A survey study on artificial fraud and thickeners in local and imported cream and yogurt that available in Baghdad city

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Abstract

The current study aimed to detect artificial fraud in chemical additives (formalin, hydrogen peroxide) and to detect thickeners (starch) in imported and local dairy products and to determine their suitability for human consumption due to the high demand for their consumption by members of society, 20 samples of products were collected The local and imported milk in the Iraqi markets of the city of Baghdad consisted of 10 samples of yoghurt and 10 samples of cream. The tests were carried out, which were the detection of chemicals and additive thickeners such as formalin, hydrogen peroxide and starch, respectively, as well as the examination of the microbial load, which included the detection of colon bacteria, yeasts and molds, and the results showed that they contained Sample (20) contained formalin, and each of the samples (6,7,8,11,17,20) contained hydrogen peroxide, and samples (3,4,5,8,17) contained starch as for the microbial load. The results showed that all samples were free of coliform bacteria, yeasts and molds on day zero, but after preservation for 5 days in the refrigerator at a temperature of ºC (5), it showed the presence of growth of colon bacteria and molds The yeasts except samples (6,7,8,11,17,20) were characterized as being free, and the reason may be due to the presence of formalin and hydrogen peroxide in the samples.

Key words: cream and yogurt, artificial fraud, thickeners , Baghdad city .

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دراسة مسحية عن الغش الصناعي والمثخنات في القيمر واللبن الرائب المحلي والمستورد المتوفر في مدينة بغداد

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الخلاصة :

هدفت الدراسة الحالية الكشف عن الغش الصناعي في المضافات الكيميائية(الفور مالين ، بيروكسيد الهيدروجين) والكشف عن المواد المثخنة (النشا) في منتجات الالبان المستوردة والمحلية ومعرفة مدى صلاحيتها للاستهلاك البشري بسبب كثرة الاقبال على استهلاكها من قبل افراد المجتمع ، تم جمع 20 عينة من منتجات الالبان المحلية والمستوردة الموجودة في الاسواق العراقية لمدينة بغداد بواقع 10عينات لبن رائب و10 عينات قشطة وتم اجراء الفحوصات التي تمثلت بكشف المواد الكيميائية والمواد المثخنة المضافة مثل الفورمالين وبيروكسيد الهيدروجين والنشا على التوالي وكذلك تم فحص الحمولة الميكروبية والتي شملت الكشف عن بكتريا القولون والخمائر والأعفان واظهرت النتائج احتواء العينة (20) على مادة الفورمالين كما احتوت كل من العينات (6،7،8،11،17،20)على مادة بيروكسيد الهيدروجين وكذلك احتوت العينات (5،8،17،3،4) على مادة النشا اما بالنسبة للحمولة الميكروبية فقد اظهرت النتائج خلو جميع العينات من بكتريا القولون والخمائر والأعفان في اليوم الصفر اما بعد الحفظ لمدة 5 ايام في الثلاجة بدرجة 5) (Cºفقد اظهر وجود نمو لبكتريا القولون والاعفان والخمائر ماعدا العينات (6،7،8،11،17،20) امتازت بخلوها وقد يعود السبب الى وجود الفورمالين وبيروكسيد الهيدروجين في العينات .

الكلمات المفتاحية : القيمر واللبن الرائب ، الغش الصناعي، مدينة بغداد.

Introduction:

Milk is considered one of the important types of food needed by a child, an infant, an elderly, a breastfeeding mom, a pregnant, as well as a sick person, thus it is a food to consume from cradle to grave. Dairy products occupy high rank between the different food groups; therefore, humans' knowledge of the dairy products goes back to the beginning of life [1].

