

CHEMICAL AND MICROBIOLOGICAL EVALUATION OF SOME DIFFERENT SOFT CHEESE

ABO EL-MAKAREM, H.S.¹, SABER, A.S.² and EL ASUOTY, M.S.²

¹ Lecturer at Food Hygiene Department, Fac. Vet. Med. Alex. Univ.

² Researcher of Food Hygiene Unit., Animal Health Research Institute, Damanhour Branch, Egypt.

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ABSTRACT

The purpose of this study was to assess the chemical and microbiological quality of some different types of soft cheeses. A total of 100 samples of different soft cheeses included: Kareish, Damietta, Tallaga and double cream cheese (25 of each types) were collected randomly from Damanhour city markets, Egypt and chemically and microbiologically examined. Mean values of acidity and salt percent were 1.97 ± 0.18 , 2.84 ± 0.5 ; 1.36 ± 0.25 , 5.01 ± 0.25 ; 1.0 ± 0.19 , 2.99 ± 0.17 and 0.90 ± 0.32 , 1.8 ± 0.11 in the examined Kareish, Damietta, Tallaga and double cream cheese samples, respectively. Microbiological examination revealed that APC, *Staph. aureus*, coliforms, *E. coli* and mould counts were present in 100, 60, 48, 40, 72% of Kareish cheese, 100, 48, 32, 20, 56 % of Damietta cheese, 100, 44, 40, 24, 64 % of Tallaga cheese and 100, 24, 36, 12, 40 % of double cream cheese, respectively, with mean values $1.2 \times 10^5 \pm 2 \times 10^4$, $1.4 \times 10^3 \pm 8 \times 10^2$, $1.5 \times 10^4 \pm 4 \times 10^3$, $8 \times 10^3 \pm 3 \times 10^3$, $2.5 \times 10^4 \pm 6 \times 10^3$ of Kareish cheese, $7.8 \times 10^4 \pm 8 \times 10^3$, $2.8 \times 10^3 \pm 6 \times 10^2$, $1.6 \times 10^3 \pm 5 \times 10^2$, $2.0 \times 10^2 \pm 9 \times 10$, $4 \times 10^3 \pm 1 \times 10^3$ of Damietta cheese, $1.1 \times 10^5 \pm 1 \times 10^4$, $1.7 \times 10^3 \pm 5 \times 10^2$, $3 \times 10^3 \pm 1 \times 10^3$, $1.3 \times 10^3 \pm 5 \times 10^2$, $2.2 \times 10^3 \pm 6 \times 10^2$ of Tallaga cheese and $8 \times 10^4 \pm 1 \times 10^4$, $4 \times 10^2 \pm 2 \times 10^2$, $9 \times 10^2 \pm 3 \times 10^2$, $1.0 \times 10^2 \pm 6 \times 10$, $6 \times 10^3 \pm 2 \times 10^3$ of double cream cheese, respectively. All examined samples of different kinds of soft cheese were free from listeria species. The obtained results indicated unhygienic conditions applied during production, handling and distribution of different soft cheese so, we recommended application of strict hygienic measures during all stages of production.

Key words: Soft cheese, APC, *Staph. aureus*, Coliforms, *E. coli*, moulds,

INTRODUCTION

In Egypt, soft cheese is manufactured from cow or buffalo milk or a mixture of them according to the Egyptian cheese-making technology. Cheese has a great nutritional value for human consumption as its fat and protein have a high biological value and contains all essential fatty and amino acids. Also, it is considered as a source of vitamins and minerals. However, cheese is very susceptible to bacterial and mould growth and is normally kept under refrigeration (Awad *et al.*, 2012).

Damietta cheese is the most popular local type of pickled soft cheeses by all socioeconomic classes in Egypt due to its nutritional value, convenience and good taste, when fully ripened, it has strong sharp

flavor as well as smooth body and texture (Kanka *et al.*, 2007). Also, Kareish cheese is a soft cheese commonly made and consumed in Egypt as it is rich in protein, amino acids, calcium, phosphorus, vitamins and many micronutrients. Environmental conditions prevailing during storage, combined with the composition of the cheese often create possibilities for extensive development of mould on cheese surface, which reduces considerably its quality (Reps *et al.*, 2002). The microbiological quality of cheese is influenced by initial flora of raw milk, equipment and environmental hygiene during manufacturing, packaging and handling (Robinson and Tamime 2002).

Microbial contamination of cheese may originate from various sources, during cheese production as: brine, floor, packaging material, cheese vat, cheese cloth, curd cutting knife, cold room and air of production room (Temelli *et al.*, 2006).

Coliform bacteria are the main contaminants of raw milk and dairy products, including fresh cheeses.

Corresponding author: Dr. EL ASUOTY, M.S

E-mail address: mido_15158@hotmail.com

Present address: Researcher at Food Hygiene Unit., Animal Health Research Institute, Damanhour Branch, Egypt.

Coliforms are easily destroyed by heat treatments usually employed for milk, being an indicator of process failures or post-processing contamination in pasteurized milk (Okura *et al.*, 2010). Among all microorganisms *Escherichia coli* is frequently contaminating organism, and is reliable indicator of faecal pollution generally in unsanitary conditions of water, food, milk and other dairy products (Soomro *et al.*, 2002).

