



Quality Assessment of Chemical and Microbiological Characteristics of Cow's Milk and Some Dairy Products in the New Valley Governorate

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Abstract

Raw cow's milk, Kareish cheese, Domiati cheese and plain yoghurt were collected from four different areas in the New Valley Governorate for detecting chemical, and microbiological properties. Cow's milk was high in moisture (88.69%) & acidity (0.23%) and low in fat (2.41%); other components were normal. Total solids, salt and acidity in Kareish and Domiati cheeses were within the normal limits. Yoghurt was normal in TS% and lower in fat than legal standards, while the acidity was quite high (0.95%) in most areas. Total bacterial counts were 6.56, 5.65, 3.70 and 6.25 log CFU.g⁻¹ for raw milk, Kareish cheese, Domiati cheese and yoghurt, respectively. *Psychrotrophic* bacterial counts were high in milk (4.20 log CFU.g⁻¹) and low in Domiati cheese (3.49 log CFU.g⁻¹). Lactic acid bacterial counts were high in raw milk & Kareish cheese (6.46 & 6.05 log CFU.g⁻¹) and low in Domiati cheese (2.45 log CFU.g⁻¹). *Staphylococcus aureus* was detected in Kareish cheese in El-Dakhla and Paris. It was also detected in Domiati cheese in all regions except the Paris area and was found in yoghurt in El-Dakhla only. Coliform bacteria were detected in all samples; the highest count was in raw milk (3.64 log CFU.g⁻¹). Yeast and molds were detected in all samples and were high in Kareish and Domiati cheeses. Organoleptic properties revealed normal colour for all samples. Flavour and taste were to some extent accepted, with salty taste in Domiati cheese and a yeasty in Kareish cheese. Yoghurt was sour in taste; the overall quality was just acceptable for all products.

Keywords: Raw milk, plain yoghurt, kareish cheese, Domiati cheese, Microbiological quality

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Introduction

Milk has an outstanding nutritional quality; it is also an excellent medium for bacterial growth and an important source of bacterial infection when consumed without pasteurization (Parekh and Subhash, 2008). Milk is virtually a sterile fluid when secreted into the alveoli of the udder. However, the microbial load and types found in milk shortly after milking are influenced by factors such as animal cleanliness and health, equipment cleanliness, season, ambient temperature, storage, and personnel health (Kivaria et al., 2006). The surrounding air, feed, soil, faces, and grass are also possible sources of contamination (Solomon et al., 2013). When milk is secreted from a healthy udder, it contains only a very small number of bacteria. After milking, environmental contamination may occur, which in turn increases the total bacterial counts (Pandey and Voskuil, 2011). The microbiological quality of milk and dairy products is influenced by the initial flora of raw milk, the processing conditions and post-heat treatment contamination (Rajagopal et al., 2005). Several studies have been done in different places to estimate the chemical compositions of raw cow's milk, kareish & Domiati cheeses and plain yoghurt.

Amin (2016) collected raw cow's milk samples in Assuit city. The results revealed an adulteration of milk. Also, Talkhan et al. (2016) analyzed cow's milk in El-Minufia Governorate. They reported that 37.5% of samples were adulterated by water, and 50 & 54.17% of milk samples were less than the legal standards for fat & SNF, respectively. Cow's milk was collected from Alexandria Governorate by El-Leboudy et al. (2017) and found that the mean values of fat, protein, lactose, SNF and minerals were 3.57, 3.80, 4.50, 8.91 and 0.50%; respectively.

Kareish cheese is a type of soft cheese commonly made and consumed in Egypt. However, the use of raw milk leads to either unpredictable chemical or biological changes or the possible survival of various pathogens (Deeb et al., 2004). Environmental

conditions prevailing during storage, combined with the composition of the cheese, often create possibilities for extensive development of molds on the cheese surface, which considerably reduces its quality (Reps et al., 2002). Metwalli (2011) analyzed Kareish cheese samples from Zagazig city, and reported higher moisture, coliform and yeast & moulds levels than those of standard requirements.

Domiati cheese is one of the most popular soft white cheeses in Egypt consumed either fresh or after pickling for a few months. The microbial quality and safety of Domiati cheese are major areas of concern for producers and consumers. White soft cheese was analyzed by Ghita et al. (2017), who recorded very low protein and high-fat contents besides the presence of starch in some samples. Mehanna et al. (2014) stated that the range of moisture, fat, protein, acidity and pH were 47.93-59.21%, 8.33-29.3%, 11.61-21.29, 0.45-1.35% and 3.75-4.44 of Baramili cheese, respectively.

Yoghurt is the most popular type of fermented milk known in Egypt. It is recommended for sick and convalescent people because it inhibits the harmful bacterial flora of the intestine, prevents autointoxication, colitis and helps in the absorption of calcium and phosphorus (Khan et al., 2008). Yoghurt quality depends on the quality of the raw material and efficient control at all processing stages. Yeast and molds are the main spoilage organisms found in yoghurt as the high acidity of these products inhibits many bacteria. The contamination of yoghurt by yeasts will cause several defects in the yoghurt texture and flavor: yeasty, fruity, bitter and unpleasant off-flavour (Vasdinyei and Deak, 2003).

