

# BACTERIAL AND FUNGAL MICROFLORE IN FRUITS AND VEGETABLES

Mexhit Musa <sup>1</sup>, Sabri Hajdini <sup>2</sup>

<sup>1</sup> University of Travnik, Faculty of Pharmacy and Health, Travnik, Bosnia and Herzegovina  
email: mexhit-musa@hotmail.com

<sup>2</sup> University "Isa Boletini" Faculty of Food and Technology  
email: s\_hajdini@live.com

## **Abstract**

*The aim of our research was the determination of the presence and density of bacteria and musk yeast in fruits and vegetables. We also have seen the reason to conclude about numerical and qualitative reports of fruits and vegetables which were examine with heterotrophic bacteria, kaliformet totale and musk of yeasts. We had the curiosity to do the research of these data and also the comparison with other investigations in order to give a modest contribution on the density of investigated microflora in unit of measure for gram. of fruits and vegetables. Some fruits and vegetables have served as a material for the investigation. The materials have been collected in the green market, and in some markets of Mitrovica. The research methods have been methods with membrane filters. This method is the indirect method because of the results that were obtained, and they are also evidenced after the planting and incubation of the samples.*

**Keywords:** fruit, vegetable, bacteria, yeast and musk.

## **1. Introduction**

Trees and vegetables have served as a source of human food along with other products such as meat, fish, bread since ancient times as the basic food of the majority of humanity. Human society has the obligation and duty to provide itself with sufficient but also qualitative food. In nature, food is found in different forms, cereals, milk, eggs, fruits, vegetables, fish, seafood, sugar and its products, etc. Old man. M. (2001). General Microbiology, 2nd Edition by ETMM, Prishtina Food as such can be used as fresh, but they can be preserved, dehydrated, (ground, dried), fermented, frozen and preserved with chemical means. As such they spread easily and stay for a long time. Fields, M. L (1979):. Fundamentals of Food Microbiology. AVI Publishing Company, Inc. Westport, Connecticut. The scientist or student-researcher dealing with food microbiology must have prior knowledge of food science and microbiology. (Sini, K. 2003) Thus he must know the isolation, identification and microbiology of molds, yeasts and bacteria with special emphasis

on those microorganisms which are used in the production of food and which cause its spoilage. Decay of trees and vegetables is caused by a small number of microflora that is present from the beginning. Greenwood, M. and Roberts D. (2001): Practical fund Microbiology Blackwell Publishing., thirr edition,

Therefore, types of decay can occur even under normal storage conditions (Prifti, D. 2007). Gram-negative rods (*Pseudomonas*), *Xanthomonas*, *Flavobacterium*, *Lactobacillus* and *Bacillus* have been found as a dominant factor in the spoilage of vegetables, which as soil bacteria reach products from the time when the plants have developed, for this reason these microorganisms are called autochthonous (Plakolli. M. 2001). Vegetables - in addition to the chemical composition, the quality is determined by the presence of the total number of microorganisms per unit (gram). This applies to onions, potatoes, cabbage, carrots, etc. with the caveat that potatoes and carrots have a greater number of heterotrophic flora. Fruits - Fruits are dominated by fungi: *Asperilligus*, *Penicillium* and *Mucor*, so these are not attacked by yeasts. Through pasteurization, the total number of microorganisms can be reduced. Fruits and vegetables occupy an important place in human nutrition. Prescott, L, Harley, J. and D Klein (1999). Microbiology, Mc Graw–Hill 4th edit. The amount of water in fruits and vegetables is 70 - 90% and in some cases up to 95%. On the surface of fruits and vegetables there is constantly a large amount of different microorganisms, most of them are in an inactive state and do not participate in the decay of fruits and vegetables, while many others die after a while. Unlike other food products, the vegetative organs of fruits and vegetables undergo continuous evolutions after harvest, which can be favorable for the fruit (ripening) or harmful (alterations by microorganisms and their enzymatic activity). (Troja. R. 2007). The changes that the fruit possesses during the stages of development is presented schematically as follows.