Staphylococcus aureus has a potential importance to the public health because of its ability to produce enterotoxins, resulting in staphylococcal food intoxication (Hill 1983) Presence of *Staphylococcus aureus* may be attributed to inadequate heat treatment, unhygienic handling practices, use of contaminated containers, faulty storage and transportation (Gill *et al.*, 1994).

Fungal growth on cheese is a common problem for the cheese manufacture during ripening and curing as well as for the retailer and consumer during refrigeration storage. Species of *Penicillium* and *Aspergillus* are the most common contaminants of cheese (Gandomi *et al.*, 2004). By the searching in the medical references, it was observed that, most of this fungi had the ability to induce human and animal pathogenicity or produced toxins (Ghibaud and Peano 2010).

This study was conducted to evaluate the chemical quality and microbiological status of some locally manufactured different kinds of soft cheeses sold in Damanhur city, El-Behera governorate, Egypt, including Kareish, Damietta, Tallaga and double cream cheese, such cheese is mostly contaminated with different types of organisms gaining access to the product from various sources during production, handling and distribution.

MATERIALS AND METHODS

1. Collection of samples:

A total of 100 samples of different cheese (Kareish, Damietta, Tallaga and double cream cheese samples) 25 of each were collected randomly from supermarkets, and street-vendors at Damanhour city, Egypt. The samples were transferred directly in an icebox at 4 ± 1 °C to the laboratory with a minimum

of delay to be examined. Preparation of the samples was carried out according to (APHA 2004).

2. Chemical evaluation of examined cheese samples: Salt content was determined according to AOAC (2005) and determination of acidity percent according to Atherton and Newlander (1977).

3. Microbiological evaluation of examined cheese samples:

Representative 10 g. of each sample was aseptically homogenized in 90 ml of a sterile 2% sodium citrate solution, in a stomacher for 1 minute. Decimal dilutions were prepared in 0.1% sterile peptone water and appropriate dilutions were used to enumerate the following as described by Roberts and Greenwood (2003).

3.1. Aerobic plate count (APC) was carried out as the conventional method, FDA (2002) using plate count agar (Oxoid).

3.2. *Staphylococcus aureus* was counted using Baird Parker medium after incubation at 35°C for 24- 48 hours (Oxoid 2006).

3.3. Coliforms count was determined using plate method onto plates of violet red bile agar (Difco) according to the method reported by FDA (2002).

3.4. *E.coli* count on Eosin Methylene Blue Agar (E.M.B.) at 35 ± 0.5 °C for 24 hours according to FDA (2002).

3.5. Mould count according to (APHA 2004).

3.6. Isolation and identification of listeria species according to the methods prescribed by (Hitchins 2003).

4. Statistical analysis:

The results are expressed as the mean \pm SE. Data analysis was preformed SPSS program (2008) (Statistical Package for Social Science, version 10).

RESULTS

Results are illustrated in Tables (1-8) and Fig. (1-5).

Table 1: Statistical analytical results of acidity percent of different examined soft cheese samples (n=25 of each).

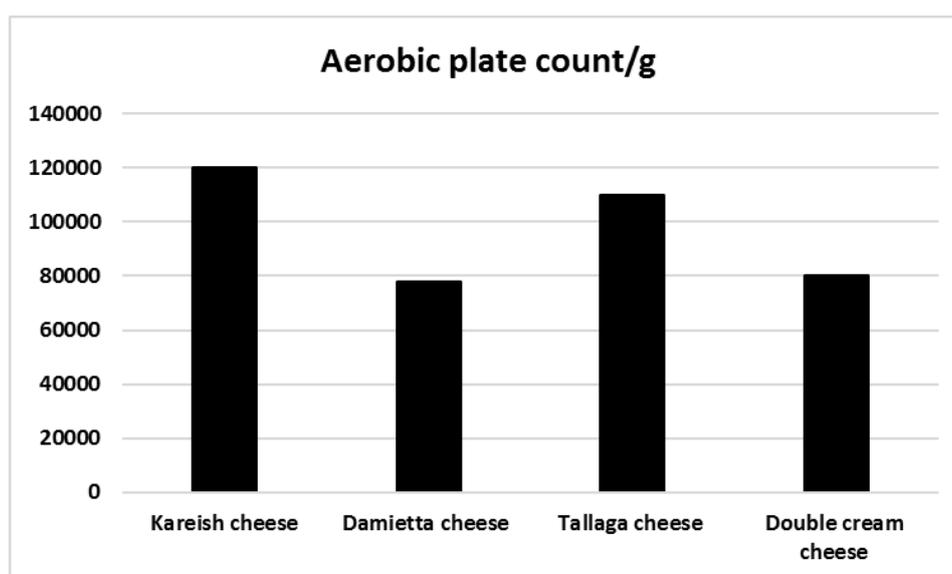
| Sample category | Acidity percent | | |
|--------------------|-----------------|---------|-----------------|
| | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 1.4 | 2.9 | 1.97 \pm 0.18 |
| Damietta cheese | 0.25 | 2.5 | 1.36 \pm 0.25 |
| Tallaga cheese | 0.50 | 1.9 | 1.0 \pm 0.19 |
| Double cream chees | 0.30 | 1.20 | 0.90 \pm 0.32 |

Table 2: Statistical analytical results of salt content of different examined soft cheese samples (n=25 of each).

