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# The effect of plant-based preservatives on the reduction of microbiological activity in fresh milk

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**Abstract.** The scope of this study has been the antimicrobial effect of plant-based preservative on fresh milk. Analyzes of the total number of microorganisms in milk have been carried out in accordance with the requirements of ISO 4833. From the samples taken randomly in the market were separated in two samples where one we analyzed the number of total microorganisms without using any treatment, while in the other one we analyzed the number of total microorganisms after adding a quantity of 0.4 ml preservative per 1 L milk. The results show that the number of microorganisms decreased by 26 times 30 minutes after the addition of the preservative, while the 48-hour action of the preservative reduced the number of microorganisms by 174 times, cipher that represents the peak of the effect of the added preservative.

**Keywords:** Antimicrobial, Plant-based preservative, Fresh milk

## 1 Introduction

In this research paper have been studied the antimicrobial properties of a mix of herbal extracts. The obtained substance has been tested in milk and mice. The nutrition supplement we are talking about is a combination of four different extracts from herbal origin. This compound contains many substances which exhibit antibacterial, antifungal, antiviral, antioxidant, anti-diuretic, anti-inflammatory, antiseptic, antiemetic, antidepressant, anticancer, antisorbic, dermogenic, immunostimulant, nephritic, phagocytic properties. This element that was used as a nutrition supplement has an advantage over other methods of eliminating and reducing the number of microorganisms which is the ease of preparation and also the fact that it is an element with a natural origin, with necessary ingredients and deficient in the 21<sup>st</sup> century human diet. It should also be noted that these ingredients lose the bactericidal effect during milk boiling, which enables fermented milk products to be derived from the same milk.

## 2 Research Elaborations

For preparation certain sections from each plant were taken and dissolved in distilled water. Then they were treated thermally to temperatures above 100°C (due to patent law the processing procedures as well as the ingredients are not elaborated). As a sample to analyze we obtained milk for its very suitable content for the development of microorganisms and also its widespread use. For this analyze of antimicrobial properties of the additive we applied the standard method ISO 4833-1: 2013 Microbiology of the food chain – Horizontal method for the enumeration of microorganisms - Part 1 Colony at 30 degrees C by the pour plate technique. The analyzes were performed by the students and under the supervision of the professor and laboratory staff. The milk sample was taken from random market and immediately analyzed. The taken sample was analyzed for the number of present microorganisms, then the amount of 0.4ml/L were added. After the addition of the additive the number of microorganisms was observed followed by continuous planting.

Also additive toxicity in mice was tested, where mice were fed milk to which the supplement was added and their vital signs were monitored for 14 days. The effect on milk was also monitored where the amount of 3ml/L were added and milk showed no signs of fermentation after 96 hours of incubation at 30°C. During this period 4ml/L water of cheese were added every 24h, the first signs of milk fermentation were after 96h of incubation.

## 3 Results and Findings

The obtained results after the analysis have shown a significant decrease in the number of microorganism. From the milk taken from the market the planting of microorganisms was made and the preservative was immediately added, 30 minutes after the addition of the preservative another planting was continued and this continued for several days. The number of microorganisms in the analyzed milk is as follows:

**Table 1.** Monitoring of total aerobic mezophile bacteria in fresh milk. CFU - Colony Forming Unit. (Time of preservative addition: 13.01.2019, 12:00).

Subject	Date and time	Result
Fresh milk	13.01.2019 12:00	17 400 000 CFU/ml
Fresh milk containing preservative	13.01.2019 12:30	720 000 CFU/ml
Fresh milk containing preservative	14.01.2019 12:00	670 000 CFU/ml
Fresh milk containing preservative	15.01.2019 12:00	100 000 CFU/ml
Fresh milk containing preservative	18.01.2019 12:00	289 000 CFU/ml

Fresh milk containing preservative	19.01.2019 12:00	1 230 000 CFU/ml
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From the table we can see a drastic decrease in the number of microorganisms since the first few minutes after the addition of the supplement and this decrease has continued at lower rates over the next 48 hours, where it is the lowest value of the number of microorganisms. The possibility of presenting the toxic affinity of the supplement has also been the target of the study. To proceed a fully gaining of data on this the effect of additional mixed milk was studied on mice. The mice were fed milk for 14 days and reached the following conclusions:

**Table 2.** Monitoring of possible toxic effects on living organism caused by fresh milk containing preservative.

Subject	Dosage	Duration	Results
Mice	Fresh milk containing 2 ml/L preservative	14 days	No changes of the vital signs.
Mice	Fresh milk containing 3 ml/L preservative	14 days	No changes of the vital signs.
Mice	Fresh milk containing 4 ml/L preservative	14 days	No changes of the vital signs.

## 4 Conclusions

Based on the study data we can conclude that:

- The combination of herbal ingredients added to milk constantly reduces the total number of microorganisms;
- The bactericidal effect of the substance is up to day three;
- Substances did not show toxicity when feeding rats with this milk;
- The bactericidal effect of the substance is lost at the boiling temperature of the milk;
- Boiled milk can be used as milk for derived fermented products of milk;
- Boiling milk eliminates the bactericidal effect of the substances and lactobacillus can perform their fermentative activity.

Seeing the increasing number of the synthetic substances used by the food industry there is a need for the presence of natural substances that have the ability to replace synthetic substances, while at the same time being able to positively influence the human body.

Based on the data obtained during this study we recommend:

- Counting on the very powerful effect of reducing the number of microorganisms this additive may have endless applications in various food production and processing industries;
- In addition to the antimicrobial effect, this supplement can be analyzed in further studies of the positive effects associated with many diseases present in the 21<sup>st</sup> century;
- To carry out more in-depth studies on the constituents that have bactericidal properties and their extraction;
- To study specifically the type of microorganisms that have the most potent bactericidal properties.

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