Using low-quality milk for processing will result in poor-quality products, therefore, good-quality raw materials can produce high-quality milk products (Siirtola, 2000).

Hence, the aim of this study was to evaluate the chemical and microbiological quality of raw cow's milk, kareish cheese,

Domiaty cheese and plain yoghurt collected from different areas of New Valley Governorate. Also, the organoleptic quality of Kareish cheese, Domiaty cheeses and plain yoghurt was evaluated.

Materials and Methods

Experimental

In this study 40 samples of raw cow's milk and 40 samples of each Kareish cheese, Domiaty cheese and plain yoghurt were collected from local markets, supermarkets and small dairy shops. All samples were randomly collected from four regions in the New Valley Governorate named: Elkharga (KH), Eldakhla (DKH), Elfarafra (FAR) and Pareis (PRS). Samples were transported under completely aseptic conditions in a cool, isolated icebox as soon as possible to the laboratory of the Dairy Science Department, Faculty of Agriculture, New Valley University, and analyzed chemically for moisture, fat, protein, lactose, salt, acidity and pH as well as microbiologically for; Total bacterial count, Lactic acid bacteria, Psychrotrophic bacteria, Coliform bacteria, *Staphylococcus aureus* bacteria and Yeast & molds. Kareish cheese, Domiaty cheeses and Plain yoghurt samples were tested for organoleptic properties.

Chemical analysis

Acidity, protein, total solids (TS%), moisture, lactose, salt and ash were determined according to the method described by AOAC (2007), fat content was determined by Gerber's method (Ling, 1963), while pH values were measured using a pH meter (Jenway, 3505, Jenway Ltd., Felsted, Dunmow, Essex, UK).

Microbiological analysis

Total bacterial count (TBC)

Tryptone glucose extract agar medium (Marshall, 1992) was used for the enumeration of TBC after incubation at 37°C for 2 days under aerobic conditions.

Lactic acid bacteria count (LAB)

Elliker agar medium (Marshall, 1992) was used for the enumeration of LAB after incubation at 43°C for 3 days under aerobic conditions.

Psychrotrophic bacterial count (PSY)

Tryptone glucose extract agar medium (Marshall, 1992) was used for the enumeration of PSY after incubation at 7°C for 7:10 days under aerobic conditions.

Staphylococcus aureus count (S. aureus)

Baird-Parker medium (Marshall, 1992) was used for the enumeration of *S. aureus* after incubation at 37°C for 2 days aerobic conditions.

Coliform count (CC)

Violet red bile agar medium was used for enumeration of CC (Marshall, 1992) after incubated at 37°C for 48 h under aerobic conditions.

Yeast and Molds count (Y & M)

Antibiotic standard plate count agar medium (Marshall, 1992) was used for the enumeration of Y & M after incubation at 25°C for 4 days under aerobic conditions.

Antibiotic standard plate count agar medium (standard plate count agar medium supplemented with 2 ml of antibiotic solution 100 ml⁻¹ medium). Antibiotic solution consisted of chlortetracycline hydrochloride, 500 mg (CID Co., Egypt) and chloramphenicol, 500 mg (MISR Co., Egypt) suspended in 100 ml of sterile phosphate-buffered diluents.

Evaluation of the organoleptic properties

Kareish cheese, Domiaty cheeses and plain yoghurt were organoleptically assessed using the following score points: colour (5), flavour (5), taste (5), texture (5) and overall (20) points.

Statistical analysis

Each sample was analysed in triplicate. Microbial counts were converted to CFU.g⁻¹. All the results were subjected to an analysis of variance (ANOVA) using SPSS (version 20).

Results and discussions

Physiochemical properties of cow's milk samples

Results in Table 1 represent the average chemical composition of cow's milk collected from four different areas in the New Valley Governorate. The results revealed that the cow's milk samples seem adulterated by water as their moisture is high (88.69%) and their fat contents are low

(2.41%), which is less than the Egyptian standard (ES) for raw cow's milk.

Table (1): Physiochemical properties of cow's milk samples collected from different areas of the New Valley Governorate

Ingredients	Region*				Mean**
	KH	DKH	FAR	PRS	
Moisture	89.10±2.72 ^a	89.15±1.17 ^a	88.13±2.29 ^a	87.93±0.59 ^a	88.69±1.87
Protein	3.18±0.73 ^a	3.45±0.51 ^a	3.38±0.22 ^a	3.68±0.13 ^a	3.40±0.50
Fat	2.15±1.32 ^a	2.52±0.23 ^a	2.85±1.62 ^a	2.10±0.87 ^a	2.41±1.11
Lactose	4.87±1.18 ^a	5.13±0.73 ^a	4.90±0.48 ^a	5.50±0.18 ^a	5.08±0.78
Ash	0.70±0.09 ^a	0.75±0.08 ^a	0.75±0.06 ^a	0.80±0.08 ^a	0.75±0.08
Acidity	0.18±0.05 ^a	0.23±0.06 ^a	0.23±0.03 ^a	0.26±1.00 ^a	0.23±0.06
pH value	6.76±0.36 ^a	6.36±0.10 ^b	6.29±0.16 ^b	6.29±0.65 ^b	6.48±0.42

*Elkharga (KH), Eldakhla (DKH), Elfarafra (FAR) and Pareis (PRS).

