

Microbial Quality Assessment of Some Local and Imported Butter

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Abstract:

A total of 13 random samples of farm-house butter were collected from different places in El-minya and Assiut governorates, 8 samples of local commercial brands butter and 11 samples of imported brands butter, were purchased from local supermarkets in Alexandria, Cairo and Assiut cities. All samples were examined for their microbial status. The obtained results indicated that the farm-house butter always contained higher total bacterial counts of min. 0.95×10^4 and max. of 234.67×10^4 cfu/g. The corresponding values for local butter and imported butter were of min. 14.8×10^2 and max. of 1116.7×10^2 cfu/g. and of min. 3.5×10^2 and max. of 139.67×10^2 cfu/g., respectively. Total lactic acid bacteria showed the same trend as the total bacterial counts were of min. 0.08×10^4 and max. of 119×10^4 cfu/g., and min. of 12.2×10^2 and max. of 440×10^2 and min. of 31×10 and max. of 138.33×10 cfu/g. for farm-house, local and imported butter respectively. Coliform was detected only in the farm-house butter, meanwhile the local commercial brands and imported brands were free from the growth of coliform. The count of total psychrotrophic

bacteria proved to be higher for the farm-house butter (min. of 0.33×10^3 and max. of 91.67×10^3 cfu/g.), than the local butter (min. of 4.6×10^3 and max. of 14.933×10^3 cfu/g.), however the lowest psychrotrophic count were found in the imported butter (min. of 4.03×10^2 and max. of 154.67×10^2 cfu/g.). The obtained results indicated that the counts of proteolytic and lipolytic bacteria in the different groups had the same trend as the total bacterial counts. Furthermore, aerobic, anaerobic spores, yeasts and molds were present only in farm-house butter.

Key words: assessment, farm-house, local, imported butter.

Introduction:

The hygienic quality of milk products is necessary to provide the consumer with safe, wholesome and high quality products. Since cooking butter is one of the most popular varieties of dairy products in Egypt, and of a higher nutritional value, it constitutes a public health hazard, Henin and Kaldes (1992).

Ghoneim (1963) examined cooking butter samples and revealed that 35% of the examined samples contained coliforms in a mean value of 10^3 /g., similar results were obtained by Saingliver

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and Dupont (1966), Canton *et al.* (1974), Voyzas *et al.* (1976), El-Essawy (1980), Kausar *et al.* (1993), Santos *et al.* (1995), Dogan-Halkman *et al.* (2003) and Moustafa (2004).

Khalafalla *et al.* (1974) found that Egyptian farm-house butter had higher bacterial, yeasts and moulds count than that of factory-made butter. Similar results were obtained by El-Gendy *et al.* (1977), Bakheet (1979), Bahout (2001) and Kasana *et al.* (2002).

In 1972 the results of Sultan indicated that the factory-made butter samples contained less yeasts and moulds than those encountered in the farm-house butter. The isolated moulds belonged to *Aspergillus spp.*, *Streptomyces spp.*, *Penicillium spp.* and *Geotricum spp.*, while isolated yeasts belonged to *Torulopsis spp.*, *Candida spp.*, and *Rhodotrula spp.* However, Bakheet (1979) mentioned that the isolated yeasts were found to be belonging to *Candida spp.*, *Trichosporon spp.*, *Rhodotrula spp.*, *Torulopsis spp.*, and *Saccharomyces spp.* while moulds isolated were *Aspergillus spp.*, *Geotricum spp.*, *Penicillium spp.*, *Mucor spp.*, and *Cladosporium spp.*

Therefore, the present study was undertaken to evaluate some farm-house, local and imported butter for microbial quality and how far these determination comply with the Egyptian standards.

Generally, the ultimate goal of this study was to help dairy industry to produce healthy and safe food to the consumers. Also, with this information appropriate action can be taken to improve quality control farm-house butter available in the local markets.

Materials and Methods:

Materials

Samples used in this study were divided into three different groups i.e., farm-house butter, local butter and imported butter. To avoid any influence of temperature on butter which might affect the rate of microbial growth and chemical reactions, samples were transferred in ice-box.

