 | - | - | - |

Data in Table (3) showed that the acidity of yoghurt increased gradually by increasing their SNF contents. During storage, the acidity in all treatments increased gradually at reaching the maximum after 15 days of storage. Yoghurt samples prepared from UF retentate has the highest acidity. In all treatments and along the storage period samples of yoghurt made with the addition of retentate showed higher acidity than yoghurt from buffalos milk. This might be due to the competitive properties of organisms using lactose in fermentation of milk. these results disagreed with those mentioned by ELGazzar and Marth (1991).

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Table (4) showed the viscosity of yoghurt manufactured with different levels of SNF and stored at 5° C for 15 days .

The results showed that in all treatments cured tension increased as SNF increased. These results are in agreement with Abrahamsen and Holmen (1980), who found that yoghurt made from ultrafiltrated milk gave the best viscosity . The high cured tension of products manufacture from UF retentate might be due to their high protein content. Proteins are capable to bind and imbibe more water, and consequently increase the cured tension .

Table (5) Effect of S.N.F. level on the organoleptic properties of fortified with different levels of skim milk powder and retentate powder yoghurt during storage.

| Treat-ments | Storage period (days) | | | | | | | | | | | | |
|-------------|--|--------|---------|--------------------|-----------|-----------|--|--------|---------|--------------------|-----------|-----------|-----------|
| | yoghurt manufactured from buffalo milk | | | | | | yoghurt manufactured from UF Retentate | | | | | | |
| | S.N.F% | | | Total points (100) | | | S.N.F% | | | Total points(100) | | | |
| | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | |
| CN | 10 | 10 | 11.3 | 70 | 84 | 74 | CR | 10 | 11 | 11.5 | 65 | 84 | 87 |
| T1 | 11.5 | 12.4 | 12.9 | 69 | 81 | 82 | T1" | 11.5 | 12 | 12.3 | 70 | 78 | 79 |
| T2 | 13.4 | 14.4 | 14.5 | 79 | 85 | 85 | T2" | 13.4 | 13.9 | 14.8 | 73 | 81 | 82 |
| T3 | 14.9 | 15.1 | 15.4 | 77 | 89 | 88 | T3" | 14.7 | 15.9 | 17.1 | 79 | 85 | 85 |
| T4 | 11.9 | 13.5 | 13.4 | 81 | 91 | 96 | T4" | 11.8 | 12.4 | 13.1 | 75 | 81 | 88 |
| T5 | 13.7 | 14.2 | 14.2 | 77 | 81 | 90 | T5" | 13 | 14 | 14.9 | 78 | 83 | 83 |
| T6 | 15.2 | 15.3 | 15.6 | 79 | 89 | 94 | T6" | 14.9 | 15.6 | 16.4 | 81 | 89 | 92 |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk **T 4:** yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk **T5:** yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk **T6:** yoghurt made from buffalo milk +3%retentate powder

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk **T 4":** yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk **T5":** yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk **T6":** yoghurt made from retentate+3%retentate powder

Results given in table (5) show that the organoleptic- score points of yoghurt increased gradually in all treatments during the storage periods . The highest score was gained in T4 (in buffalos yoghurt)and T6(in yoghurt manufactured from UF retentate), which might be due to their high level of proteins. The obtained results are in agreement with Abrahmsen and Holmen (1980), who found that yoghurt made from ultrafiltrated milk was of acceptable and had good flavor. Also, fermented milk produced from Ultrafiltrated milk of lower lactose and calories than that produced by the traditional method.Results in Table (6)indicated that T.V.F.A in yoghurt manufactured from buffalo milk fortified by different levels of skim milk and retentate increased when fat content increased during the cold storage. But, T.V.F A in yoghurt manufactured from UF retentate fortified by different levels of skim milk and retentate decreased when fat content increased . this might be due to the higher heat treatment during drying process. It is obvious from table (7) that T.N and S.N content increased during storage , however, N.P.N content decreased in yoghurt made from buffalo milk fortified with different levels of skim milk and retentate.

On the other hand ,It was observed on increase in the N.P.N content of yoghurt made from retentate during storage .This could be ascribed to a limited hydrolysis of proteins during storage(EL- Shibiny *et al.*, 1979).