**Means (three different determinations) ± standard deviation (SD).

The range of moisture, protein, fat, lactose, ash, acidity and pH were 87.93-89.15%, 3.18-3.68, 2.10-2.85, 4.87-5.50, 0.70-0.80%, 0.18-0.26% and 6.29-6.76; respectively. Moreover, **Hamad and Baiomy (2010)** analyzed cow's milk in Qena Governorate and reported that the fat, moisture, protein, lactose, ash and pH were 4.28%, 87.4%, 3.37%, 4.47%, 0.69% and 6.65, respectively. In addition, **Talkhan et al. (2016)** evaluated cow's milk in El-Minufia Governorate for chemical composition and reported that 37.5% of samples were adulterated by water, 50 & 54.17% were less than the legal standard for fat and SNF%; respectively. Further, **Asar (2021)** collected cow's milk samples from Aswan market and, after analyzing them, found the range of acidity 0.16–0.20%, pH 6.51–6.63, T.S. 11.42–14.52, fat 3.70–5.20%, protein 3.00–3.76%, ash 0.65–0.84%, and lactose 4.10–4.98%, respectively. We can also notice that the milk acidity of all samples was quite high (0.23%) except for the KH area (0.18%). The milk pH followed the opposite trend. The high acidity of milk makes it difficult to heat or pasteurize; the high acidity of milk could be explained by the high climatic weather in these areas, a lack of cooling or bad sanitation and hygienic systems in the milking and handling of the milk.

The lactose, protein and ash of the cow's milk in all regions seem normal. The

general chemical quality of cow's milk in all regions of the New Valley is not accepted and restricted control is needed.

Physiochemical properties of Kareish cheese, Domiati cheese and Yoghurt samples

As seen in Table 2, the average TS% of Kareish cheese, Domiati cheese and plain yoghurt collected from four regions in the New Valley Governorate were within the normal range of these types of cheeses and conformed to the ES.

Total solids (TS %)

In Kareish cheese, the lowest TS% was recorded in DKH (25%), while the highest TS% was recorded in FAR (34.25%). In Domiati cheese, the lowest TS% was recorded in FAR (36.75%), while the highest TS% was recorded in DKH (48.25%). The average TS% for Kareish and Domiati cheese were 29.20 and 42.51%, respectively. Several authors followed the composition of Kareish cheese; **Ghada et al. (2004)** reported that Kareish cheese has high moisture, protein, fat and ash contents (68.97, 19.99, 3.87 and 1.81%). **Metwalli (2011)** collected Kareish cheese from Zagazig city, and found that there was more moisture, coliform and yeast & molds than that of standard requirements. Domiati cheese samples were collected from the Assiut region by **Saleh et al. (2019)**, and they reported that moisture, salt and ash contents were 57.03, 5.24 and 4.58%, respectively.

In plain yoghurt, the lowest TS% was recorded in PRS (12.03%), while the highest TS% was recorded in KH (15.35%). The TS% in plain yoghurt was accepted except for samples collected from the PRS area, as it was quite low.

Table (2): Physiochemical properties of Kareish cheese, Domiati cheese and Yoghurt samples collected from different areas of the New Valley Governorate

Ingredients	Sample	Region*				Mean **
		KH	DKH	FAR	PRS	
Total solids	Kareish	26.75±2.06 ^{bc}	25.00±1.63 ^c	34.25±6.13 ^a	31.33±1.53 ^{ab}	29.20±4.99
	Domiati	40.78±0.93 ^c	48.25±2.22 ^a	36.75±1.71 ^d	44.83±2.02 ^b	42.51±4.83
	Yoghurt	15.35±3.93 ^a	13.63±1.11 ^a	13.98±0.46 ^a	12.03±1.88 ^a	13.86±2.34
Fat	Kareish	4.00±0.16 ^c	4.50±0.24 ^b	5.00±0.24 ^a	4.00±0.30 ^c	4.40±0.48
	Domiati	30.00±1.63 ^b	30.00±2.45 ^b	39.00±0.82 ^a	21.00±2.00 ^c	30.60±6.53
	Yoghurt	2.70±0.16 ^{ab}	3.00±0.33 ^a	3.00±0.08 ^a	2.53±0.15 ^b	2.83±0.27
Salt (NaCl)	Kareish	2.23±0.88 ^b	1.77±0.31 ^b	3.76±1.33 ^a	1.74±0.22 ^b	2.42±1.15
	Domiati	6.03±0.98 ^a	5.77±0.35 ^a	4.65±2.91 ^a	3.61±1.48 ^a	5.11±1.81
	Kareish	1.53±0.05 ^a	0.96±0.01 ^c	1.59±0.02 ^a	1.17±0.15 ^b	1.32±0.28
Acidity	Domiati	1.50±0.03 ^a	0.60±0.06 ^b	1.25±0.32 ^a	0.73±0.21 ^b	1.04±0.42
	Yoghurt	1.04±0.07 ^a	0.93±0.08 ^{bc}	0.83±0.07 ^c	1.00±0.05 ^{ab}	0.95±0.10
	Kareish	4.73±0.36 ^a	3.88±0.63 ^c	3.83±0.33 ^c	4.25±0.15 ^b	4.17±0.52
pH value	Domiati	5.00±0.65 ^b	5.1863±1.94 ^a	4.83±0.84 ^b	5.2±1.10 ^b	5.16±0.28
	Yoghurt	4.13±0.22 ^b	4.49±0.36 ^{ab}	4.32±0.16 ^a	5.25±0.10 ^b	4.30±0.25