| Sample category | Salt content | | |
|--------------------|--------------|---------|-----------------|
| | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 0.45 | 5.20 | 2.84 \pm 0.5 |
| Damietta cheese | 3.90 | 6.50 | 5.01 \pm 0.25 |
| Tallaga cheese | 2.10 | 3.70 | 2.99 \pm 0.17 |
| Double cream chees | 1.30 | 2.20 | 1.8 \pm 0.11 |

Table 3: Statistical analytical results of APC (cfu/g) of different types of soft cheese (n=25 of each).

| Sample category | Aerobic plate count | | |
|---------------------|---------------------|-------------------|-------------------------------------|
| | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 2.7 $\times 10^4$ | 2.9 $\times 10^5$ | 1.2 $\times 10^5 \pm 2 \times 10^4$ |
| Damietta cheese | 5.5 $\times 10^3$ | 1.3 $\times 10^5$ | 7.8 $\times 10^4 \pm 8 \times 10^3$ |
| Tallaga cheese | 2.5 $\times 10^4$ | 2.2 $\times 10^5$ | 1.1 $\times 10^5 \pm 1 \times 10^4$ |
| Double cream cheese | 4.3 $\times 10^3$ | 1.5 $\times 10^5$ | 8 $\times 10^4 \pm 1 \times 10^4$ |

**Fig. 1:** Mean values APC (cfu/g) for different Egyptian soft cheese**Table 4:** Statistical analytical results of *Staph. aureus* count /g of different types of soft cheese (n=25 of each).

| Sample category | Positive samples | | <i>Staphylococcus aureus</i> count/g | | |
|---------------------|------------------|----|--------------------------------------|-------------------|-------------------------------------|
| | No | % | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 15 | 60 | < 100 cfu/g* | 2.1 $\times 10^4$ | 1.4 $\times 10^3 \pm 8 \times 10^2$ |
| Damietta cheese | 12 | 48 | < 100cfu/g* | 9.8 $\times 10^3$ | 2.8 $\times 10^3 \pm 6 \times 10^2$ |
| Tallaga cheese | 11 | 44 | < 100cfu/g* | 8.3 $\times 10^3$ | 1.7 $\times 10^3 \pm 5 \times 10^2$ |
| Double cream cheese | 6 | 24 | < 100 cfu/g* | 3.0 $\times 10^3$ | 4 $\times 10^2 \pm 2 \times 10^2$ |

* Calculated as zero in statistical analysis

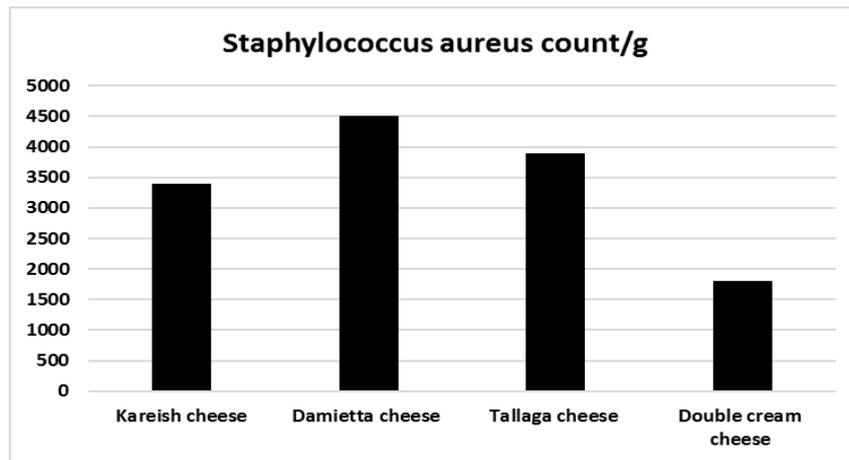


Fig. 2: Mean values of *Staphylococcus aureus* count for different soft cheese.

Table 5: Statistical analytical results of total Coliforms count /g of different types of soft cheese (n=25 of each).

| Sample category | Positive samples | | Total coliforms count /g | | |
|---------------------|------------------|----|--------------------------|-------------------|-------------------------------------|
| | No | % | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 12 | 48 | < 10 cfu/g* | 7.2×10^4 | $1.5 \times 10^4 \pm 4 \times 10^3$ |
| Damietta cheese | 8 | 32 | < 10 cfu/g* | 8.8×10^3 | $1.6 \times 10^3 \pm 5 \times 10^2$ |
| Tallaga cheese | 10 | 40 | < 10 cfu/g* | 2.0×10^4 | $3 \times 10^3 \pm 1 \times 10^3$ |
| Double cream cheese | 9 | 36 | < 10 cfu/g* | 4.4×10^3 | $9 \times 10^2 \pm 3 \times 10^2$ |