Dairy products in our diet provide essential nutrients for humans such as proteins, fats, carbohydrates and minerals [2, 3]. Also, in most arab countries, dairy products are an essential food for the people of the middle east and the importance of these products is increased in arab and european countries for their health benefits [4]. It is recommended for an adult to consume 2-3 parts of food containing dairy products per day [5]. Due to the reason that some marketing systems are unregulated; the quality of dairy products may not be sufficient [6], Especially in these circumstances that Iraq is exposed to, including the commodity dumping policy, which the dairy industry had a share of [7 **].** As imports have increased in recent years **[8]**. Many dairy products appeared on the local market with poor quality and may reach the consumer, and they are not suitable for human consumption for various reasons **[9]** as there are some immoral activities usually adapted to prevent Finance losses caused by the damage of dairy products during transportation, sale and the increase the size and thus increase the profit margin. So, we notice the fraud in dairy products

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[10, 11] for example, adding water to milk to increase the quantity of total solids as well as thickness factors by adding starch and flour. These substances are added to cover the effects of added water and fat skimming which would make it appear in a fairly natural texture [12, 13, 14, 15] The food regulations do not allow this procedure which is to change the composition of milk produced naturally. These regulations are based on the fact that there is a relationship between the amount of fat and other natural milk components, so any modification or adding water changes this relationship [12]. Furthermore, the addition of some chemicals such as formalin and hydrogen peroxide for the purpose of extending shelf life [12, 16] which are known for their toxicity and carcinogenic properties [3, 15, 17]. The researchers also reported that preservatives can cause health risks such as hypersensitivity and asthma [18; 19]. Hydrogen Peroxide is added in small amounts where the addition of 0.1% can extend the product shelf life for about 9 hours. If a percentage of less than 0.1% is added. Hydrogen Peroxide cannot be detected after 24 hours due to analysis by oxidized enzymes such as catalase and peroxidase to water and oxygen [12, 20]. The FDA administration has not approved the use of hydrogen peroxide in food for human consumption and the sale of hydrogen peroxide for this purpose is illegal [20]. Added preservatives are generally prohibited by the law and is considered one of the methods of counterfeiting of milk and dairy products that causes a big problem where it leads to a lack of nutritional value as well as causing damage to human health in case the additives are harmful to health [12]. Although, all dietary legislation prohibits the use of preservatives and chemicals such as formalin and hydrogen peroxide in food, we still suffer from the effects of various cheating methods in dairy products [21].

Milk is considered an essential natural food due to its high nutritional value. In fact, milk is the only food provided to infants during the first two or three months of their life. Milk is also great nutritional value to humans, especially older people[12]. Is a widespread white liquid and is considered a model for whole food, and there are various types in the markets such as sterile yogurt, naturalized milk, pasteurized milk, condensed milk, dried milk and fresh milk [22].

The pH of milk is 6.5-6.7 which is considered weak acid and has many products, including industrial and natural, and in this research chemical methods will be used to detect milk cheats [15]. The total milk composition is considered a liquid food that has been released by the milk glands for the purpose of feeding newborns. Milk contains fat, water, proteins, milk, sugar, and minerals. The overall composition rate of cow's milk is as follows:

Water 87%, fat 3.5 - 3.7%, proteins 3.5%, milk sugar lactose 4.9%, minerals estimated as ash 0.7% [15].

Adding any substance or removing any natural milk component would result in harming the consumer's health and cheat him [1, 15].

There are several ways to cheat milk, including natural fraud such as adding water to milk, taking off an amount of fat, adding water and filtered milk or

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adding skim milk, and there is chemical fraud, it uses ammonia, sodium carbonate, and sodium hydroxide to neutralize the acidity in milk. The most dangerous are formalin, hydrogen peroxide, salicylic acid, and antibiotics with the goal of extending shelf life. The most dangerous of these substances that are used in large quantities is the formalin. as for the use of starch, gelatin, glue or flour, these materials are allowed to be used as thickeners and stability improvers [1,15].

Therefore, recent study aimed to examine a group of yogurt and cream (1).

samples available in the local markets of different origin and examine their suitability for human consumption due to the high market demand for by members of the community.