Table (8) Microbiological properties of Yoghurt fortified with different of skim milk powder and retentate powder.

| Test Treatment | T.C 10 ⁶ - x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
|-------------------|----------------------------|--------------------------------|---------------------------------|--------------------------|-----------------------------|-----------------------------|
| CN | 65 | 18 | 13 | 1 | - | |
| T1 | 71 | 9 | 18 | - | - | |
| T2 | 82 | 12 | 15 | - | - | - |
| T3 | 97 | 8 | 13 | - | - | - |
| T4 | 55 | 14 | 36 | - | - | - |
| T5 | 40 | 11 | 44 | - | - | - |
| T6 | 51 | 12 | 25 | - | - | - |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

Table (9) Microbiological properties of Yoghurt fortified with skim milk powder and retentate powder after 7 days of storage in 4-5° C.

| Test Treatment | T.C 10 ⁶ - x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
|-------------------|----------------------------|--------------------------------|---------------------------------|--------------------------|-----------------------------|-----------------------------|
| CN | 80 | 12 | 19 | - | - | |
| T1 | 99 | 3 | 22 | - | - | |
| T2 | 109 | 6 | 25 | - | - | - |
| T3 | 111 | 4 | 26 | - | - | - |
| T4 | 109 | 2 | 46 | - | - | - |
| T5 | 117 | 1 | 55 | - | - | - |
| T6 | 98 | 2 | 66 | - | - | - |

From Tables (8,9 and 10) it is obvious that the total count and protolytic bacteria increased during storage, but Libolytic bacteria decreased during storage. However , coliform, Molds, yeasts and staphylococcus spp were not detected, whether in fresh or stored yoghurt made from buffalo milk fortified by different levels of skim milk and retentate.

Data presented in Tables (11,12and 13) show that total count and protolytic bacteria increased during storage, but Libolytic bacteria decreased during storage . However , coliform ,molds, yeasts *and staphylococcus spp* were not detected, whether in fresh or stored yoghurt made from retentate fortified by different levels of skim milk and retentate.

Table(10) Microbiological properties of Yoghurt fortified with skim milk powder and retentate powder after 14 days of storage in 4-5° C.

| Treatment | Test | | | | | |
|-----------|-----------------------|-----------------------------|------------------------------|-----------------------|--------------------------|--------------------------|
| | T.C 10 ⁶ x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
| CN | 95 | 2 | 26 | - | - | - |
| T1 | 101 | 1 | 24 | - | - | - |
| T2 | 120 | 3 | 28 | - | - | - |
| T3 | 131 | 1 | 28 | - | - | - |
| T4 | 118 | 1 | 52 | - | - | - |
| T5 | 125 | - | 62 | - | - | - |
| T6 | 112 | - | 75 | - | - | - |

Table (11) Microbiological properties of Yoghurt fortified with skim milk powder and retentate powder.

| Treatment | Test | | | | | |
|-----------|-----------------------|-----------------------------|------------------------------|-----------------------|--------------------------|--------------------------|
| | T.C 10 ⁶ x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
| CR | 79 | 2 | 9 | - | - | - |
| T1" | 87 | ٣ | 6 | - | - | - |
| T2" | 96 | ٦ | 4 | - | - | - |
| T3" | 97 | ٤ | 3 | - | - | - |
| T4" | 51 | ١ | 2 | - | - | - |
| T5" | 44 | - | 3 | - | - | - |
| T6" | 68 | - | 6 | - | - | - |

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder

Table (12) Microbiological properties of Yoghurt fortified with skim milk powder and retentate powder after 7 days of storage in 4-5° C.

| Treatment | Test | | | | | |
|-----------|-----------------------|-----------------------------|------------------------------|-----------------------|--------------------------|--------------------------|
| | T.C 10 ⁶ x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
| CR | 80 | 2 | 13 | - | - | - |
| T1" | 99 | 1 | 1١ | - | - | - |
| T2" | 109 | 3 | ١٩ | - | - | - |
| T3" | 111 | 1 | 20 | - | - | - |
| T4" | 109 | - | 38 | - | - | - |
| T5" | 117 | - | 45 | - | - | - |
| T6" | 98 | - | 56 | - | - | - |

Table (13) Microbiological properties of Yoghurt fortified with skim milk powder and retentate powder after 14 days of storage in 4-5° C.

