



# Falsification of Milk and Dairy Products by Gas-Liquid Chromatography by Spectrometric Detection

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## Abstract

The basis of the state program for the development strategy of the Republic Uzbekistan until 2030 is the long-term improvement of the sanitary, hygienic, biological and nutritional characteristics of food products. In recent years, the market share of counterfeit food products is 7-8% and tends to increase. The largest number of non-standard samples was found among milk and dairy products.

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**Keywords:** Dairy products; Non-standard samples; Phytosterols.

## Introduction

The purpose of counterfeiting is to reduce the cost of production of milk fat by combining the production of non-dairy fats. For this, cheap vegetable fats are most often used: Palm, coconut, soy and others. These fats contain sterols - tetracyclic lipid components that are present not only in plant but also in animals. The presence of sterols in the fat phase of dairy products indicates the presence of vegetable oils or vegetable-based fats [3]. The main criterion that characterizes the authenticity of dairy products is the qualitative determination of  $\beta$ -sitosterols and other phytosterols (campesterol, stigmasterol, and brassicasterol). In this connection, the aim of the work was to study the market of dairy products of the Republic of Uzbekistan for falsification with sterol compounds.

## Materials and methods of research

The objects of research were milk and dairy products - cottage cheese, sauerkraut, butter and cheese. The research was conducted in the test laboratory "Samarkand Regional State Center for Diagnosis of Animal Diseases and Food Safety" in accordance with the requirements of the State Standard of Uzbekistan 67,100 "Milk and dairy products". Detection of vegetable oils by gas-liquid chromatography with mass spectrometric detection" [1,2].

For identification using the system of gas chromatography Agilent 7890A (USA) with mass-selective detection, which leads to a range of measurements in the range from 1.6 to 700 a.e.m (Atomic Unit Mass) in the mode of ionization electrons bibliotekoy spectrum NIST. Chromatographic mode: injection vol-

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ume analysis oil sample - 1 ml, flow distribution - 1: 1, evaporation temperature - 310 °C, column type - HP-5 MS, gas-helium gas, helium flow helium cherez column - 1 cm<sup>3</sup>/min, ionization energy - 70 eV, ion source temperature - 230 °C, quadrupole temperature - 150 °C, GX/MS interface temperature - 290 °C, mass ion scanning range - 35-450 a.e.m. Time analysis 45 minutes.

A mixture of phytosterins was used as standard samples: brasicasterin (CAS №. 474-67-9), campesterin (CAS №. 474-62-4), stigmasterin (CAS № 83-48-7), and  $\beta$ -sitosterin (CAS № 83-46-5) in chloroform with a total mass concentration of 25 mg / cm<sup>3</sup> and cholesterolin (CAS №. 80-98-9) with a mass fraction of the main substance of at least 99.0%.

### Research results

In the period from 2018 to 2020, the dairy products present on the consumer market of the Republic of Uzbekistan were subjected to research (Table 1).

**Table 1:** Study of dairy products for the content of sterols.

Indicators	Research period, years			Total for 2018-2020 y.y.
	2018	2019	2020	
Total number of samples	1140	868	868	2876
Number of non-standard samples	106	71	69	246
% of non-standard samples	9.29	8.17	7.94	8.55

When analyzing the tabular data, one can notice a positive trend in the reduction of falsified dairy products in the territory of the Republic of Uzbekistan. In 2018, the volume share of non-standard dairy products was 9.29%. As of 2020, the volume share of non-standard dairy products has been reduced to 7.94%. Comparative studies of non-standard samples of dairy products were of particular interest (Table 2)[4].

**Table 2:** Comparative studies of non-standard samples of dairy products.

Indicators	Name of dairy products				
	Milk	Cottage cheese	Sour cream	Butter	Cheese
<b>2018 year</b>					
Number of samples	420	12	62	442	204
Number of non-standard samples	22	2	7	56	19
% of non-standard	5.2				
<b>2019 year</b>					
Number of samples	126	36	62	586	58
Number of non-standard samples	8	2	7	48	6
% of non-standard	6.3	5.5	11.3	8.2	10.3
<b>2020 year</b>					
Number of samples	660	36	26	88	58
Number of non-standard samples	54	2	4	3	6
% of non-standard	8.1	5.5	15.4	3.4	10.3
<b>Total for 2018-2020</b>					
Number of samples	1206	84	150	1116	320
Number of non-standard samples	84	6	18	107	31
% of non-standard	6.96	7.14	12.00	9.58	9.68

In 2018, the specific volume of non-standard samples of dairy products was 2-3 times higher in comparison with milk. By 2020, the level of product counterfeiting has dropped significantly. When analyzing the data in the table, it was found that in the period from 2018 to 2020, the share of non-standard samples increased: milk from 5.2 to 8.1%, sour cream - from 11.3 to 15.4% and cheese - from 9.3 to 10.3%. Revealed a significant decrease in counterfeit cottage cheese - from 16.6 to 5.5% and butter - from 12.6 to 3.4%[5,6].

### Conclusion

The specific volume of non-standard samples of dairy products on the consumer market of the Republic of Uzbekistan decreased in the period from 2018 to 2020 from 9.29 to 7.94%. The study of milk and dairy products revealed non-standard samples with phytosterol content: milk - 5.2-8.1%, cottage cheese - 5.5-16.6, sour cream - 11.3-15.4, butter - 3.4- 12.6% and cheese - 9.3-10.3%.

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