Material and method:

Samples collection:

A total of 20 Cream and yogurt samples were randomly collected from supermarkets, hotels, restaurants and private companies in Baghdad city during the period from april to august 2019, which are the most present samples in the local market, as shown in Table

Table (1) Dairy Product Samples in Baghdad city

Sample's number	Samples	The origin
1	Activia yogurt	Iraq – Duhok
2	Canoon yogurt	Iraq
3	Smile yogurt	Iraq – Arbil
4	Baraka yogurt	Iraq - Duhok
5	Rotach 7 yogurt	Iraq - Zakho
6	AlSafi Danone yogurt	Iraq - Arbil
7	Al-Rafidayn yogurt	Iraq
8	Kalleh 7 yogurt	Iran
9	Reemas yogurt	Germany
10	Pinar yogurt	Turkey
11	Local cream	Iraq
12	Al-Fatlawi local cream	Iraq
13	Abu Ghraib cream	Iraq
14	KDD cream	Kuwait
15	Nojoud cream	Kuwait
16	Kalleh cream	Iran
17	Sabah cream	Iran
18	Pinar cream	Turkey
19	President cream	France
20	Yag Gol cream	France

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Detection of starch:

2-3 drops of dissolved iodine (1%) were added to 3 ml of the sample in a test tube, the blue color show as an indication of the presence of starch as in Figure (1) [23].

Figure (1) Detection of Starch

Detection of Formalin:

Taking 3 ml of the sample in a testing tube, then diluted by a same amount of water plus adding 5 ml sulfuric acid (90%) slowly and with caution on the side of the tube (which should be in an inclined status). Where layer of separation is formed and with the presence of the formalin, a violet ring is formed on the surface of separation of the adequate liquids. In case the lack of the formalin presence, the color formed would be light green and after a period of time the color turned to reddish brown as in Figure (2) [23, 24].

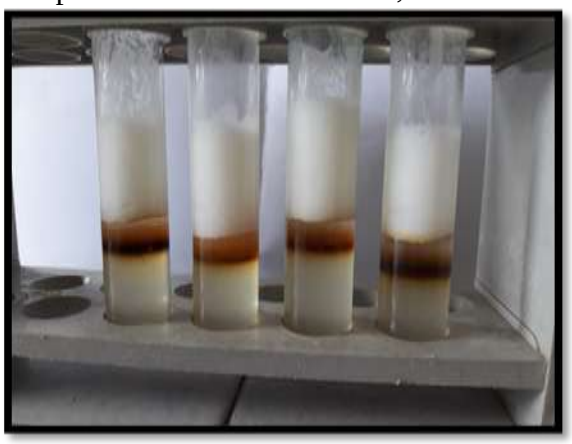

Figure (2) Formalin detection

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Detection of Hydrogen Peroxide H_2O_2:

1 ml of Potassium Iodide from (6%), 1ml Sulfuric Acid H_2SO_4 were added to 10ml of the sample in a test tube. In the presence of hydrogen peroxide H_2O_2, a yellow color is formed after 2-3 minutes as in Figure (3) [25].

Figure (3) Hydrogen Peroxides detection

Viable Count:

Petri plates of Violet Red Bile Agar medium containing (g/L): were used to determine viable E.coli bacteria count, 1 ml of each sample was transferred to the individual plates for determination of total viable counts (TVC) followed by incubation at 37ºC for 24-48 h. Each sample was run in triplicates (Anon, 1994). Total number of colonies on each plate were counted with the help of colony counter and colony forming unit (CFU) was counted using formula:

CFU = No. of colonies x Dilution factor / sample volume (ml) [19].

Mold and Yeast Count

Petri plates containing malt agar medium : were used to determine the presence of molds and yeasts, respectively. The plates containing 1 ml of each sample were incubated at 25-30ºC. After 3-5 day, the number of mold and yeast colonies was counted by colony counter [26].

Results and Discussion:

The results in a table (2) shows the presence of thickening additives (starch) in the research samples. It was observed from the extracted results that the samples (3,4,5,8,17) contain thickening agent of starch, while the rest of the samples were free of starch . These results did not agree with [22] studies who where all samples were free of starch. Starch consists of α1-4 linked amylose and α1-6 amylopectin. The reaction is due to the formation of polyiodide chains from the reaction of starch and iodine. Amylose in starch is responsible for the formation of deep blue color in the presence of iodine. The iodine molecule slips inside of the amylose coil. This makes a linear triiodide ion complex with is soluble that slips into the coil of the starch causing an intense blue-black color [27].

