

MICROBIAL EXAMINATION OF SOME IMPORTED POWDER MILK+

Kithar R. Majeed*

Sabah M. H. Al-Shatty*

Ali A. K. Al-Ka'abi**

Abstract

The research includes a study based on microbial examination of ten trade marks of imported full cream milk powder of different origins, which are “Renypicot”; “Matines”; “Dielac”; “Crystal”; “Al-Mudhish”; “Elmoroug El-Khadra”; “Al-Badie”; “Murooj”; “Safa”; and “Euro”. All samples of these trade marks were examined for total viable bacteria count, thermophilic bacteria count, lipolytic bacteria count, proteolytic bacteria count, coliforms count and (molds and yeasts) count. The presence of *Staphylococcus aureus* and *Salmonella* spp. was also examined in all tested samples. Results show that all tested samples of imported powder milk do not exceed the limits recommended by the Iraqi standards (IQS) and International Specifications Organization (ISO) and also are free from *Staphylococcus aureus* and *Salmonella* spp.

المستخلص

تضمنت الدراسة الحالية إجراء الفحوصات المايكروبية لعشرة أنواع من الحليب المجفف الكامل الدسم المستورد من مناشئ مختلفة والموجودة في الأسواق المحلية وقد شملت هذه الأنواع كل من (ريني بيكوت - ماتين - ديلاك - كرسنال - المدهش - المروج الخضراء - البديع - المروج - الصفا - يورو). الفحوصات المايكروبية للعينات المدروسة والتي أجريت تمثلت في كل من: العد البكتيري الهوائي الكلي - عد البكتريا المحبة للحرارة - عد البكتريا المحللة للدهن - عد البكتريا المحللة للبروتين - عد بكتريا القولون فضلاً عن عد الخمائر والأعفان. كما شملت الدراسة الكشف عن البكتريا المرضية المتمثلة بالمكورات العنقودية الذهبية والسالمونيلا ولجميع العينات المفحوصة. أوضحت النتائج إن الأعداد المايكروبية كانت ضمن الحدود المسموح بها ولم تتجاوز الأعداد المحددة في المواصفات القياسية العراقية والعالمية وكذلك تبين خلوها من البكتريا المرضية.

Introduction

Milk powder is made by removing water from liquid milk. Removing water is necessary to reduce water activity for the prevention of microorganism growth [1]. Dry milk is used to produce such products as yogurt, cheese; ice cream and whey powder. There are a multitude of products derived from dried milk. Moreover, the advantages of dry milk over liquid milk are better keeping quality, less storage space and low shipping costs [2].

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* Assist. professor /College of Agriculture/University of Basrah

** Assistant lecturer/ College of Agriculture/University of Basrah

In the last ten years, large quantities of powder milk which have been imported by both general and private sectors from different origins and are distributed to Iraqi people every month as a food stuff portion. However, no attempt has been to study the hygienic quality of these products except one study which included studying of physiochemical properties and composition of these products [3]. Therefore the present study is carried out to assess the microbiological quality of these products.

Materials And Methods

Forty samples of imported full cream milk powder of different origins were purchased from local markets. These samples included four laminated bags (250 capacity) of powder milk from each of the following trade marks: “Renypicot”; “Matines”; “Dielac”; “Crystal”; “Al-Mudhish”; “Elmoroug El-Khadra”; “Al-Badie”; “Murooj”; “Safa”; and “Euro”. All samples were tight and free from any damages.

Samples were examined microbiologically for total viable counts at 30°C; thermophilic bacteria counts at 55 C° and (molds and yeasts) counts at 25C°, adopting the methods given in Standard Method for the Examination of Dairy products [4]. Lipolytic and proteolytic counts were determined according to the methods described by [5,6]. *Staphylococcus* counts were determined according to the methods described by [7]. Morcom, coagulase and DNase tests were used to differentiation between the colonies *S. aureus* and another species of *Staphylococcus*[8,9].

Most Probable Number (MPN) was used for determining coliform counts, MPN was calculated on the basis of positive tubes using McCrady’s Table as indicated in Standard Methods for the Examination of Dairy products [10]. The detection of *Salmonella* spp. in dried milk samples was done according to the methods given in [11].

Results And Discussion

Average and percentages of total viable bacteria counts are shown in Table 1, the total viable count ranged from 2.26×10^2 to 24.2×10^2 per gram. These results clearly show that all samples contain less than the upper limit (50,000 per gram) required by the Iraqi standards [12] and International Specification Organization ISO [13] of dried milk powder.

Thermophilic counts ranged from 22 to 672 per gram. All tested samples of “Renypicot”, “Matines” and “Euro” contain thermophilic bacteria. The lowest counts were in “Al-Badie” and “Murooj” samples (Table 1). Inefficient cleaning of condensers and feed tanks, as well as other poor conditions are considered the main sources of thermophilic bacteria.

Lipolytic bacteria count was the highest in “Euro” samples (average of 39.6×10 per gram), and the lowest in “Al-Badie” samples (average of 19×10 per gram). This group of bacteria were detected in all tested samples of “Euro” trade mark, while all other tested samples of powder milk gave 25% of tested samples (Table 1). Lipolytic bacteria are of great importance to dairy industry especially this

group can produce lipase an enzyme which catalyzes the hydrolysis of fats to fatty acids and glycerol that causes rancidity in milk [11].