*, ** See footnote of table (1) for details

El-Leboudy et al. (2015) collected plain yoghurt samples from street-vendors, groceries and supermarkets of different sanitary levels in Mansoura city, Dakahlia Governorate, and found that the mean values of protein, fat, lactose, and acidity were 2.2, 0.64, 3.28, 0.644, respectively.

Fat content

In Kareish cheese, the lowest fat content was recorded in KH and PRS (4.00%), while the highest fat content was recorded in FAR (5.00%). In Domiati cheese, the lowest fat content was recorded in PRS (21.00%), while the highest fat content was recorded in FAR (39.00%). In plain Yoghurt, the lowest fat content was recorded in PRS (2.53%), while the highest fat content was recorded in DKH and FAR (3.00%). The fat content of yoghurt was on the borderline and less than the E.S. for cow's milk yoghurt. The collected Domiati cheese sample could be a vegetable oil soft cheese as they replace the milk fat with vegetable oils and add a lot of them reducing the cost of production. **Ismail et al. (2010)**

collected samples of white soft cheese containing vegetable oils from local markets. The average fat, protein, TS, lactose, salt, ash and acidity were 30-38, 4.49, 35.44-49.65, 3.9- 5.6, 1.6-4.15, 2.15-4.47 and 0.20-1.14%, respectively. The ES allowed the production of vegetable soft cheese with a high fat content (E.S. 1867/2005). **Ghita et al. (2017)** analyzed samples of white soft cheese from different places and recorded very low protein and high fat contents, besides the presence of starch in some samples.

Salt percent

In Kareish cheese, the lowest salt% was recorded in PRS (1.74%), while the highest salt% was recorded in FAR (3.76%). In Domiati cheese, the lowest salt% was recorded in PRS (3.61%), while the highest salt% was recorded in KH (6.03%).

Acidity percent

In Kareish cheese, the lowest acidity was recorded in DKH (0.96%), while the highest acidity was recorded in FAR (1.59%). In Domiati cheese, the lowest

acidity was recorded in DKH (0.60%), while the highest acidity was recorded in KH (1.50%). The same trend was noticed by **Mehanna et al. (2014)**, who stated that the average of moisture, fat, protein, acidity and pH in Baramili cheese were 47.93-59.21%, 8.33-29.33%, 11.61- 21.29%, 0.451.35% and 3.75-4.44, respectively. In plain Yoghurt, the lowest acidity was recorded in FAR (0.83%), while the highest acidity was recorded in DKH and KH (1.04%). The acidity of plain yoghurt was high in all samples, the average was 0.95%. However, **Eid et al. (2023)** analyzed yoghurt samples from the New Valley and found an average acidity of 1.13%.

pH values

In Kareish cheese, the lowest pH was recorded in FAR (3.83), while the highest pH was recorded in KH (4.73). In Domiati cheese, the lowest acidity was recorded in FAR (4.83), while the highest acidity was recorded in PRS (5.20). In plain Yoghurt, the lowest acidity was recorded in KH (4.13), while the highest acidity was recorded in PRS area (5.25). **El-Ansary (2014)** collected yoghurt samples from the El-Behera area and gave an average pH of 4.06.

Microbiological of raw milk and some dairy products

Total bacterial count (TBC)

The average TBC of raw cow's milk, plain yoghurt, Kareish and Domiati cheese collected from different areas in the New Valley regions is presented in Table 3. The TBC in KH, DKH and FAR areas was very close, and no significant difference ($P < 0.05$) could be noticed between all collected samples of raw cow's milk. The lowest count was recorded in the PRS area ($5.65 \log \text{CFU.g}^{-1}$) and the highest was recorded for KH ($6.92 \log \text{CFU.g}^{-1}$). The TBC of all cow's milk samples was over one million and exceeded that reported by Egyptian standard (**ES, 154-1/2005**). However, the TBC in the milk indicates the level of sanitation and hygiene through the milking process and handling until it reaches the consumer. **Meshref (2013)** mentioned that the standard plate count of raw cow's milk was $7.56 \log \text{CFU.g}^{-1}$. Also, **El-Leboudy et al. (2014)** in Alexandria gave a mean value for TBC of $4.51 \log \text{CFU.g}^{-1}$. **Meshref et al. (2021)** in Beni-Swief Governorate reported TBC in raw cow's milk of $7.18 \log \text{CFU.g}^{-1}$.