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Formalin test HCHO:

The results in table (2) the presence of formalin in dairy products, as sample (20) contains formalin, and that was identical with what each of [28, 29, 2] found in their study, where some samples contain formalin, which is one of the most common preservatives that has the effect of eliminating existing bacteria if added at a high concentration, but if it was added at a low concentration it leads to a delay and slowness of the reproduction of bacteria [23]. It is also a carcinogen, as confirmed by the government agencies such as the U.S. Department of Health, thus it shouldn't be used in any food products [19]. As for the rest of the samples, it is proven that they are free of formalin ، If consumed at a higher concentration, formaldehyde may cause damage to the gastro intestinal tract(GI tract), kidney, liver and lungs, and may lead to cancer. formaldehyde, when ingested, exerts an irritant action upon mucous membranes and may cause inflammatory changes in the liver and kidneys. In addition, there is evidence linking formaldehyde with nasopharyngeal cancer [30].

Hydrogen Peroxide Test H_2O_2: -

Table (2) shows the results of the presence of hydrogen peroxide in dairy products, where it shows from the results that all the samples are peroxide-free except the samples (6,7,8,11,17,20) because they contained hydrogen peroxide and that did not match with the study [29; 22]. This was confirmed by the Food and Drug Administration (FDA,2009) as it did not approve the use of Hydrogen Peroxide in food products [20; 31], which is used by producers in order to prevent financial losses caused by the damage of products and to preserve them for as long as possible without caring about the threatening effects to the human health [11].

It was showed from the previous tables that some samples contain chemicals such as formalin, hydrogen Peroxide, as well as the use of starch to improve the stability of these products. This might be due to several reasons that milk is inherently a liquid that is easy to be cheated, where a part of the milk fat can be easily removed and be sold at a higher price in the form of fatty products such as cream, butter and margarine. Milk can also be diluted with water or Skim milk without changes in its color or general properties.

It is also due to the association of distributors to the delivery of milk to a certain number of consumers (customers) and the lack of milk quantities to suffice the demands of all consumers in certain seasons or under certain circumstances, forcing distributors and also to the lack of religious and moral authority, to cheat milk by adding a quantity of water or Skim milk to meet the wishes of all their customers in order to keep them from going to another distributor. In addition, the poor methods of milk production and in a result, its low quality, especially the bacteriological with high temperature in the summer, encourage some producers and distributors to add some preservatives to the milk or cool it by adding a quantity of ice or cold water so that it keeps it in its liquid status until it reaches the consumer or dairy factories.

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Table (2) Detection of Starch, Formalin and Hydrogen Peroxide in Research Samples

Sample's Number	Samples	Starch Test	Formalin detection Test	Detection of hydrogen peroxide Test
1	Activia yogurt	-	-	-
2	Canoon yogurt	-	-	-
3	Smile yogurt	+	-	-
4	Baraka yogurt	+	-	-
5	Rotach 7 yogurt	+	-	-
6	AlSafi Danone yogurt	-	-	+
7	Al-Rafidayn yogurt	-	-	+
8	Kalleh 7 yogurt	+	-	+
9	Reemas yogurt	-	-	-
10	Pinar yogurt	-	-	-
11	Local cream	-	-	+
12	Al-Fatlawi local cream	-	-	-
13	Abu Ghraib cream	-	-	-
14	KDD cream	-	-	-
15	Nojoud cream	-	-	-
16	Kalleh cream	-	-	-
17	Sabah cream	+	-	+
18	Pinar cream	-	-	-
19	President cream	-	-	-
20	Yag Gol cream	-	+	+

Microbial contamination test: -

Table (3) shows microbial contamination in yogurt and cream samples, where it was noted on the zero day of the results that all samples used in the study were free of microbial contamination, while the results were after 5 days of keeping them in the refrigerator. At a degree (5 ° C) there is microbial contamination except for samples (6, 7, 8, 11, 17, 20) It was noted that it was free from microbial contamination, and this corresponds to the use of chemicals such as formalin, hydrogen peroxide, which would inhibit the growth of microorganisms and thus prevent the occurrence of any microbial. As a result, this will affect the human and consumer health and results into harm to them, and these results are consistent with what she found [29] in her study, where the samples she studied contained E-coli bacteria, yeasts and molds. Dairy contamination with fecal coliform bacteria might be a result from the lack of hygiene or it might have an

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external source caused by workers and contamination with yeasts and molds, which leads to a change in the flavor of the product as well as affecting the duration of preservation. And the main reason goes to the dander of the metabolic products that are produced by yeasts and molds [32]. Also, the presence of preservatives will limit the growth of microorganisms [12].