* Calculated as zero in statistical analysis

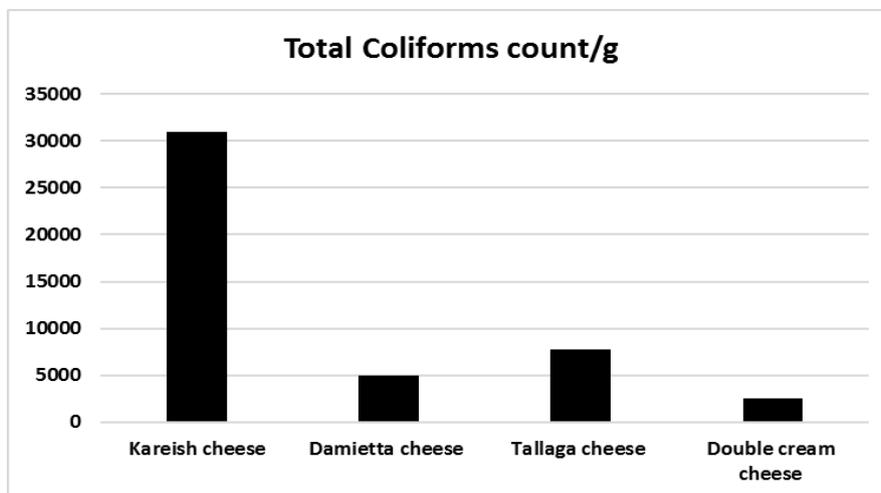


Fig. 3: Mean values of total Coliforms count for different soft cheese.

Table 6: Statistical analytical results of *E. coli* count/g of different types of soft cheese (n=25 of each).

| Sample category | Positive samples | | <i>E. coli</i> /g | | |
|---------------------|------------------|----|-------------------|-------------------|-------------------------------------|
| | No | % | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 10 | 40 | < 10 cfu/g* | 4.5×10^4 | $8 \times 10^3 \pm 3 \times 10^3$ |
| Damietta cheese | 5 | 20 | < 10 cfu/g* | 2.0×10^3 | $2.0 \times 10^2 \pm 9 \times 10$ |
| Tallaga cheese | 6 | 24 | < 10 cfu/g* | 9.0×10^3 | $1.3 \times 10^3 \pm 5 \times 10^2$ |
| Double cream cheese | 3 | 12 | < 10 cfu/g* | 1.3×10^3 | $1.0 \times 10^2 \pm 6 \times 10$ |

* Calculated as zero in statistical analysis

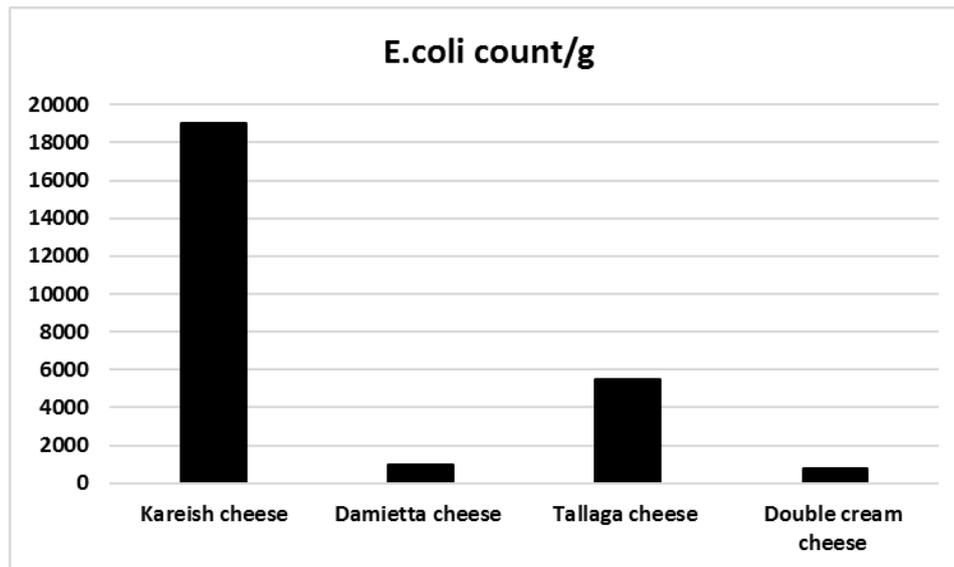


Fig. 4: Mean values of *E. coli* count for different soft cheese.

Table 7: Statistical analytical results total mould count /g of different types of cheese (n=25 of each).

| Sample category | Positive samples | | Total mould count /g | | |
|---------------------|------------------|----|----------------------|-------------------|-------------------------------------|
| | No | % | Minimum | Maximum | Mean \pm SEM |
| Kareish cheese | 18 | 72 | < 10 cfu/g* | 9.5×10^4 | $2.5 \times 10^4 \pm 6 \times 10^3$ |
| Damietta cheese | 14 | 56 | < 10 cfu/g* | 2.0×10^4 | $4 \times 10^3 \pm 1 \times 10^3$ |
| Tallaga cheese | 16 | 64 | < 10 cfu/g* | 1.5×10^4 | $2.2 \times 10^3 \pm 6 \times 10^2$ |
| Double cream cheese | 10 | 40 | < 10 cfu/g* | 3.0×10^4 | $6 \times 10^3 \pm 2 \times 10^3$ |