Farm-house butter samples were collected during the winter season, a total of 13 random samples were collected, and each one was obtained from different places in El-minya and Assiut Governorates. The mentioned samples were:-

1. Buffalo's butter (Unsalted) from Mallawi.
2. Buffalo's butter (Salted) from Mallawi.
3. Cow's butter (Unsalted) from Mallawi.
4. Buffalo's butter (Unsalted) from Deir Mawas.
5. Buffalo's butter (Unsalted) from Dairut.
6. Buffalo's butter (Salted) from Dairut.
7. Buffalo's butter (Salted) from Manqabad.
8. Buffalo's butter (Unsalted) from Manqabad.

9. Buffalo's butter (Unsalted) from El Wilidiya.
10. Buffalo's butter (Unsalted) from El Megahdin.
11. Buffalo's butter (Unsalted) from El Fateh.
12. Buffalo's butter (Unsalted) from Beni Zeid.
13. Cow's butter (Unsalted) from Beni Zeid.
6. La vache de paris (Unsalted) butter.
7. Royal Buisman (Unsalted) butter.
8. Bridel (Unsalted) butter.
9. President (Unsalted) butter.
10. President (Salted) butter.
11. Petit Normand (Salted) butter.

Methods.

Factory-made butter samples were purchased from local supermarkets in Alexandria, Cairo, and Assiut towns. Samples were also obtained from the dairy factory of the Faculty of Agriculture, Assiut University. The mentioned samples were:-

1. Royal Pack (Unsalted) butter.
2. Cheesa (Unsalted) butter.
3. Radwa (Unsalted) butter.
4. Antoniadès (Unsalted) butter.
5. Cow's butter (Unsalted) from Laboratory of Faculty of Agriculture Assiut University.
6. Cow's butter (Salted) from Laboratory of Faculty of Agriculture Assiut University.
7. Buffalo's butter (Unsalted) from Laboratory of Faculty of Agriculture Assiut University.
8. Buffalo's butter (Salted) from Laboratory of Faculty of Agriculture Assiut University.

Imported brands were purchased from the local supermarkets in Alexandria, Cairo, and Assiut towns. The mentioned samples were:-

1. Lurpack (Unsalted) butter.
2. Campina (Unsalted) butter.
3. Francepac (Unsalted) butter.
4. Flechard (Unsalted) butter.
5. Almarai (Unsalted) butter.

10 grams of melted butter were mixed and emulsified with 90 ml of 2% sodium citrate solution in a sterile conical flask, and shaken gently until the mixture become homogenized. This 1:10 dilution of butter was then used for making the serial dilutions required for the microbiological analysis according to the International Standard: FIL/IDF (122 C/1996).

The standard plate count technique was used for counting of the total bacterial content of butter samples. Appropriate dilutions of butter samples were plated in duplicate on an agar medium, which has the following composition:-

Bacto – yeast extract	3.0 g
Beef –extract	3.0 g
Bacto – peptone	5.0 g
Glucose	2.5 g
Lactose	2.5 g
Sodium chloride	5.0 g
Agar	18.0 g
Distilled water up to	1000.0 ml

The pH of the medium was adjusted to 7.0 and sterilized. Incubation of the plated medium was carried out at 30°C for 3 days, at the end of which the number of the colonies were counted according to the Interna-

tional Standard: FIL/IDF (100A/1987).

Examination of the samples for the presence of coliform bacteria were carried out by inoculating butter dilutions into Mac Conky broth according to the International Standard: FIL/IDF (73A/1985). Duplicate tubes were used from each dilution and incubated at 37°C for 24 hours. The medium was prepared as described by Darwish (2010).

Detection of aerobic and anaerobic spores was determined by inoculating litmus milk with appropriate dilutions of butter sample. The inoculated tubes were heated for 10 minutes at 85°C. For anaerobic spores, the medium in half of the tubes was covered immediately after heating and cooling with vaspar, while the second half of the tubes was left uncovered under aerobic condition for detecting aerobic spores. Both groups of tubes were incubated at 30°C for two weeks. Peptonization of culture after 24 hours under aerobic and anaerobic condition was taken as a criterion for the presence of aerobic bacilli, while stormy gas formation after 72 hours under anaerobic conditions was taken as an indicator for the occurrence of butyric acid fermentation and the presence of anaerobic spores Mohamed (2000).

