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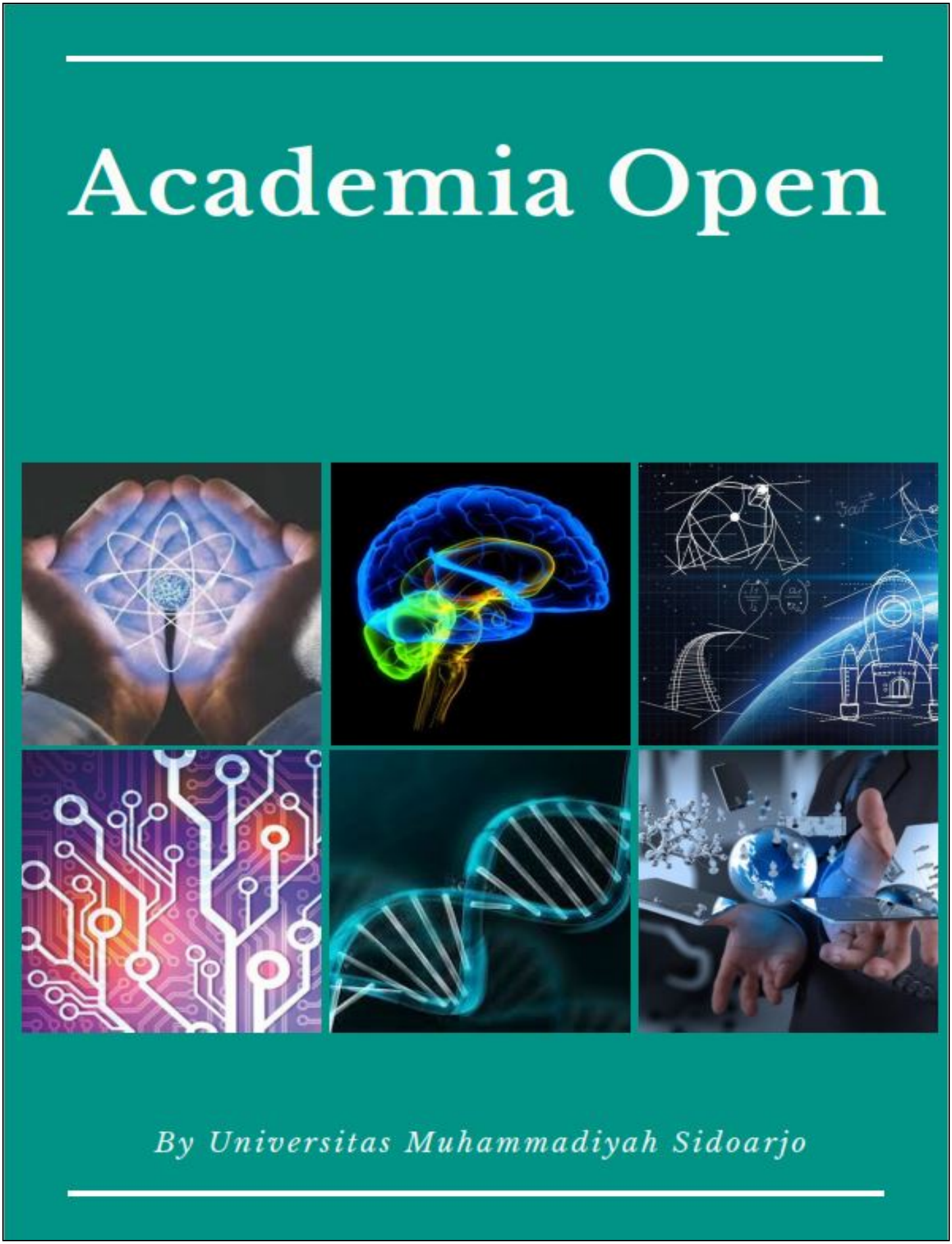

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Exposing Milk Adulteration in Iraq Markets

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Abstract

This study evaluated eighteen unflavored milk samples from local markets in Karbala, Diyala, Basra, Kirkuk, Wasit, and Babil, Iraq, to detect adulteration. Using total solids measurements, refractive index tests, and iodine starch tests, we aimed to assess milk quality. Except for sample No. 6, all samples tested negative for starch, indicating minimal thickening agent adulteration. However, samples 4, 5, 11, and 13 failed the refractive index test, suggesting water adulteration. These findings highlight the need for better monitoring and regulation to ensure milk purity and protect public health across different Iraqi regions.