* Calculated as zero in statistical analysis

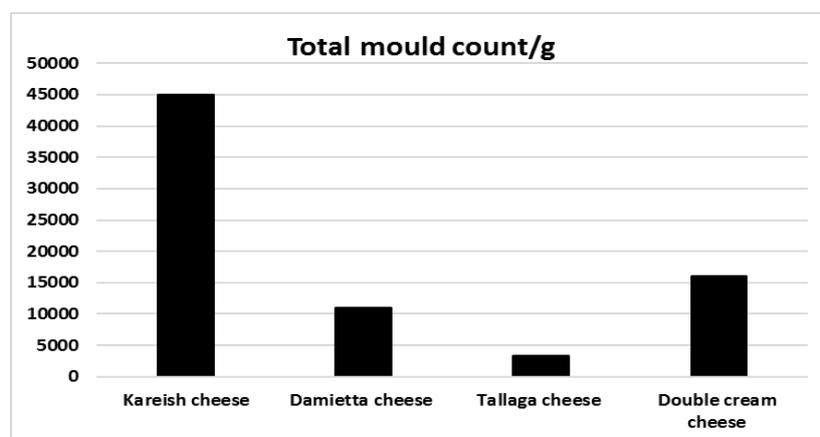


Fig. 5: Mean values of total mould count for different types of soft cheese

Table 8: Comparison the obtained results of coliforms, *staph. aureus*, *E. coli* and yeast and moulds in different examined soft cheese with Egyptian standard, 2005.

| Coliforms count | | | | | | |
|-----------------------------|-------------------------|---------------------------|--------------------------------|-----|-----------------------------------|----|
| Products | No. of examined samples | Egyptian Standard, (2005) | Comply with Egyptian standards | | Not comply with Egyptian standard | |
| | | | NO | % | NO | % |
| Kareish cheese | 25 | 10 cfu / g | 13 | 52 | 12 | 48 |
| Damietta cheese | 25 | 10 cfu / g | 17 | 68 | 8 | 32 |
| Tallaga cheese | 25 | 10 cfu/ g | 15 | 60 | 10 | 40 |
| Double cream cheese | 25 | 10 cfu/ g | 16 | 64 | 9 | 36 |
| Staphylococcus aureus count | | | | | | |
| Kareish cheese | 25 | Free | 10 | 40 | 15 | 60 |
| Damietta cheese | 25 | Free | 13 | 52 | 12 | 48 |
| Tallaga cheese | 25 | Free | 14 | 56 | 11 | 44 |
| Double cream cheese | 25 | Free | 19 | 76 | 6 | 24 |
| E. coli count | | | | | | |
| Kareish cheese | 25 | Free | 15 | 60 | 10 | 40 |
| Damietta cheese | 25 | Free | 20 | 80 | 5 | 20 |
| Tallaga cheese | 25 | Free | 19 | 76 | 6 | 24 |
| Double cream cheese | 25 | Free | 22 | 88 | 3 | 12 |
| listeria species | | | | | | |
| Four Types of cheese | 100 | Free | 100 | 100 | 0 | 0 |
| Mould counts | | | | | | |
| Kareish cheese | 25 | Not more than 10 cfu/g | 7 | 28 | 18 | 72 |
| Damietta cheese | 25 | Not more than 10 cfu/g | 11 | 44 | 14 | 56 |
| Tallaga cheese | 25 | Not more than 10 cfu/g | 9 | 36 | 16 | 64 |
| Double cream cheese | 25 | Not more than 10 cfu/g | 15 | 60 | 10 | 40 |

DISCUSSION

Results recorded in Table 1 revealed that the mean value of titra table acidity percent of examined kareish, Damietta, Tallaga and double cream cheeses samples were 1.97 ± 0.18 , 1.36 ± 0.25 , 1.0 ± 0.19 and 0.90 ± 0.32 , respectively, with a range of 1.4 to 2.9, 0.25 to 2.5, 0.50 to 1.9 and 0.30 to 1.20 % respectively.

Lower acidity percent of kareish and Damietta cheese obtained by Salama *et al.* (2015) as they found that the mean values of acidity % in Kareish cheese and Damietta cheese were 0.79 ± 0.04 and 0.72 ± 0.039 %.

High acidity percent of some examined kareish cheese samples may attributed to the method of its manufacture (farm method) in which skim milk is kept for about 36 hours at room temperature giving the chance for lactic acid or other bacteria to grow and produce acid as its manufacture depends upon acid coagulation (Amer 2002). Relative variations in acidity percent of the examined Damietta cheese samples may be attributed to variation in manufacturing process, ripening periods, temperature

of storage and/ or age of cheese samples (Mohamed 2016). Generally, delayed manufacturing process, prolonged ripening period, warm storage temperature and aging of cheese increasing the acidity percent of such product (Mohamed 2016).

Results presented in Table 2 showed that the mean values of salt content of examined Kareish, Damietta, Tallaga and Double cream cheese samples were 2.84 ± 0.5 , 5.01 ± 0.25 , 2.99 ± 0.17 and 1.8 ± 0.11 , respectively. With a range of 0.45 to 5.20, 3.90 to 6.50, 2.10 to 3.70 and 1.30 to 2.20 %, respectively. According to Egyptian standard (1008-3/2005) which stipulated that salt content in Damietta cheese should not be more than 9%, all examined Damietta cheese samples were within the permissible limit.

Higher salt content of kareish cheese obtained by Salama *et al.* (2015) they reported that the mean value of sodium chloride content was 5.28 ± 0.14 , while the obtained result of salt content in Damietta cheese nearly similar to mean value of sodium chloride content obtained by Salama *et al.* (2015) they reported that mean values of sodium chloride content was 5.10 ± 0.130 .

The microbiological quality of white soft cheese in different Egyptian varieties affected by different salt concentrations, acidity percent as kareish cheese is acid coagulated while Damietta cheese is enzyme coagulated, ripening in brine solutions and keeping temperatures (El-Sayed *et al.*, 2011).