Total lactic acid bacteria in butter samples were counted using MRS (DeMan, Rogosa, Sharpe) medium according to Marshall (1992).

Yeasts and molds in butter samples were counted on Czapek Dox agar medium with adding antibiotic as previously described by Darwish *et al.* (2008).

Psychrotrophic bacteria in butter samples were carried out as previously described for the standard plate count, except incubation of plates at 7±1°C for 10 days Vedamuthu *et al.* (1978).

The colonies of proteolytic bacteria were identified as previously described by Ewings *et al.* (1984) on skim-milk agar media. The respective colonies exhibiting clear zones on skim-milk agar were counted as total proteolytic bacterial count.

Determination of Lipolytic bacteria was carried out according to the International Standard: FIL/IDF (41/1966).

Results and Discussion:

Data presented in Table (1) show the total bacterial count in different samples as well as the minimum and maximum values. As seen from the Table, first, in between each group of samples there was a big difference in the total bacterial count, second, bacterial count always was higher in farm-house butter with a min. of 0.95×10^4 and a max. of 234.67×10^4 cfu/g. than those of local butter which contained a min. of 14.8×10^2 and a max. of 1116.7×10^2 cfu/g. The corresponding values for imported butter were a min. of 3.5×10^2 and a max. of 139.67×10^2 cfu/g.

Table 1. Total Bacterial Count in Some Farm-house, Local, and Imported Butter.

Determinations Samples	Total Bacterial Count		
	Farm-house Butter $\times 10^4$	Local Butter $\times 10^2$	Imported Butter $\times 10^2$
1	133	95.33	95.67
2	8.1	127.33	137.67
3	59.67	14.8	7.93
4	15.2	99	11.37
5	10.7	1116.7	139.67
6	15.2	61.33	12.67
7	112.0	65.67	3.87
8	210.67	55.33	93.67
9	159.33	-	129.33
10	94.67	-	3.5
11	0.95	-	5.77
12	234.67	-	-
13	98.33	-	-
min	0.95	14.8	3.5
max	234.67	1116.7	139.67

Average of 3 Replicates.

These results are in good agreement with those obtained by Khalafalla *et al.* (1974), Hayaoglu and Konar (2001) and Osman *et al.* (2002), and it can be due to the method of handling, collecting of milk, manufacture processes and storage conditions which can affect the bacteriological quality of the product.

The same trend in total bacterial count was obtained con-

cerning counts of L.A.B. as presented in Table (2). The corresponding values for farm-house butter were a min. of 0.08×10^4 and a max. of 119×10^4 cfu/g. On the other hand, values for local butter and imported butter were of a min. of 12.2×10^2 and 31×10^2 and max. of 440×10^2 and 138.33×10^2 cfu/g., respectively.

Table 2. Total Count of Lactic Acid Bacteria in Some Farm-house, Local, and Imported Butter.

Determination Samples	Total count of Lactic Acid Bacteria		
	Farm-house Butter x 10 ⁴	Local Butter x 10 ³	Imported But- ter x 10 ³
1	1.51	146	953.3
2	1.27	141.33	90.67
3	0.44	12.2	74.33
4	0.08	146	102
5	2.01	440	111.33
6	1.87	58	62.33
7	19.97	62.33	89.67
8	119	72.33	138.33
9	10.70	-	83.67
10	12.73	-	31
11	0.11	-	34.33
12	2.50	-	-
13	1.26	-	-
min	0.08	12.2	31
max	119	440	138.33

Average of 3 Replicates.

The obtained results are in good agreement with those obtained by El-Gendy *et al.* (1977), Bakheet (1979), Bahout (2001) and Kasana *et al.* (2002). Who found that farm-house butter always had higher total bacterial and L.A.B. than that of factory-made butter.

The examination of the samples for the presence of coliform bacteria by the presumptive test indicated that all the samples of farm-house butter were positive. On contrast, all the samples of local and imported butter were completely free of coliform.