Table (3): Total bacterial count ($\log \text{CFU.g}^{-1}$) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				
	KH	DKH	FAR	PRS	Mean **
Raw cow milk	6.92 ± 0.92^a	6.87 ± 0.38^a	6.80 ± 0.90^a	5.65 ± 2.19^a	6.56 ± 1.23
Plain yoghurt	6.56 ± 0.59^a	6.32 ± 0.54^a	6.15 ± 0.40^a	5.98 ± 0.44^a	6.25 ± 0.48
Kareish cheese	4.94 ± 0.86^a	5.89 ± 0.66^a	5.73 ± 0.48^a	6.06 ± 1.04^a	5.65 ± 0.81
Domiati cheese	4.43 ± 0.23^a	4.10 ± 0.17^a	4.33 ± 0.58^a	1.93 ± 0.63^b	3.70 ± 1.14

*, ** See footnote of Table (1) for details

In the same Table, the TBC in both Kareish and Domiati cheese were not significantly different ($P < 0.05$) in all regions except that of the PRS region, which has significantly different TBC for Domiati cheese. The average TBC was 5.65 and $3.87 \log \text{CFU.g}^{-1}$ for Kareish and Domiati cheeses, respectively, which may be due to the high salt content (average 5.11%). However, **Hassan and Gomaa (2016)** analyze Kareish and Domiati cheeses in Cairo and Giza Governorates. They reported

that both cheese samples were highly contaminated having contaminated, with a bacterial load exceeding the accepted limit. **Salem et al. (2016)** said that the microbiological parameters of Kareish cheese in Alexandria showed unacceptable high counts especially among the street vendor's samples. **Eid et al. (2022)** reported that TBC in Assiut city was $4.62 \log \text{CFU.g}^{-1}$ for Dominate cheese and $5.41 \log \text{CFU.g}^{-1}$ for Kareish cheese. Generally, we could notice that the TBC of plain yoghurt was very close

in the four regions in the New Valley and there were no significant ($P<0.05$) differences between them. The average TBC of yoghurt in the four regions was $6.25 \log \text{CFU.g}^{-1}$. **El-Ansary (2014)** said that yoghurt traded in El Behera Governorate has poor microbiological quality; it is common that the LAB counts in both commercial and homemade yoghurt are similar (**Tolu and Altun, 2021**).

Lactic acid bacteria count (LAB)

Lactic acid bacteria are a natural microorganism that is already present in milk

Table (4): Lactic acid bacteria count ($\log \text{CFU.g}^{-1}$) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				Mean **
	KH	DKH	FAR	PRS	
Raw cow milk	5.53 ± 0.39^b	7.19 ± 0.23^a	6.52 ± 0.45^a	6.6 ± 0.52^a	6.46 ± 0.72
Plain yoghurt	5.49 ± 0.68^a	4.92 ± 0.76^a	5.25 ± 0.48^a	4.73 ± 0.64^a	5.10 ± 0.63
Kareish cheese	6.16 ± 0.41^a	6.42 ± 0.77^a	5.97 ± 0.48^a	5.67 ± 0.35^a	6.05 ± 0.53
Domiati cheese	2.03 ± 0.95^a	3.08 ± 0.58^a	2.46 ± 0.47^a	2.25 ± 0.98^a	2.45 ± 0.78

*, ** See footnote of table (1) for details

In plain yoghurt, LAB counts were very close in the four regions of the New Valley Governorate and no significant difference ($P<0.05$) could be noticed. The high LAB counts were related to the added yoghurt starter culture during yoghurt manufacturing. The same Table showed high LAB counts for Kareish cheese in all four regions in the New Valley Governorate, with an average of $6.05 \log \text{CFU.g}^{-1}$. The highest count may be related to the acidification process throughout the cheese processing, and it may be manufactured from raw milk. **Abd El Gawad et al. (2010)** reported that, the mean counts of lactic acid bacteria in Laban Rayeb samples collected from different areas in Egypt were 6.34, 6.22, 6.34 and $7.30 \log \text{CFU.g}^{-1}$. In Domiati cheese, LAB counts were quite low in all four regions of the New Valley and no significant ($P<0.05$) difference could be observed. The average LAB counts in Domiati cheese were $2.45 \log \text{CFU.g}^{-1}$. The low LAB counts in Domiati cheese could be

and other dairy products. The high count of LAB may cause over acidity in these products. The LAB of raw cow's milk, plain yoghurt, Kareish and Domiati cheese collected from different areas in the New Valley regions is presented in Table 4. There were no significant differences ($P<0.05$) that could be noticed for the count of LAB in raw cow's milk in the four regions except in the KH area and the highest count was in DKH and the lowest was in KH. The average LAB for the four regions was $6.46 \log \text{CFU.g}^{-1}$.

explained by the high salt content (over 6%), which affects the growth of most of the LAB as it cannot resist over 4% salt.