Data in Table 3 revealed that the APC was detected in all examined samples of Kareish, Damietta, Tallaga and double cream cheese, ranged between 2.7×10^4 and 2.9×10^5 , 5.5×10^3 and 1.3×10^5 , 2.5×10^4 and 2.2×10^5 , 4.3×10^3 and 1.5×10^5 cfu/gm, with mean value of $1.2 \times 10^5 \pm 2 \times 10^4$, $7.8 \times 10^4 \pm 8 \times 10^3$, $1.1 \times 10^5 \pm 1 \times 10^4$ and $8 \times 10^4 \pm 1 \times 10^4$ cfu/gm, respectively.

The present data of kareish cheese are in agreement with those obtained by El-Sayed *et al.* (2011). Higher results of APC in kareish cheese was obtained by Metwalli (2011) who found that the APC of Kareish cheese ranged between 50 and 21×10^7 cfu/gm. Also, Hassan and Gomaa (2016) reported that total colony count of examined Damietta cheese in Cairo was ranged from 9×10^2 to 3×10^6 with a mean value of $1.7 \times 10^5 \pm 9.6 \times 10^4$. Higher results of APC in kareish cheese reported by Baraheem *et al.* (2007) who reported that the mean \pm SD of APC in opened and packaged kareish cheese were $1.1 \times 10^9 \pm 1.6 \times 10^9$ and $2.4 \times 10^8 \pm 7.4 \times 10^8$, respectively and, Hassan and Gomaa (2016) reported that total colony count of Kareish cheese samples in Cairo was ranged from 2×10^2 to 1×10^7 with a mean value of $1.7 \times 10^6 \pm 3.8 \times 10^5$.

The relatively high total bacterial count in the examined cheese samples revealed that such cheese exposed to contamination during the various stages of production, handling and distribution (Halawa and Moawad 1999). Soft cheese with high pH value and high moisture content will support growth of a wide range of microorganisms (Varnam and Sutherland 1994).

Regarding to data in Table 4 The incidence of *Staphylococcus aureus* were 60, 48, 44 and 24 % in Kareish, Damietta, Tallaga and double cream cheeses samples, respectively, with respective mean values $1.4 \times 10^3 \pm 8 \times 10^2$, $2.8 \times 10^3 \pm 6 \times 10^2$, $1.7 \times 10^3 \pm 5 \times 10^2$ and $4 \times 10^2 \pm 2 \times 10^2$ cfu/g. while its range were < 100 to 2.1×10^4 , < 100 to 9.8×10^3 , < 100 to 8.3×10^3 and < 100 to 3.0×10^3 cfu/g, respectively. Egyptian Standards (2005) which stated that white soft cheese must be free from *Staph. aureus*, according to this standard 60, 48, 44 and 24% of examined Kareish, Damietta, Tallaga and double cream cheeses samples were incompatible with this limit (Table 8), this mean that all positive samples for *Staph. aureus* was incompatible with this limits. Presence of *Staph. aureus* in cheese may be due to contamination during processing, insufficient pasteurization or from use bad quality starter culture.

Sayed *et al.* (2011) reported that 28 and 84% of the examined Damietta and Tallaga cheese samples had *Staph. aureus* above the allowed limit stated with Egyptian standard, with a mean values 1.7×10^4 and 3.2×10^5 , respectively. Hassan and Gomaa (2016) detected *Staphylococcus aureus* in 49(98%) and 50(100%) of examined Damietta cheese samples in Cairo and Giza with a range (4×10^2 - 4.3×10^5) and from (6×10^2 to 7×10^7), respectively, while in kareish cheese samples *Staph. aureus* was isolated from all examined samples with a range of (1.2×10^2 - 8.1×10^4) and (3×10^2 to 8.2×10^5) in Cairo and Giza, respectively.

Presence of large number of *Staph. aureus* in dairy products is considered a good indicator of personal hygiene of workers with respiratory infections (Kamat *et al.* 1991). Generally, Differences between the results may be based on the differences in the cheese production techniques, storage conditions; type of cheese and whether the milk used was raw or pasteurized. It could be also related to the unclean conditions where the cheese is produced and the personnel involved in production.

Staphylococcal cells can be introduced into raw milk cheeses through one of three pathways: The presence of staphylococcal cells in the raw milk used to produce the cheese; Cross contamination from an infected cheese maker or food handler during or after cheese making cross contamination of contaminated surfaces/machinery during cheese making (Paulin *et al.*, 2011).

Data in Table 5 showed that the incidence of total Coliforms group were 48, 32, 40 and 20% in the examined Kareish, Damietta, Tallaga and double cream cheeses samples, with a mean values of $1.5 \times 10^4 \pm 4 \times 10^3$, $1.6 \times 10^3 \pm 5 \times 10^2$, $3 \times 10^3 \pm 1 \times 10^3$ and $9 \times 10^2 \pm 3 \times 10^2$, respectively. The Standard Egyptian Guidelines allow maximum possible of Coliforms bacterial count in cheese which up to 10 cells/ g. according to these standard 48, 32, 40 and 36% of examined Kareish, Damietta, Tallaga and double cream cheeses samples were not comply with Egyptian standards table (8).