Highlights:

1. Identified milk adulteration in six Iraqi governorates.
2. Sample 6 tested positive for starch adulteration.
3. Samples 4, 5, 11, 13 failed refractive index test.

Keywords: milk adulteration, Iraqi markets, quality control, refractive index, starch test

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Introduction

Dairy products, including milk, are among the most vital foods that sustain human health. This is due to the fact that it has all the essential elements, such as calcium and minerals. Mammals, including humans, generate a milky fluid called milk from their glands, which is meant to nourish their young[1]. All mammals, including humans, get their milk mostly from their mothers' breasts. Milk provides all the nutrition and minerals a child needs to be nourished and grow in a healthy and sound way[2]. In addition to the primary and secondary proteins, milk contains a variety of other substances, the most significant of which are carbohydrates, minerals, and lipids. Although the components of most milk varieties are identical, each kind differs in the amount of these components[3]. A number of factors primarily influence these components, the most significant being the animal's nutrition and health, along with temperature, the length of the animal's pregnancy and reproduction, age, and other variables[4].Milk is produced by a variety of animals, the most common being cows[5]. At 90%, cow milk is the most consumed type of milk, followed by that from buffalo (5%), goats (3%), and sheep (2%)[6]. The best nourishment for a baby is breast milk, especially in the early stages of life. It is a whole meal that doesn't need the mother to get involved. It is full of all the nutrients a youngster needs to grow healthily[7]. But for a variety of reasons, the most significant of which is the mother's health, which occasionally renders her unfit for nursing her child, as well as other factors, the use of produced milk powders and their dissemination has grown widespread[8]. Other factors might include the mother's focus on the job market or her undernourished state, which results in inadequate milk supply from the mother's glands. While using milk powder can occasionally be advantageous, it is frequently detrimental to the child's health and nutrition, and this is dependent on the mother's daily habits[9]. Like other food items, milk is easily tampered with in a variety of ways, which has raised concerns around the world. There is more milk fraud in poorer countries than in developed ones. This results in several health issues for customers and is caused by a lack of health control, instruments to identify milk fraud, and legislation that punishes those who tamper with accountable goods. The research that may be used to identify adulterated milk will be covered in this study[10].

Methods

First, collect samples

In the study of a research, eighteen unflavored milk samples were obtained from local markets in many Iraqi governorates, including Karbala, Diyala, Basra, Kirkuk, Wasit, and Babil. The objective of the sample collection process was to identify instances of adulterated milk.

Starch test:

Using drops of iodine, we examine if milk has been tampered with.

1) A test tube was filled with 5 ml of milk.

2) Incorporate a few iodine drops into the milk.

3) We shift the tube and observe the outcome.

4) The presence of starch is indicated if a blue-black tint emerges[11].

Refractive index and total solids testing

1) We deposit milk droplets in the measuring area, verify, and record the

Result and Discussion

Sample number	The Company's name	Sample name	SYMBOL
1	KDD	Not mentioned	M. 1. IM.
2	KDD	(1.2.3)	M. 2.lM
3	KDD	Skimmed	M. 3.lM
4	Almarai Company	Almarai	M. 4.lM.
5	Juice time	Nan	M. 5.L.
6	Pegah	Not mentioned	M. 6.IM.
7	Kalleh	Not mentioned	M. 7.IM.
8	Kalleh	Not mentioned	M. 8.IM.