Psychrotrophic bacteria count (PSY)

In milk, PSY are able to grow at refrigerated temperature, most of them are destroyed by normal heat treatment. Some PSY bacteria are heat stable and affect the quality of milk and other dairy products through the production of lipase and proteinase enzymes. These enzymes are heat stable and can cause off flavor, and food spoilage, reduction in shelf life (**Qi et al., 2023** and **Huck et al., 2008**). The average PSY counts in cow's milk in the four regions in the New Valley Governorate are $4.20 \log \text{CFU.g}^{-1}$. In Table 5, the higher counts were in FAR. There is a significant difference ($p<0.05$) between PSY counts in the FAR area and other areas. The attained results in samples of raw cow milk were like those recorded by **Meshref et al. (2021)**, who found that the mean was $5.24 \log \text{CFU/ml}$.

Table (5): Psychotropic bacteria count (log CFU.g⁻¹) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				Mean **
	KH	DKH	FAR	PRS	
Raw cow milk	3.73±0.50 ^{ab}	3.49±0.80 ^b	5.18±0.37 ^a	4.39±1.10 ^{ab}	4.20±0.93
Plain yoghurt	5.06±0.23 ^a	5.39±0.13 ^a	5.36±0.35 ^a	4.21±0.13 ^b	5.01±0.51
Kareish cheese	4.80±0.28 ^a	5.50±0.31 ^a	5.32±0.46 ^a	1.02±0.13 ^b	4.41±1.83
Domiati cheese	4.82±0.68 ^a	2.20±0.10 ^c	3.26±0.24 ^{bc}	4.00±0.22 ^{ab}	3.49±1.14

*, ** See footnote of table (1) for details

In plain yoghurt, the PSY count was quite high and reached 5.39 log CFU.g⁻¹ in the DKH region, while the lowest count was in PRS, which was a significant difference (P<0.05) from that of other regions. The PSY count in Kareish cheese was also high, except in the PRS region, which reached 1.02 log CFU.g⁻¹ and was significantly different from other New Valley regions. The average PSY count of Kareish cheese in the New Valley was 4.41 log CFU.g⁻¹. The lowest PSY count in Domiati cheese was recorded in the DKH area and was significantly different from other regions. The highest count was in KH, and the average count in the New Valley was 4.82 log CFU.g⁻¹. Amer *et al.* (2008) reported that, PSY counts in Domiati cheese and plain yoghurt were 3.23 and 3.04 log CFU.g⁻¹, respectively.

Coliform count (CC)

The presence of CC in milk or other dairy products gave an indication of the bad quality of these products as they have fecal

contamination, which may cause diseases (Yabaya and Idris 2012). It should not be presented in these dairy products. The CC of raw cow's milk, plain yoghurt, Kareish cheese and Domiati cheese is presented in Table 6. The average CC in raw cow's milk in the four regions in the New Valley Governorate are 3.64 log CFU.g⁻¹. There is a significant difference (P<0.05) between the CC count in the DKH area and other areas. The highest CC was recorded in FAR (5.20 log CFU.g⁻¹) and the lowest was in DKH areas (1.46 log CFU.g⁻¹).

In plain yoghurt, the average CC in the New Valley Governorate recorded 2.95 log CFU.g⁻¹. The highest CC was recorded in DKH (4.18 log CFU.g⁻¹) and the lowest was in PRS (1.50 log CFU.g⁻¹). The average CC in the New Valley Governorate was 2.95 log CFU.g⁻¹. The presence of CC means inadequate heating of the milk or post-contamination, as yoghurt milk should be heated to around 85-90°C for 10 minutes in yoghurt processing.

Table (6): Coliforms count (log CFU.g⁻¹) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				Mean **
	KH	DKH	FAR	PRS	
Raw cow milk	4.61±1.47 ^a	1.46±0.61 ^b	5.20±0.63 ^a	3.29±1.35 ^{ab}	3.64±1.77
Plain yoghurt	2.88±0.17 ^b	4.18±0.53 ^a	2.63±0.21 ^{cb}	1.50±0.71 ^c	2.95±1.12
Kareish cheese	4.50±0.71 ^a	4.21±0.13 ^a	3.00±1.41 ^{ab}	1.36±0.16 ^b	3.27±1.45
Domiati cheese	1.79±0.70 ^b	3.89±0.02 ^a	2.40±0.66 ^b	1.77±0.67 ^b	2.62±1.07

*, ** See footnote of table (1) for details

In Kareish cheese, the average CC in the New Valley Governorate was recorded at 3.27 log CFU.g⁻¹. The highest CC was recorded in KH (4.50 log CFU.g⁻¹) and the lowest was in PRS (1.36 log CFU.g⁻¹). The

sanitation of Kareish cheese making in ruler areas is not adequate.