Sayed *et al.* (2011) reported that 12 and 40% of examined Damietta and Tallaga cheese had coliforms count above limits stated by Egyptian standard with mean values of 82.4 and 2.64×10^2 , respectively. Baraheem *et al.* (2007) reported that incidence of total coliforms was 54 (67.5%) of examined kareish cheese samples with mean \pm SD of $7.3 \times 10^2 \pm 9.9 \times 10^2$ and $1.6 \times 10^2 \pm 5.6 \times 10^2$ in opened and packaged kareish cheese respectively. El Sayed *et al.* (2011) found that coliform group and *Escherichia coli* as fecal indicator contamination were implicated in 50 and 24 % of the retailed white soft cheese samples, respectively. Hassan and Gomaa (2016) revealed that coliforms were present in Damietta cheese samples in 45 (90%)

and 50 (100%) and ranged from 3×10^2 to 5.5×10^5 with a mean value of $2.7 \times 10^4 \pm 1.2 \times 10^4$ and from 1×10^2 to 2.2×10^5 with a mean value of $1.6 \times 10^4 \pm 2.3 \times 10^3$ in Cairo and Giza cheese samples while in Kareish cheese all examined samples were contaminated with coliforms with a count ranged from 7×10^2 to 1.8×10^7 with a mean value of $6.1 \times 10^5 \pm 3.5 \times 10^5$ and from 1×10^2 to 8×10^6 with a mean value of $5.8 \times 10^5 \pm 2 \times 10^5$ in Cairo and Giza samples respectively.

High contamination of Kareish cheese with coliforms may be due to the fact that Kareish cheese is sold uncovered and without container which made it good medium for growth and multiplication of different types of spoilage and pathogenic microorganisms (Ibrahim *et al.*, 2015). The variation in total coliforms between Kareish, Damietta, Tallaga and double cream cheeses may be due to the difference in salt concentrations, acidity, and the method of manufacture. Additionally, ripening in brine solution, quality and heat treatment of milk used in the manufacture, handling method, hygienic practices, transportation condition, storage condition and distribution play an important role in its microbial quality.

Coliforms including faecal coliforms and *E. coli* have probably received more attention than most other groups of bacteria owing to their importance as indicator species in routine analysis to ascertain the quality of cheese (Synge 2000).

Data presented in Table 6 revealed that the incidence of *E. coli* was 40, 20, 24 and 12% in the examined Kareish, Damietta, Tallaga and double cream cheeses samples, with a mean values of $8 \times 10^3 \pm 3 \times 10^3$, $2.0 \times 10^2 \pm 9 \times 10$, $1.3 \times 10^3 \pm 5 \times 10^2$ and $1 \times 10^2 \pm 6 \times 10$, respectively. Egyptian standard (2005) stated that cheese samples must be free from *E. coli*, according to these standard 40, 20, 24 and 12% of examined Kareish, Damietta, Tallaga and double cream cheeses samples were not complying with this limits as shown in table (8).

Lower results of *E. coli* incidence in soft cheeses samples obtained by Sayed *et al.* (2011) who reported that 4 and 12 % of examined Damietta and Tallaga cheese had *E. coli* count above limits stated by Egyptian standard with average count 40 and 22.2, respectively, also, Hassan and Elmalt (2008) reported that *E. coli* was recovered from 11 (47.8%) of Kareish cheese samples. While, higher results of *E. coli* incidence obtained by Baraheem *et al.* (2007) who reported that *E. coli* was detected in 60 (75%) of examined kareish samples with mean \pm SD values $3.8 \times 10^2 \pm 8.1 \times 10^2$ and $4.4 \times 10 \pm 9.9 \times 10$, in opened and packaged kareish cheese respectively. Hassan and Gomaa (2016) reported that *E. coli* was detected in 6 (12%), 9 (18%), 9 (18%) and 14 (28%) of the examined Damietta and Kareish cheese in Cairo and

Giza respectively. On the other hand, *E. coli* could be detected in soft cheese by Araujo *et al.* (2002) and Abd Elaal (2008) with incidences of 97.7 and 28 % respectively.

The high incidence and count of *E. coli* in the examined cheese samples reveal lack of proper sanitation and give good indication about faecal contamination as *E. coli* constituted a part of normal intestinal flora in human and some animals (WHO 1995).

Table 7 revealed that the incidence of mould was 72, 56, 64 and 40 % in examined Kareish, Damietta, Tallaga and double cream cheeses samples, respectively. With a mean values $2.5 \times 10^4 \pm 6 \times 10^3$, $4 \times 10^3 \pm 1 \times 10^3$, $2.2 \times 10^3 \pm 6 \times 10^2$ and $6 \times 10 \pm 2 \times 10^3$ cfu/g, respectively. While its range were < 10 to 9.5×10^4 , < 10 to 2.0×10^4 , < 10 to 1.5×10^4 and < 10 to 3.0×10^4 cfu/g, respectively. Egyptian standard (2005) allow maximum possible of mould count in cheese not more than 10 cells /g, according to these standard 72, 56, 64 and 40% of examined Kareish, Damietta, Tallaga and double cream cheeses samples were not complying with this limits as shown in table (8).