These results can be explained by the way of milking animals and handling of raw materials, manufacturing process and storage conditions.

These results are in harmony with those obtained by El-Essawy (1980), Mostafa (2004), Karagozlu and Ergonul (2008) and Hussain *et al.* (2011). However Khalafalla *et al.* (1974) found that 2 out of 22 samples of the factory-made butter and 13 out of 48 samples of the farm-house butter were positive for presumptive coliform test. The presence of coliform in the butter samples indicates unsatisfactory hygienic practices in the butter making and/or handling.

As it can be seen from Table (3) the count of total psychrotrophic bacteria proved to be higher for the farm-house butter (min. of 0.33×10^3 and max. of 91.67×10^3 cfu/g.), than the local butter (min. of 4.6×10^3 and max. of

14.933x10³ cfu/g.), however the lowest psychrotrophic count were found in the imported butter (min. of 4.03x10² and max. of 154.67x10² cfu/g.). The same trend was found by Kasana *et al.* (2002).

Table 3. Total Count of Psychrotrophic Bacteria in Some Farm-house, Local, and Imported Butter.

Determinations Samples	Total Count of Psychrotrophic Bacteria		
	Farm-house Butter x 10 ³	Local Butter x 10 ³	Imported Butter x 10 ²
1	1.2	7.867	78
2	8.5	14.933	90.33
3	7.73	4.6	8.73
4	1.52	7.733	11.73
5	5.0	5.333	124.67
6	10.5	6.567	10.17
7	23.933	45	7.33
8	6.87	12.433	154.67
9	37.0	-	88
10	6.83	-	7.33
11	1.82	-	4.03
12	0.33	-	-
13	91.67	-	-
min	0.33	4.6	4.03
max	91.67	14.933	154.67

Average of 3 Replicates.

From Table (4) and Table (5) it can be seen that the counts of proteolytic and lipolytic bacteria in different groups of samples had the same trend as that obtained for the total psychrotrophic bacteria. The same trend was obtained by Hayaloglu and Konar (2001).

Table 4. Total Count of Proteolytic Bacteria in Some Farm-house, Local, and Imported Butter.

Determinations Samples	Total Count of Proteolytic Bacteria		
	Farm-house Butter x 10 ⁴	Local Butter x 10 ²	Imported Butter x 10 ²
1	28.33	49.67	84.33
2	40.67	73.67	94.33
3	10.33	10.1	7.5
4	1	169.67	12.43
5	18.03	386.7	131.67
6	36	120.67	5.63
7	46.33	83.33	2.63
8	162.67	95.33	74.33
9	181.67	-	96.67
10	75.67	-	3.93
11	4.67	-	3.6
12	36	-	-
13	36.33	-	-
min	1	10.1	2.63
max	181.67	386.7	131.67

Average of 3 Replicates.

Table 5. Total Count of Lipolytic Bacteria in Some Farm-house, Local, and Imported Butter.

Determinations Samples	Total Count of Lipolytic Bacteria		
	Farm-house Butter x 10 ²	Local Butter x 10	Imported Butter x 10
1	8.87	47	48.33
2	37.67	40.33	14
3	83.33	22	13
4	7.9	48	14.67
5	49	600	13.33
6	65.33	800	25.67
7	363.3	81.33	19.33
8	563.3	68	5
9	37.33	-	15.33
10	476.7	-	5
11	5.5	-	5.33
12	8.8	-	-
13	38.33	-	-
min	5.5	22	5
max	476.7	800	48.33

Average of 3 Replicates.

Concerning the presence of aerobic and anaerobic spores in different groups of the samples from the three groups, it is clear that both groups of spores were present only in farm-house butter, these results are normal and it can be a reason of method of handling and processing, on the other hand both group of samples

obtained from local and imported butter were negative.

On the other hand, from the data presented in Table (6) it can be seen that presence of yeasts and moulds were detected only in the farm-house butter, however, no growth was observed in both local and imported butter.

Table 6. Total Count of Yeasts & Molds in Some Farm-house, Local, and Imported Butter.