Proteolytic bacteria counts of powder milk were the highest in “Euro” trade mark (average of 34.5×10 per gram). The lowest was in “Safa” trade mark (average 3.2×10 per gram). No proteolytic bacteria were detected in “Elmoroug Elkhadra”, “Al-Badie” and “Murooj” trade marks (Table 1).

Table (1) Total bacteria counts, thermophilic counts, lipolytic counts, proteolytic counts and Staphylococci counts of some imported powder milk.

Trade mark	Total counts*	Thermophilic counts	Lipolytic counts	Proteolytic counts	Staphylococci count					
	Average No./g $\times 10^2$	% of positive samples	Average No./g $\times 10^2$	% of positive samples	Average No./g $\times 10^2$	% of positive samples	Average No./g $\times 10^2$	% of positive samples	Average No./g $\times 10^2$	% of positive samples
Renypicot	19.3	100	6.21	100	2.10	25	1.50	50	28	50
Matines	8.18	100	5.40	100	1.91	25	2.44	50	19	50
Dielac	4.53	100	6.75	75	0.62	25	1.10	25	14	25
Crystal	4.05	100	2.34	50	0.65	25	0.42	25	10	25
Al-Mudhish	5.00	100	2.48	25	0.88	25	0.39	25	8	25
Elmoroug Elkhadra	3.20	100	1.03	50	0.70	25	0	0	22	25
Al-Badie	4.11	100	0.22	25	0.19	25	0	0	0	0
Murooj	2.26	100	0.30	25	0.99	25	0	0	0	0
Safa	5.11	100	0.54	25	1.60	25	0.32	25	0	0
Euro	24.2	100	2.68	100	3.96	100	3.45	75	36	100

0: Not detected

* Iraqi standards (IQS) for total bacteria counts in powdered full cream milk is 50.000 per gram and 100.000 per gram recommended by international specifications (ISO).

Proteolytic bacteria can degrade the casein to peptides and end products of proteolysis may import abnormal flavor or odor to the milk and dairy products even though they are kept refrigerated especially that the most proteolytic belongs to psychrophilic which is able to grow and reproduce during the period of storage in cool place.

Staphylococcus counts were in the range of 0 (not detected) and 36 per gram. All isolates of this bacteria were non-pathogenic types [7]. No staphylococci were found in “Al-Badie”, “Murooj” and “Safa” trade marks (Table 2).

Table (2) Coliforms counts of some imported powder milk.

Trade mark	(%) of positive samples	Range No./g	Average No./g*
Renypicot	100 (4)	9-45	25
Matines	100 (4)	3-18	9
Dielac	(25) 1	0-24	6
Crystal	0 (not detected)	0 (not detected)	0 (not detected)
Al-Mudhish	(25) 1	0-8	2
Elmoroug Elkhadra	(50) 2	0-19	7
Al-Badie	(25) 1	0-10	2.5
Murooj	0 (not detected)	0 (not detected)	0 (not detected)

Safa	(75) 3	0-13	4
Euro	(100) 4	21-196	89

* Iraqi standards (IQS) for coliform in powdered full cream milk is 100 per gram and 0 per gram recommended by international specifications (ISO).

Table 2 shows counts of coliforms, it can be seen that the highest count of coliforms is in “Euro” (average of 89 and range of 21-196 per gram). These organisms were detected in 100% of tested samples of “Reny picot”, “Matines” and “Euro”. However, no coliforms were detected in all tested samples of “Crystal” and “Murooj”. One sample of all trade marks exceeded the 100 per gram limit for dried milk powder recommended by the Iraqi standards [10]. It is known that coliforms are destroyed by pasteurization and by successive heat treatment during processing. Therefore, the presence of these bacteria in dried milk powder may be attributed to contamination after heating caused by improper cleaning and sterilization of manufacturing plants. However, even if milk gets contaminated with low levels of coliforms as do some serotypes of *Escherichia coli*, they would be able to proliferate and produce millions of cells during holding at warmer temperatures which may cause some health hazard such as diarrhoeal disease [12,13]. On the other hand, the counts of molds and yeasts of dried milk samples were very little in all samples and can be insignificant (Table 3).

Table (3) Molds and yeasts counts of some imported powder milk.

Trade mark	(%) of positive samples	Range No./g	Average No./g
Reny picot	100	18-61	33
Matines	100	2-25	13.5
Dielac	75	0-18	12
Crystal	25	0-40	10
Al-Mudhish	0 (not detected)	0 (not detected)	0 (not detected)
Elmoroug Elkhadra	50	0-51	15.2
Al-Badie	0 (not detected)	0 (not detected)	0 (not detected)
Murooj	25	0-32	8
Safa	100	16-23	20
Euro	100	30-48	37

All dried milk samples were examined for the presence of *Salmonella* spp. . In none of the forty samples examined could *Salmonella* isolate be detected. Generally, from these results obtained it can be revealed that all trade marks of dried milk are than the under limit required by the world standards of dried milk powder [2,10].

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