The obtained results agree with Sayed *et al.* (2011) who reported that 52 and 84 % of examined Damietta and Tallaga cheese had yeast and mould count above limits stated by Egyptian standard with average count 7.7×10^4 and 1.2×10^5 , respectively. Hassan and Gomaa (2016) reported that total yeasts and moulds count of examined Damietta cheese samples in Cairo and Giza were ranged from 2×10^2 to 2.4×10^6 with a mean value of $1.7 \times 10^5 \pm 6.3 \times 10^4$ and from 1.6×10^2 to 6×10^5 with a mean value of $3.9 \times 10^4 \pm 1.6 \times 10^4$. While in Kareish cheese samples were ranged from 8×10^2 to 3.5×10^6 with a mean value of $4.7 \times 10^4 \pm 1.1 \times 10^4$ and from 6×10^2 to 3.4×10^6 with a mean value of $3.1 \times 10^5 \pm 4.3 \times 10^4$ cfu/ml, respectively.

The major sources of mould in cheese were found in air, equipment and the plastic films of packaging, where air is considered as the major source of cheese contamination (Kure *et al.* 2004). Presence of wild types of moulds is undesirable as they may influence the organoleptic characteristics of the cheeses and can produce mycotoxins which represent a potential health risk (Wouters *et al.* 2002).

The presence of moulds in cheese are objectionable, as they grow at a wide range of temperature and pH values, resulting in spoilage of the product. Their count is used as an index of storability and sanitary quality of the product. Such moulds and yeasts can cause gas and off flavor in cheese due to their proteolytic activity (Osama *et al.* 2014).

In conclusion, the current study indicated that some samples of soft cheese are of inferior quality as result of they produced, handled and distributed under

neglected sanitary measures. The presence of pathogenic bacteria may pose a risk for public health. Therefore, we recommended to implement immediate regulatory measures like good manufacturing practices as well as HACCP system to ensure microbiological safety of different soft cheese.

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التقييم الكيميائي والميكروبيولوجي لبعض انواع الجبن الطرى

حسين أبو المكارم ، صابر على سعد ، محمد سعيد الاسيوطى

Email: mido_15158@hotmail.com

Assiut University web-site: www.aun.edu.eg

الجبن الطرى من أكثر أنواع الجبن المستهلكة في مصر وهناك مصادر عديدة لتلوثها ولذلك تمت هذه الدراسة لتقييم الجودة الكيميائية والميكروبيولوجية لأنواع مختلفة من الأجبان الطرية. تم تجميع ١٠٠ عينة من الأنواع المختلفة ٢٥ عينة من كل نوع (الجبن القريش، الجبن الدمايطى، جبنة التلاجة و جبنة الدبل كريم) من الاسواق المختلفة في مدينة دمنهور. تم تحديد نسبة الحموضة والملح ووجد متوسط قيمتها الاحصائية كالآتي 1.97± 0.18, 2.84± 0.5; 1.36±0.25, 5.01±0.25; 1.0± 0.19, 2.99± 0.17 and 0.90± 0.32, 1.8± 0.11 ، في كل من الجبن القريش، الدمايطى، جبنة التلاجة و جبنة الدبل كريم علي التوالي. وكشفت النتائج الميكروبيولوجية أن العد الكلى للبكتيريا، الاستافيلوكوكس أوريس، العد الكلى لبكتيريا الكوليفورم، الايشيركية كولاى والفطر موجود بنسبة 100، 60، 48، 40، 72٪ في الجبنة القريش، 100، 48، 40، 20، 56٪ في الجبن الدمايطى، 100، 44، 40، 24، 64٪ في جبنة التلاجة و 100، 24، 36، 12، 40٪ في جبنة الدبل كريم ، على التوالي، مع متوسط القيم $1.4 \times 10^3 \pm 1.2 \times 10^5 \pm 2 \times 10^4$ ، $7.8 \times 10^4 \pm 0.8 \times 10^4$ ، $1.5 \times 10^4 \pm 4 \times 10^3$ ، $8 \times 10^3 \pm 3 \times 10^3$ ، $2.5 \times 10^4 \pm 6 \times 10^3$ ، 8×10^2 ، $1.1 \times 10^5 \pm 0.1$ ، $4 \times 10^3 \pm 1 \times 10^3$ ، $2.0 \times 10^2 \pm 9 \times 10$ ، $1.6 \times 10^3 \pm 5 \times 10^2$ ، $2.8 \times 10^3 \pm 6 \times 10^2$ ، $0.8 \times 10^5 \pm 0.1$ ، $2.2 \times 10^3 \pm 0.6 \times 10^3$ ، $1.3 \times 10^3 \pm 5 \times 10^2$ ، $3 \times 10^3 \pm 1 \times 10^3$ ، $1.7 \times 10^3 \pm 5 \times 10^2$ ، $x 10^5$ ، $6 \times 10^3 \pm 2 \times 10^3$ ، $1.0 \times 10^2 \pm 0.6 \times 10^2$ ، $9 \times 10^2 \pm 3 \times 10^2$ ، $4 \times 10^2 \pm 2 \times 10^2$ ، $x 10^5$ الجبن التى تم فحصها خالية من الليستيريا. وتشير نتائج هذه الدراسة إلى أن بعض عينات الجبن الطري ذات جودة رديئة نتيجة لإنتاجها ومعالجتها وتوزيعها في ظل تدابير صحية مهمة. وقد يشكل وجود البكتيريا المسببة للأمراض خطرا على الصحة العامة. لذلك، أوصينا بتنفيذ تدابير تنظيمية فورية مثل ممارسات التصنيع الجيدة وكذلك ضرورة تطبيق نظام الهاسب لضمان السلامة الميكروبيولوجية لمختلف أنواع الجبن الطرى.