In Domiati cheese, there is a significant difference (P<0.05) between CC in the DKH area and other areas. The

average CC in Domiati cheese was 2.62 log CFU.g⁻¹. The low CC in Domiati cheese as compared to other products could be explained by the effect of high salt content (> 6%), which affect the growth of most of the CC. The microbiological quality of white soft cheese in different Egyptian varieties is affected by different salt concentrations, and acidity percent's as kareish cheese is acid coagulated while Domiati cheese is enzyme coagulated, ripening in brine solutions and keeping temperatures (El-Sayed *et al.*, 2011).

Staphylococcus aureus count (*S. aureus*)

S. aureus is a pathogenic microorganism; it's presents in raw milk or dairy products and is an index for contamination from persons sharing the

producing or handling. Some *S. aureus* may grow in food and cause food poisoning or health problems as it causes beta hemolysis (Abdel-Hameed and Elmalt, 2009). As seen in Table 7, all milk samples were contaminated by *S. aureus* in the four New Valley regions. These reveal how bad sanitation was in milk processing and handling. The average *S. aureus* count in milk was 3.59 log CFU.g⁻¹. These results agree with Meshref (2013), with average scores of 3.67 log CFU ml⁻¹.

In plain yoghurt, *S. aureus* was not detected in the KH, FAR and PRS regions. The low acidity of yoghurt may affect the growth of pathogenic microorganisms. *S. aureus* was only detected in the DKH zone (1.63 log CFU.g⁻¹).

Table (7): *S. aureus* count (log CFU.g⁻¹) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				Mean**
	KH	DKH	FAR	PRS	
Raw cow milk	4.00±0.96 ^a	3.51±0.48 ^{ab}	4.67±0.58 ^a	2.17±0.93 ^b	3.59±1.16
Plain yoghurt	ND*	1.63±0.10	ND	ND	1.63±0.10
Kareish cheese	3.46±1.10	ND	3.73±0.38	ND	3.57±0.81
Domiati cheese	1.23±0.29	1.52±0.34	1.63±0.36	ND	1.46±0.32

*, ** See footnote of table (1) for details, ND; Not detected

The results in the same Table showed that, *S. aureus* was not detected in Kareish cheese in both the DKH and PRS regions. The low acidity of these cheeses may play a role in these results. The average *S. aureus* count in Kareish cheese was 3.57 log CFU.g⁻¹; the low acidity of Kareish cheese is not suitable for the growth of *S. aureus*. Nearly similar results were reported by El-Leboudy *et al.* (2017) with a mean count of 3.56 log cfu g⁻¹.

In Domiati cheese, *S. aureus* was represented in all samples from New Valley except those from PRS. The average *S. aureus* count in Domiati cheese was 1.46 log CFU.g⁻¹. Sotohy *et al.* (2022) found loads of *S. aureus* in the examined samples >10² CFU/ml.

Yeast and molds (Y & M)

The presence of yeast and molds (Y & M) in milk or dairy products is undesirable even in low counts which affect the product quality (Abdel-Hameed, 2011). Most of Y & M are killed by heat treatments; its presence means post contamination after the heat treatment.

The Y & M of raw cow's milk, plain yoghurt, Kareish cheese and Domiati cheese are presented in Table 8. Raw cow's milk in the four regions in the New Valley is highly contaminated with Y & M. The lowest count was in PRS area (2.56 log CFU.g⁻¹), but no significant difference (P<0.05) between most of the three other regions.

Table (8): Yeast & Molds count (log CFU.g⁻¹) in raw cow milk, plain yoghurt, kareish cheese and Domiati cheese collected from different areas of the New Valley Governorate

Examined samples	Region*				
	KH	DKH	FAR	PRS	Mean**
Raw cow milk	4.70±0.51 ^{ab}	4.55±0.49 ^{ab}	5.89±1.26 ^a	2.56±2.04 ^b	4.45±1.50
Plain yoghurt	3.44±0.66 ^a	3.32±0.54 ^a	3.40±0.50 ^a	3.34±0.52 ^a	3.37±0.46
Kareish cheese	5.56±0.51 ^a	5.24±0.12 ^a	5.51±0.29 ^a	5.41±0.23 ^a	5.43±0.30
Domiati cheese	5.65±0.58 ^a	5.54±0.47 ^a	5.28±0.49 ^a	4.82±0.25 ^a	5.37±0.51

*, ** See footnote of table (1) for details

In plain yoghurt, the presence of yeast impairs the taste, which may produce alcoholic fermentation and off flavor. There were no significant differences in the Y & M counts between the four regions of the New Valley. The average of Y & M counts is 3.37 log CFU.g⁻¹. The results of yeast and mold in Kareish and Domiati cheese revealed a high count in all four regions. The average Y & M counts were 5.43 and 5.37 log CFU.g⁻¹ for kareish and Domiati cheeses, respectively. It means that the hygiene is not right in the cheese processing. For kareish and Domiati cheese, the results of Y & M were reported by Hassan and Gomaa (2016), with average counts of 5.49 and 5.23 log CFU.g⁻¹; respectively.