**Flowering → Enlargement of cell volume → Maturation → Decomposition → Destruction**

From the point of view of metabolic development, the ripening stage is a period of tissue changes, accompanied by a specific synthesis of various enzymes, responsible for the change in color, structure and taste. This period is associated with a disorganization of the metabolic and respiratory apparatus. (R. Troy, 2007). If the skin of the fruit is not damaged, then there will be a very small amount of nutrients on their surface, so only some types of organisms will be able to live and multiply, thus forming the epiphyte microflora of the fruit. It hits. A, Loisel, N (1984): cited by Sinani. The most characteristic representatives of the epiphytic flora of fruits are various yeasts, lactic bacteria, acetic bacteria and mold spores. Very rich in different types of microorganisms, is the microflora of fruits with damaged skin, since the juice flowing from the wounded tissues serves as nutrients for the microorganisms.

## 2. Methodology

The scientific methods used in this paper are mainly methods of analysis, synthesis and comparison, which help to analyze, synthesize and compare (Maloku,2020:323) bacterial and fungal microflora in fruits and vegetables. This paper is an attempt to highlight (Maloku,

2015: 119) the determination of the presence and density of bacteria and musk yeast in fruits and vegetables. This paper is based on the use of numerous research methods. Special scientific methods used in this paper are mainly the method of analysis and synthesis, which will be especially useful when researching the theoretical views of domestic and foreign authors, (Maloku, 2021: 53) who have studied and analyzed bacterial and fungal microflora in fruits and vegetables.. In addition, based on the available literature, reports, contacts and personal research, the paper provides a brief summary (Maloku & Maloku 2020:21).

Some decayed (rotten) trees and vegetables served as material for the research. The materials were collected in the green market in Mitrovica and some grocery stores. The research methods were that of the agar plate according to Koh and the membrane filter method. Sinani A. (2008): Grain storage and processing technology. First edition "Maluka", Tirana.

Both methods are indirect methods because the obtained results are evidenced after sowing and incubating the samples. In addition, based on the available literature, reports, contacts and personal research, the paper provides a brief summary (Maloku & Maloku 2020:21) for presence and density of bacteria and musk yeast in fruits and vegetables.

## 2.1. Work progress

The progress of the methodological work - the microbiological examinations of one of the samples went as follows: First, the preparation of the sample was done. For research, six types of decayed (rotten) trees and vegetables were taken, such as: apples, pears, potatoes, cabbage, onions and lemons. For analysis, 10 grams were taken from each sample, which were placed in a nylon bag, then in the stomach to extract the liquid, from the extracted liquid, 10 ml dilutions were taken. for each sample, then this amount is mixed in the Erlenmeyer container. Methodology: Determining the density of microorganisms in the substrate was done with the indirect agar plate method. The plate has dimensions of Ø60mm, the method was carried out by planting on bacteriological filters. The filtrate has a diameter of 50.7 mm while the pores are 0.47 µm. A vacuum pump is used to achieve the negative pressure. The filter is taken with tweezers and placed on the filter container, the corresponding glass is placed on the filter.

The dilution series was made as follows:

- 10 ml of the fruit were taken and mixed with 90 ml of sterilized croix water. Then the container (beaker, Erlenmeyer) is shaken vigorously.
- From the mixture of 10 ml of the samples and 90 ml of sterilized chlorine water, 10 ml were transferred to the next container and so on. These 10 ml were transferred to a series of Erlenmeyer flasks that each contained 90 ml of sterilized and cooled crotch water, therefore the first Erlenmeyer flask had a dilution ratio of 1:10, the second 1:100 and so on. Usually the dilution series has been from 10<sup>1</sup>-10<sup>6</sup>. These dilutions are specially shaken to homogenize the concentration of cells in the amount of water. Inoculation was done on peptonic meat agar as a universal food for heterotrophic bacteria, then on non-enriched endo agar for total