Table (3) Microbial Contamination

Sample's Number	Samples	Microbial Contamination in (0) day		Microbial Contamination in (5) day	
		E.Coli	Yeasts and Molds	*E.Coli*	Yeasts and Molds
1	Activia yogurt	-	-	+	+
2	Canoon yogurt	-	-	+	+
3	Smile yogurt	-	-	+	+
4	Baraka yogurt	-	-	+	+
5	Rotach 7 yogurt	-	-	+	+
6	AlSafi Danone yogurt	-	-	-	-
7	Al-Rafidayn yogurt	-	-	-	-
8	Kalleh 7 yogurt	-	-	-	-
9	Reemas yogurt	-	-	+	+
10	Pinar yogurt	-	-	+	+
11	Local cream	-	-	-	-
12	Al-Fatlawi local cream	-	-	+	+
13	Abu Ghraib cream	-	-	+	+
14	KDD cream	-	-	+	+
15	Nojoud cream	-	-	+	+
16	Kalleh cream	-	-	+	+
17	Sabah cream	-	-	-	-
18	Pinar cream	-	-	+	+
19	President cream	-	-	+	+
20	Yag Gol cream	-	-	-	-

Conclusion

The use of chemicals such as formalin, hydrogen peroxide and thickeners such as starch in cream and yogurt samples. The goal of adding chemicals is to prolong the shelf life, and these substances are considered dangerous to the health of the consumer. As for starch, it is used as a thickener and improver of stability.

Recommendations

1- Detection of pesticides in milk and milk products carried by cows

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2- Investigation of heavy elements in dairy products
3- Detection of antibiotics added to dairy products.
4- Detection of the genetic modification of the milk of transgenic animals.
5- Detection of dairy products irradiated

References:

1- Abu Foul, N. **2009**. Dairy products industry. Development Action Center. First edition. Al-Azhar University - Gaza.
2- Shahadat, H., Samiyl, l., Subrata, p. and Abu shara, S. **2016**. Investigation of Formaldehyde Content in Dairy Products Available in Bangladesh by a Validated High Performance Liquid Chromatographic Method. Dhaka Univ. J. Pharm. Sci. 15(2):187-194.
3- Gwin, M. C., Lienert, G. and Kennedy, J. **2009**. Formaldehyde exposure and asthma in children. A systematic review. Environ Health Perspect 118: 313-317.
4- Al-Yaziji, S., Ali, A. and Hattal, A. **2010**. Investigation and diagnosis of yeasts and for Fungi sour milk produced in some Syrian governorates. Damascus University Journal for Agricultural Sciences. 26(1):261-275.
5- Kanwal, R., Ahmed, T. and Mirza, B**. 2004**. Comparative analysis of milk collected for buffalo,cow,goat and sheep of Rawalpindi/Islamabad region in Pakistan. Asian J. Plant Sci. 3: 300-305.
6- Javaid, S. B., Gadahi, J. and Khaskheli, M. **2009**. Physical and Chemical quality of market milk sold at Tandojam. Pak. Pak vet. J. 29(1): 27-31.
7- Alkhafaji, M. **2018**. Quality of Local and Imported Dairy Products from Iraq Consumer opinion. Iraqi Journal of Market Research and Consumer Protection, 10(2), 101.
8- Fahd, T**. 2016**. Analysis of Economic Efficiency and Optimal Allocation of Economic Resources at Abu Ghraib Plant Using Linear Programming. Master Degree, University of Baghdad / Faculty of Agriculture.
9- Lafta, B. **2016.** the causes of the phenomenon of marketing deception and its impact in the areas of consumer protection. Iraqi Journal of Market Research and Consumer Protection, 8 (2), 54-63.
10- Lateef, M., Faraz, A. and Bashir, M. **2009**. Detection of adulterants and chemical composition of milk supplied to canteens of various hospitals in Faisalabad city. Pak J. Zool. 9:139-142.
11- Naz, W. 2000. Subject: The dairy sector. http//www.Pakistan economist.com. Accessed Fed.
12- Abu Zaid, N. A**. 2009**. Milk and human health. Al-Zahraa Publishing, Al- Riyadh.
13- Ali, A., Mahmood, M. S. and Hussain, L**. 2011**. Adulteration and microbiological quality of milk. Pak J. Nutri. 12:1195-1202.
14- Fakhar, H., Law, F. **2006**. The white revolution. dhoodh darya. Pakistan dairy development company. pp.72.
15- Ibrahim, B. **2019**. Dairy Production. Kordofan University- College of Natural Resources and Environmental Studies.
16- Tariq, M. A. **2001**. Subject: A close look at dietary patterns. http//www.dawn.com/Accessed Fed.