Organoleptic quality

Organoleptic properties of Kareish cheese, Domiati cheese, and plain yoghurt collected from different areas in the New Valley Governorate

Table (9): Organoleptic quality of Kareish cheese, Domiati cheese and Yoghurt samples collected from different areas of the New Valley Governorate

Ingredients	Sample	Region*				
		KH	DKH	FAR	PRS	Mean**
Color (5)	Kareish	3.67±0.58 ^a	3.50±0.50 ^a	3.00±1.00 ^a	3.67±0.58 ^a	3.46±0.66
	Domiati	3.00±1.00 ^a	3.67±1.53 ^a	3.33±1.53 ^a	3.33±0.58 ^a	3.33±1.07
	Yoghurt	2.67±0.58 ^{ab}	2.33±0.58 ^b	3.50±0.50 ^a	3.50±0.50 ^a	3.00±0.71
Flavor (5)	Kareish	2.83±0.76 ^a	3.00±1.00 ^a	2.67±0.58 ^a	2.00±0.00 ^a	2.63±0.71
	Domiati	3.00±1.00 ^a	3.00±0.0 ^a	3.00±1.00 ^a	3.67±0.58 ^a	3.17±0.72
	Yoghurt	2.83±0.76 ^a	3.00±0.00 ^a	2.50±0.50 ^a	3.33±0.29 ^a	2.92±0.51
Taste (5)	Kareish	3.00±1.00 ^a	3.00±1.00 ^a	2.33±0.58 ^a	3.00±0.00 ^a	2.83±0.72
	Domiati	2.67±2.08 ^a	3.00±1.73 ^a	3.67±0.58 ^a	3.67±1.15 ^a	3.25±1.36
	Yoghurt	2.67±0.58 ^a	2.33±0.58 ^a	3.00±1.00 ^a	3.67±0.58 ^a	2.92±0.79
Texture (5)	Kareish	3.33±0.58 ^a	2.83±0.58 ^a	2.67±0.76 ^a	3.00±0.00 ^a	2.96±0.54
	Domiati	3.33±0.58 ^a	3.00±2.00 ^a	2.33±0.58 ^a	2.67±0.58 ^a	2.83±1.03
	Yoghurt	2.67±0.58 ^b	3.67±0.58 ^a	3.83±0.29 ^a	4.17±0.29 ^a	3.58±0.70
Overall acceptability (20)	Kareish	12.17±44 ^a	10.83±54 ^a	11.67±62 ^a	11.88±66 ^a	11.64±58
	Domiati	12.67±52 ^a	12.33±42 ^a	13.34±52 ^a	12.58±43 ^a	12.73±48
	Yoghurt	11.33±38 ^b	12.83±45 ^{ab}	14.67±41 ^a	12.42±44 ^b	12.81±38

*, ** See footnote of table (1) for details

The yoghurt taste was too acidic especially in the KH and DKH areas. The

Valley regions are presented in Table 9. The colour of Kareish and Domiati cheeses was accepted in all four areas, and no significant differences (P<0.05) could be noticed. The average colour degrees were 3.46 and 3.33 for both cheeses, respectively. Yoghurt colour was also accepted, except in both DKH and KH areas.

The flavour of Kareish cheese was not good in the PRS area, but other areas were accepted. Domiati cheese flavour was reasonable for all regions with no significant differences (P<0.05). The flavour of plain yoghurt was sour to some extent, especially in DKH and PRS areas. The taste of Kareish and Domiati cheeses was accepted in all regions with salty taste. The average taste degrees were 2.83 and 3.25 for Kareish and Domiati cheese, respectively.

texture was quite accepted in all samples of Kareish and Domiati cheeses except those

from the FAR area. The yoghurt texture was normal, with an average of 3.85. The overall acceptability pointed out that, all samples of Kareish and Domiati cheese and yoghurt in the New Valley Governorate were accepted with average total scores of 11.64, 12.73 and 12.81, respectively.

Conclusions

The chemical composition of raw cow's milk and some milk products collected from four different areas in the New Valley Governorate was within the normal limits, except that the fat in raw milk and plain yoghurt was less than legal standards. The microbiological quality revealed the presence of some pathogenic bacteria in raw milk and some dairy product samples, and a higher total bacterial count and yeasts & molds than the Egyptian standard (ES) recommendation. To improve the safety of raw milk and dairy products, hygiene barriers and raw milk quality must be raised, as well as proper decontamination of processing equipment must be ensured. On the other hand, sensory evaluation revealed normal color for all samples. Flavour and taste were to some extent accepted, with a salty taste in Domiati cheese and a yeasty taste in Kareish cheese. The yoghurt was sour in taste; the overall quality was just as acceptable for all products.

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Conflicts of Interest/ Competing interest

Authors have no conflicts of interest to declare for this article.

Ethical statement

We declare did not make invasive procedures or changes to normal animal keeping, feeding, etc.

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