| Test Treatment | T.C 10 ⁶ x | Lipolytic 10 ³ x | Protolytic 10 ³ x | M&Y 10 ³ x | E.coli 10 ³ x | Staph. 10 ³ x |
|-------------------|--------------------------|--------------------------------|---------------------------------|--------------------------|-----------------------------|-----------------------------|
| CR | 95 | 2 | 9\ | - | - | |
| T1" | 101 | 1 | 18 | - | - | |
| T2" | 120 | 3 | 25 | - | - | - |
| T3" | 131 | 1 | 26 | - | - | - |
| T4" | 118 | - | 46 | - | - | - |
| T5" | 125 | - | 55 | - | - | - |
| T6" | 112 | - | 66 | - | - | - |

Table (14) Organoleptic properties of yoghurt from buffalo milk fortified with skim milk powder and retentate powder.

| Treatments | Appearance 10 | Body & Texture 40 | Flavor 50 | Total 100 |
|------------|------------------|----------------------|--------------|--------------|
| CN | 3 | 32 | 35 | 70 |
| T1 | 7 | 30 | 32 | 69 |
| T2 | 8 | 30 | 41 | 79 |
| T3 | 9 | 28 | 40 | 77 |
| T4 | 7 | 31 | 43 | 81 |
| T5 | 7 | 30 | 40 | 77 |
| T6 | 7 | 30 | 42 | 79 |

(CN) control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

Table (15) Organoleptic properties of yoghurt from buffalo milk fortified with skim milk powder and retentate powder after 7 days of storage in 4-5° C.

| Treatments | Appearance 10 | Body & Texture 40 | Flavor 50 | Total points 100 |
|------------|------------------|----------------------|--------------|---------------------|
| CN | 7 | 28 | 49 | 84 |
| T1 | 7 | 32 | 42 | 81 |
| T2 | 7 | 39 | 39 | 85 |
| T3 | 8 | 39 | 42 | 89 |
| T4 | 9 | 37 | 44 | 91 |
| T5 | 6 | 36 | 39 | 81 |
| T6 | 10 | 39 | 40 | 89 |

Data presented in Tables (14,15 and 16) show that yoghurt made from buffalo milk+1% Retentate had the highest organoleptic- scoring points whether ,when it was fresh or after cold storage for 7 or 14 days. It had 81when it was fresh and 91 and 96 after 7and 14 days of storage ,respectively .

From Tables (17,18 and 19)show that yoghurt made from retentate +3% retentate powder had the highest organoleptic- scoring points whether ,when it was fresh or after cold storage for 7 or 14 days. It had 81when it was fresh and 89 and 92 after 7and 14 days of storage, respectively .

Table (16) Organoleptic properties of yoghurt from buffalo milk fortified with skim milk powder and retentate powder after 14 days of storage in 4-5° C.

| Treatments | Appearance 10 | Body &Texture 40 | Flavor 50 | Total points 100 |
|------------|------------------|---------------------|--------------|---------------------|
| CN | 7 | 30 | 37 | 74 |
| T1 | 5 | 37 | 40 | 82 |
| T2 | 8 | 37 | 40 | 85 |
| T3 | 8 | 35 | 45 | 88 |
| T4 | 9 | 38 | 49 | 96 |
| T5 | 9 | 36 | 45 | 90 |
| T6 | 9 | 38 | 47 | 94 |

Table (17) Organoleptic properties of yoghurt made from retentate fortified with skim milk powder and retentate powder.

| Treatments | Appearance 10 | Body &Texture 40 | Flavor 50 | Total points 100 |
|------------|------------------|---------------------|--------------|---------------------|
| CR | 5 | 30 | 30 | 65 |
| T1" | 5 | 30 | 35 | 70 |
| T2" | 5 | 28 | 40 | 73 |
| T3" | 5 | 34 | 40 | 79 |
| T4" | 4 | 31 | 40 | 75 |
| T5" | 4 | 30 | 44 | 78 |
| T6" | 6 | 32 | 43 | 81 |

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder

Table (18) Organoleptic properties of yoghurt fortified with skim milk powder and retentate powder after 7 days of storage in 4-5° C.