Determinations Samples	Total count of Yeasts & Molds
	Farm-house Butter x 10 ²
1	113.3
2	7.67
3	15.33
4	60
5	43.67
6	65.67
7	55.33
8	736.7
9	68
10	62.33
11	7.37
12	93.3
13	730
min	7.37
max	736.7

Average of 3 Replicates.

These results are somehow in agreement with those of Sultan (1972), Khalafalla *et al.* (1974), Karagozlu and Ergonul (2008) and Cardak and Yilmaz (2011). They found that always factory-made butter samples contained less yeasts and moulds than those encountered in the farm-house butter.

Conclusion:

The study recommends that control should be increased on farm-house butter, also the Egyptian standard should include the maximum count of microbial load in farm-house, local and imported butter, in order to produce safe butter to consumers.

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في هذه الدراسة تم تجميع 13 عينة عشوائية من الزبد الفلاحي من أماكن مختلفة من محافظتي المنيا وأسيوط ، وكذلك تم شراء 8 عينات من الزبد المحلي و 11 عينة من الزبد المستورد من متاجر محلية كبيرة في مدن الإسكندرية والقاهرة وأسيوط. وقد تم فحص الحالة الميكروبية لجميع العينات. ودلت النتائج المبينة أن الزبد الفلاحي كان دائما مرتفعا في العدد الكلي للبكتيريا والذي تراوح من 10×0.95 كحد أدنى و 10×234.67 وحدة مستعمرة بكتيرية/جرام كحد أقصى أما في الزبد المحلي و الزبد المستورد فتراوح العدد الكلي للبكتيريا من 10×14.8 كحد أدنى و 10×1116.7 وحدة مستعمرة بكتيرية/جرام كحد أقصى و من 10×3.5 كحد أدنى و 10×139.67 وحدة مستعمرة بكتيرية/جرام كحد أقصى علي التوالي. وسارت نتائج تقدير العدد الكلي لبكتيريا حامض اللاكتيك في نفس اتجاه العدد الكلي للبكتيريا وكانت كالتالي من 10×0.08 كحد أدنى و 10×119 وحدة مستعمرة بكتيرية/جرام كحد أقصى و من 10×12.2 كحد أدنى و 10×440 وحدة مستعمرة بكتيرية/جرام كحد أقصى و من 10×31 كحد أدنى و 10×138.33 وحدة مستعمرة بكتيرية/جرام كحد أقصى للزبد الفلاحي والمحلي والمستورد علي التوالي. بينما وجدت بكتيريا القولون فقط في الزبد الفلاحي في حين أعطي الزبد المحلي والمستورد نتيجة سالبة لبكتيريا القولون. ولقد وجد أن العدد الكلي للبكتيريا المقاومة لدرجات الحرارة المنخفضة مرتفعا في الزبد الفلاحي والذي تراوح من 10×0.33 كحد أدنى و 10×91.67 وحدة مستعمرة بكتيرية/جرام كحد أقصى عن الزبد المحلي والذي تراوح من 10×4.6 كحد أدنى و 10×14.933 وحدة مستعمرة بكتيرية/جرام كحد أقصى بينما سجلت أقل قيمة للعدد الكلي للبكتيريا المقاومة لدرجات الحرارة المنخفضة في الزبد المستورد والتي تراوحت بين 10×4.03 كحد أدنى و 10×154.67 وحدة مستعمرة بكتيرية/جرام كحد أقصى. ولقد أخذت نتائج تقدير أعداد البكتيريا المحللة للبروتينات والمحللة للدهون في المجاميع المختلفة نفس اتجاه نتائج تقدير العدد الكلي للبكتيريا. ولقد وجدت الجراثيم الهوائية والجراثيم اللاهوائية والخمائر و الفطريات فقط في الزبد الفلاحي. وتوصي الدراسة بتشديد الرقابة الصحية خاصة علي الزبد الفلاحي، كما يجب أن تشمل المواصفات القياسية المصرية علي الحد الأقصى للحمولة الميكروبية في الزبد الفلاحي والمحلي والمستورد، وذلك بهدف تقديم منتج صحي وآمن للمستهلك.