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9	Al safi	safio	M. 9.IM.
10	Sahar	Not mentioned	M. 10.IM
11	yanabie almilad	Al milad	M. 11.L.
12	Not mentioned	pinar	M. 12.IM.
13	Kalleh	Low fat milk	M. 13.IM.
14	Ragaui	Not mentioned	M. 14.IM.
15	Falat Koohrand industrial Group	Koohrand	M. 15.IM.
16	Al Sadd Food Industries	Rival	M. 16.L.
17	Al-Othman	Nada	M. 17.IM.
18	Sahar	Damdaran	M. 18.IM.

Table 1. ***shows the samples that were used in the study***

Table No. (1) shows the samples used in the study, their coding, and the manufacturing companies. We note that in sample No. (1,6,7,8,10,14) the name of the sample was not mentioned, while in sample No. (12) the name of the company was not mentioned This does not meet the required standards in Iraq, which call for providing all relevant information about the sample, such as the product's name and the firm name, along with the production and finish dates.[12]

**M= milk , L= Local , IM= import

SYMBOL	Starch	SYMBOL	Starch
M. 1. IM.	Negative	M. 10.IM	Negative
M. 2.lM	Negative	M. 11.L.	Negative
M. 3.lM	Negative	M. 12.IM.	Negative
M. 4.lM.	Negative	M. 13.IM.	Negative
M. 5.L.	Negative	M. 14.IM.	Negative
M. 6.IM.	Positive	M. 15.IM.	Negative
M. 7.IM.	Negative	M. 16.L.	Negative
M. 8.IM.	Negative	M. 17.IM.	Negative
M. 9.IM.	Negative	M. 18.IM.	Negative

Table 2. *shows the results of the starch test*

Table No. (2) shows that All of the milk sample's findings from the starch test were negative, with the exception of sample M. 6.IM, which tested positive for starch. This shows that starch has been added to milk to adulterate it. To raise the lactometer reading is the rationale.

T.S	Rl %	SYMBOL
11.40961062	1.354	M. 1. IM.
11.29576682	1.354	M. 2.lM
9.581107785	1359	M. 3.lM
11.65006835	1348	M. 4.lM.
9.905417705	1.345	M. 5.L.
6.998646297	1.351	M. 6.IM.
15.70941256	1.351	M. 7.IM.
25.31533656	1.351	M. 8.IM.
11.8591538	1.352	M. 9.IM.
11.26096557	1.351	M. 10.IM
8.883045381	1.346	M. 11.L.
12.07393889	1.355	M. 12.IM.
9.162356965	1.349	M. 13.IM.
9.800529208	1.350	M. 14.IM.
10.80844892	1.351	M. 15.IM.
8.868871649	1.351	M. 16.L.

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8.951267057	1.351	M. 17.IM.
11.3407777	1.353	M. 18.IM.

Table 3. *shows the results of measuring the refractive index and total solids*

The velocity of light in a vacuum divided by the velocity of light within the material yields the Refractive Index (RI) of that substance. The refractive index of liquids is determined using a rafractometer since serum may reflect light that passes through it. When water is added to milk, the refractive index of the milk is altered. Due to its ability to identify even minute losses of water, this approach is more sensitive than the lactometer method . In milk, light has a refractive index of around 1.35, but in water[14], it is 1.33. Consequently, the refractive index of light decreases when a certain amount of milk water is added. Therefore, the refractive index of milk decreased as a result of adding water to it in samples (4,5,11,13).

Conclusion

The study evaluated eighteen unflavored milk samples from various Iraqi local markets, examining physical characteristics including total solids, refractive index, and starch tests for adulteration. The findings revealed that all samples were negative for starch adulteration, except for sample No. 6. Similarly, samples 4, 5, 11, and 13 failed the refractive index test, indicating water adulteration. These results highlight the prevalence of milk adulteration in local markets, which poses significant public health risks. The implications of these findings underscore the necessity for stringent quality control measures and regulatory enforcement. Further research should focus on developing more sensitive detection methods and exploring the broader impact of adulterated milk on consumer health.

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