ISSN 2072-3875

17- Shaikh, N., Marri, A. and Qureshi, B. **2016**. Extent of Formalin and Cane Sugar Adulteration and its Impact on Physicochemical Attributes of Milk Sold at Hyderabad and its Outskirts. Int J. Sci. Res. 5: 827-832.
18- Thompson, C. M., Ceder, R. and Grafstrom, R. C. **2010** Formaldehyde dehydrogenase: beyond phase I metabolism. Toxicol. Lett.193:1-3.
19- Willey, J. M. **2008**. Prescott, Harley and Klein. Microbiology, (7th ed.) USA: McGraw Hill Co. Wilton, J.M. Yoghurt, atop health food Blackwell Scientific Publication.
20- Solvay, I. **2000**. Food Processing with Hydrogen Peroxide. Page 2of 8 .www. SolvayInterox.com.
21- Monika, G., Gupta, M. P. 2008. Recent Trends in detection of adulteration of milk &dairy products. (8th edn) Varanasi: Dairy Book, pp: 43-52.
22- Abdul Aziz, S., Muhammad, K. and Muhammad, A**. 2014**. Study on Adulteration and Composition of Milk Sold at Badin. Impact Journal. 2(9): 57-70.
23- Ling, E. **1963**. A text book of dairy chemistry.3ed.chapman and Hall LTD. London.
24- Alves, A. M., Lima, P. H. and Dacosta, M. A. **2018**. Determination of aflatoxin M1 in bovine milk from the Alagoas /Brazil state dairy belt by high performance liquid chromatography (HPLC).African Journal of Microbiology Research, 12(25):580-586.
25- Pien, J., Desirant, J. and Lafontaine, D. **1953.** Detection of hydrogen peroxide in milk. Ann. Falsif, Fraudes, Paris Dairy Sci. Abst.46:539-540.
26- Anon, A**. 1994**. The Microbiology of Water. Part 1: Drinking Water, Report on Public Health and Medical Subjects, No. 71. Methods for the Examination of Waters and Associated Materials. London: HMSO.
27- Motiram, R., Dhawale, J., Jeffrey, W.and Mike, I. **2012**. Improved Method for Detection of Starch Hydrolysis, Applied and Environmental Microbiology. 44 (3): 747-750.
28- Mabood, F., Hussain, J. and Al Nabhani, M. **2017**. Detection and Quantification of Formalin Adulteration in Cow Milk Using Near Infrared Spectroscopy Combined with Multivariate Analysis. J Adv Dairy Res. 5 (1):43-49.
29- Muhammad, S. J. **2015**. Investigate the microbial load and types of preservatives Yogurt available in the local market. Iraqi Journal of Market Research and Consumer Protection. 7 (2):214-225.
30- Tang, X**. 2009**. Formaldehyde in China: Production, consumption, exposure levels, and health effects. Environ Int. 35:1210–1224.
31- Zhang, L., steinmaus, C., Eastmond, D. A., Xin, X. K. and Smith, M. T. **2008**. Formaldehyde exposure and leukemia: Anew meta-analysis and potential mechanisms mutat. Res. doi: 10.1016/j.mrrev. 07.002.
32- Moreira, S. R. **2014**. Isolation and identification of yeast and filamentous fungi from yoghurts produced in Brazil .Brazilian Journal of Microbiology. 32:117-122.

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