| Treatments | Appearance 10 | Body &Texture 40 | Flavor 50 | Total points 100 |
|------------|------------------|---------------------|--------------|---------------------|
| CR | 8 | 31 | 45 | 84 |
| T1" | 8 | 27 | 43 | 78 |
| T2" | 6 | 36 | 39 | 81 |
| T3" | 7 | 29 | 49 | 85 |
| T4" | 6 | 31 | 44 | 81 |
| T5" | 9 | 29 | 45 | 83 |
| T6" | 8 | 38 | 43 | 89 |

Table (19) Organoleptic properties of yoghurt fortified with skim milk powder and retentate powder after 14 days of storage in 4-5° C.

| Treatments | Appearance 10 | Body & Texture 40 | Flavor 50 | Total points 100 |
|------------|------------------|----------------------|--------------|---------------------|
| CR | 7 | 34 | 45 | 86 |
| T1" | 7 | 32 | 40 | 79 |
| T2" | 6 | 36 | 41 | 83 |
| T3" | 7 | 35 | 43 | 85 |
| T4" | 8 | 35 | 45 | 88 |
| T5" | 7 | 33 | 43 | 83 |
| T6" | 9 | 37 | 46 | 92 |

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**تأثير تدعيم الألبان المختمرة المصنعة من اللبن الجاموسى و مركز اللبن باللبن
الفرز المجفف و مركز اللبن المجفف على جودة الألبان المختمرة.**

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عند صناعة اللبن المختمر من اللبن الجاموسى و مركز اللبن بعد تعديله لنفس تركيب اللبن الجاموسى
مع تدعيمه بمستويات مختلفة من اللبن الفرز المجفف و مركز اللبن المجفف أثبتت النتائج ارتفاع جودة
الألبان المختمرة من الناحية الكيميائية و البكتريولوجية و الحسية عند صناعتها من اللبن الجاموسى المدعم بـ
١% مركز لبن مجفف و كذلك عند صناعتها من مركز اللبن المدعم بمركز لبن مجفف بنسبة ٣% .

Table (3)Effect of S.N.F. level on PH and acidity of fortified with different levels of skim milk powder and retentate powder yoghurt during storage.

| Treatments | Storage period (days) | | | | | | | | | | | | | | | | | | | |
|------------|--|--------|---------|---------|-----|---------|-----|---------|-----|------------|-------------------------------------|--------|---------|---------|-----|---------|-----|---------|------|--|
| | yoghurt manufactured from buffalo milk | | | | | | | | | | yoghurt manufactured from retentate | | | | | | | | | |
| | S.N.F% | | | fresh | | 7 days | | 14 days | | | S.N.F% | | | fresh | | 7 days | | 14 days | | |
| | fresh | 7 days | 14 days | Acidity | PH | Acidity | PH | Acidity | PH | | fresh | 7 days | 14 days | Acidity | PH | Acidity | PH | Acidity | PH | |
| CN | 10 | 10 | 11.3 | 0.78 | 4.7 | 1.2 | 4.4 | 1.27 | 4.2 | CR | 10 | 11 | 11.5 | 0.86 | 4.5 | 1.0 | 4.3 | 1.06 | 4.21 | |
| T1 | 11.5 | 12.4 | 12.9 | 0.85 | 4.5 | 1.6 | 4.2 | 1.65 | 4.0 | T1" | 11.5 | 12 | 12.3 | 1.30 | 4.3 | 1.6 | 4.1 | 1.19 | 3.9 | |
| T2 | 13.4 | 14.4 | 14.5 | 0.87 | 4.4 | 1.9 | 4.1 | 2.02 | 3.9 | T2" | 13.4 | 13.9 | 14.8 | 1.63 | 4.1 | 2.1 | 3.9 | 1.43 | 3.75 | |
| T3 | 14.9 | 15.1 | 15.4 | 0.91 | 4.2 | 2.3 | 3.8 | 2.35 | 3.4 | T3" | 14.7 | 15.9 | 17.1 | 1.85 | 3.8 | 2.5 | 3.5 | 1.53 | 3.3 | |
| T4 | 11.9 | 13.5 | 13.4 | 0.83 | 4.6 | 1.3 | 4.3 | 1.57 | 4.1 | T4" | 11.8 | 12.4 | 13.1 | 0.94 | 4.2 | 1.6 | 4.0 | 1.15 | 3.91 | |
| T5 | 13.7 | 14.2 | 14.2 | 0.86 | 4.5 | 1.6 | 4.2 | 1.64 | 4.0 | T5" | 13 | 14 | 14.9 | 1.38 | 4 | 1.8 | 3.8 | 1.24 | 3.5 | |
| T6 | 15.2 | 15.3 | 15.6 | 0.88 | 4.4 | 2.03 | 4.0 | 1.93 | 3.9 | T6" | 14.9 | 15.6 | 16.4 | 1.54 | 4.1 | 1.9 | 3.9 | 1.27 | 3.7 | |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder

Table (4) Effect of S.N.F. level on cured tension of fortified with different levels of skim milk powder and retentate powder yoghurt during storage.

| Treatments | Storage period (days) | | | | | | | | | | | | |
|------------|--|--------|---------|------------------|--------|---------|-------------------------------------|-------|--------|------------------|-------|--------|---------|
| | yoghurt manufactured from buffalo milk | | | | | | yoghurt manufactured from Retentate | | | | | | |
| | S.N.F% | | | Curd tension(gm) | | | S.N.F% | | | Curd tension(gm) | | | |
| | fresh | 7 days | 14 days | fresh | 7 days | 14 days | | fresh | 7 days | 14 days | fresh | 7 days | 14 days |
| CN | 10 | 10 | 11.3 | 4.9 | 5.1 | 5.3 | CR | 10 | 11 | 11.5 | 4.6 | 4.9 | 5.2 |
| T1 | 11.5 | 12.4 | 12.9 | 5.1 | 5.3 | 5.6 | T1" | 11.5 | 12 | 12.3 | 4.2 | 4.5 | 4.6 |
| T2 | 13.4 | 14.4 | 14.5 | 5.3 | 5.4 | 5.8 | T2" | 13.4 | 13.9 | 14.8 | 4.8 | 5.1 | 5.3 |
| T3 | 14.9 | 15.1 | 15.4 | 5.3 | 5.5 | 5.9 | T3" | 14.7 | 15.9 | 17.1 | 5.2 | 5.5 | 5.7 |
| T4 | 11.9 | 13.5 | 13.4 | 5.6 | 5.9 | 6.3 | T4" | 11.8 | 12.4 | 13.1 | 4.6 | 5.1 | 5.5 |
| T5 | 13.7 | 14.2 | 14.2 | 5.9 | 6.1 | 6.4 | T5" | 13 | 14 | 14.9 | 5.3 | 5.6 | 5.7 |
| T6 | 15.2 | 15.3 | 15.6 | 6.5 | 6.8 | 7.5 | T6" | 14.9 | 15.6 | 16.4 | 5.6 | 6.2 | 6.4 |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder

Table (6)Effect of storage period on the Fat and T.V.F.F.A contents in fortified with different levels of skim milk and retentate yoghurt during storage.

| Treatments | Storage period (days) | | | | | | | | | | | | |
|------------|--|--------|---------|-------------------|--------|---------|-------------------------------------|--------|---------|-------------------|--------|---------|------|
| | yoghurt manufactured from buffalo milk | | | | | | yoghurt manufactured from Retentate | | | | | | |
| | F% | | | T.V.F.F.A mg/100g | | | F% | | | T.V.F.F.A mg/100g | | | |
| | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | |
| CN | 5.5 | 5.6 | 5.8 | 1.51 | 1.93 | 2.02 | CR | 5.5 | 5.7 | 5.9 | 0.54 | 0.53 | 0.51 |
| T1 | 4.8 | 4.8 | 5.1 | 1.73 | 1.95 | 2.08 | T1" | 4.6 | 5.1 | 5.6 | 0.55 | 0.55 | 0.54 |
| T2 | 4.1 | 4.2 | 4.5 | 1.91 | 2.21 | 2.24 | T2" | 4 | 4.4 | 4.7 | 0.59 | 0.58 | 0.56 |
| T3 | 3.7 | 4.0 | 4.2 | 2.01 | 2.33 | 3.10 | T3" | 3.8 | 3.8 | 4.1 | 0.67 | 0.65 | 0.63 |
| T4 | 4.3 | 4.6 | 4.9 | 1.55 | 1.64 | 1.73 | T4" | 4.8 | 4.9 | 5.3 | 0.55 | 0.54 | 0.53 |
| T5 | 4.4 | 4.7 | 5.3 | 1.63 | 1.74 | 2.14 | T5" | 4.5 | 4.5 | 4.9 | 0.58 | 0.56 | 0.55 |
| T6 | 4.1 | 4.5 | 4.9 | 1.72 | 1.83 | 2.35 | T6" | 4.2 | 4.3 | 4.8 | 0.59 | 0.58 | 0.58 |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder

Table (7) Effect of storage period on the Total nitrogen, Soluble nitrogen and Non- protein nitrogen contents in fortified with different levels of skim milk powder and retentate powder yoghurt during storage.

| Treatments | Storage period (days) | | | | | | | | | | | | | | | | | | | |
|------------|--|--------|---------|-------------------|--------|---------|------------------------|--------|---------|--|--------|---------|-------------------|--------|---------|------------------------|--------|---------|-------|--------|
| | yoghurt manufactured from buffalo milk | | | | | | | | | yoghurt manufactured from UF Retentate | | | | | | | | | | |
| | Total nitrogen% | | | Soluble nitrogen% | | | Non- protein nitrogen% | | | Total nitrogen% | | | Soluble nitrogen% | | | Non- protein nitrogen% | | | | |
| | fresh | 7 days | 14 days | Fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days | 14 days | fresh | 7 days |
| CN | 0.7 | 0.81 | 0.83 | 0.079 | 0.111 | 0.118 | 0.0203 | 0.018 | 0.016 | CR | 0.989 | 1 | 1.01 | 0.079 | 0.083 | 0.104 | 0.013 | 0.023 | 0.025 | |
| T1 | 0.672 | 0.69 | 0.71 | 0.085 | 0.113 | 0.121 | 0.0213 | 0.016 | 0.015 | T1" | 1.02 | 1.05 | 1.05 | 0.088 | 0.095 | 0.108 | 0.0133 | 0.023 | 0.025 | |
| T2 | 0.77 | 0.81 | 0.84 | 0.093 | 0.121 | 0.129 | 0.0229 | 0.017 | 0.015 | T2" | 1.07 | 1.09 | 1.11 | 0.100 | 0.113 | 0.114 | 0.0139 | 0.025 | 0.026 | |
| T3 | 0.84 | 1.01 | 1.04 | 0.099 | 0.123 | 0.131 | 0.0246 | 0.019 | 0.017 | T3" | 1.17 | 1.19 | 1.20 | 0.103 | 0.117 | 0.118 | 0.0143 | 0.026 | 0.028 | |
| T4 | 0.77 | 0.93 | 0.97 | 0.086 | 0.116 | 0.125 | 0.0235 | 0.018 | 0.017 | T4" | 1.21 | 1.23 | 1.24 | 0.090 | 0.097 | 0.111 | 0.015 | 0.026 | 0.029 | |
| T5 | 0.87 | 1.03 | 1.05 | 0.085 | 0.120 | 0.129 | 0.0248 | 0.019 | 0.018 | T5" | 1.25 | 1.32 | 1.36 | 0.092 | 0.110 | 0.118 | 0.017 | 0.027 | 0.031 | |
| T6 | 1.04 | 1.15 | 1.18 | 0.107 | 0.141 | 0.148 | 0.0336 | 0.026 | 0.023 | T6" | 1.40 | 1.45 | 1.45 | 0.111 | 0.128 | 0.135 | 0.020 | 0.035 | 0.039 | |

(CN)control: yoghurt made from buffalo milk

T1: yoghurt made from buffalo milk +1%skim milk T 4: yoghurt made from buffalo milk +1%retentate powder

T2: yoghurt made from buffalo milk +2%skim milk T5: yoghurt made from buffalo milk +2%retentate powder

T3: yoghurt made from buffalo milk +3%skim milk T6: yoghurt made from buffalo milk +3%retentate powder

(CR)control: yoghurt made from retentate

T1": yoghurt made from retentate+1%skim milk T 4": yoghurt made from retentate+1%retentate powder

T2": yoghurt made from retentate+2%skim milk T5": yoghurt made from retentate+2%retentate powder

T3": yoghurt made from retentate+3%skim milk T6": yoghurt made from retentate+3%retentate powder