coliforms and malt agar for the cultivation of yeasts and molds. After sowing, incubation of the cultures followed. Heterotrophic bacteria and total coliforms were incubated in incubators for 48 hours at a temperature of 37 °C, while yeasts and molds were incubated at a temperature of 25 °C for 5 days. After incubation, the obtained colonies were checked. Those plates in which 10-80 colonies were present were selected as successful. In the case of heterotrophic bacteria, all colonies were counted regardless of size, consistency, shape and color. The method applied was that of membrane filters, which was realized using the relevant apparatus and membrane filters with a pore size of 45 µm. Each dilution was planted by 15 replications, in such a way that the obtained results represented the mathematical average value of 15 plantings from the same dilution (Harley, Prescott 2002). After planting, incubation of the planted crops followed. Heterotrophic bacteria and total coliforms were incubated in incubators for 48 hours at a temperature of 37 °C, while yeasts and molds were incubated at a temperature of 28 °C for 5 days. After incubation, the obtained colonies were checked. Sini, K (2003): Food microbiology and hygiene. Tirana. Those plates in which 10-80 colonies were present were selected as successful. In the case of heterotrophic bacteria, all colonies were counted regardless of size, consistency, shape and color. Below we present successful colonies of heterotrophic bacteria, coliform bacteria, yeasts and molds investigated.

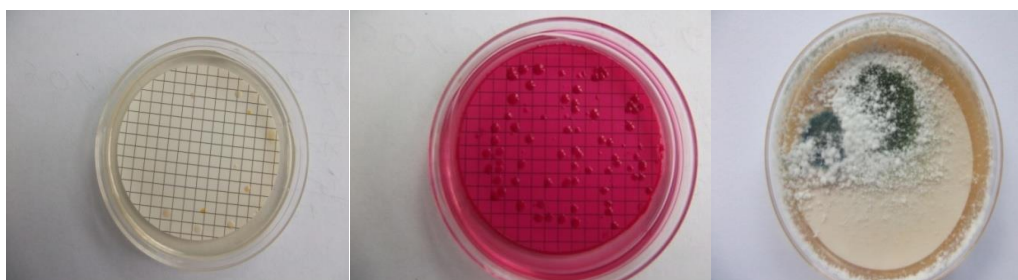


Figure 1. Colonies of heterotrophic bacteria, total coliforms and mold yeasts.

We determined the number of cells of the studied microorganisms, counting the number of colonies that grew, starting from the fact that one cell gave one colony. We made this determination of the number or density of cells in the corresponding unit according to the formula:

$$Nq/100ml=Nk \times SHH \times 100/Smf$$

Where are: NK → number of colonies counted, SHH → dilution rate from which the seeding sample was taken, 100 → the volume in which the number of cells is required, SMF → amount of sample acquired.

### 3. Results and Discussion

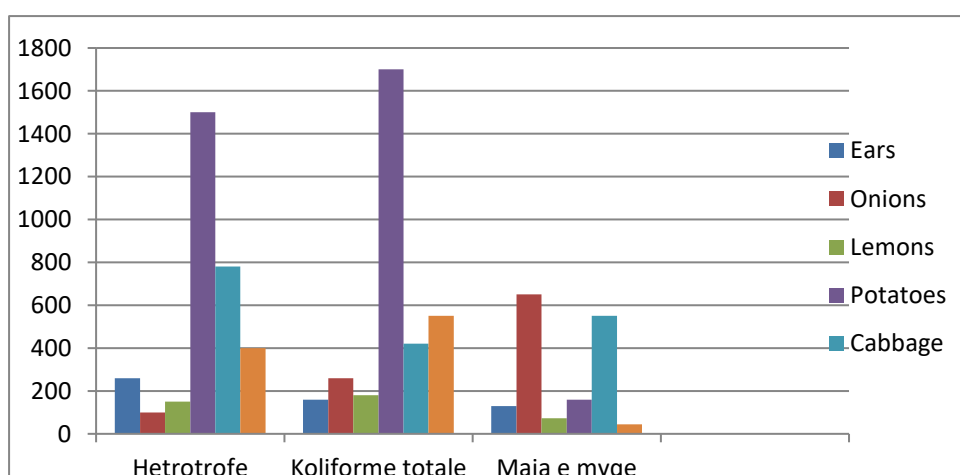
Determination of the number of heterotrophic bacteria, coliforms and yeasts and molds in some trees and vegetables. The results obtained from the research are presented in tabular form, with figures, etc. It should be noted that the method is based on the possibility of the migration of microbial cells from the analyzed fruits in the water environment, this process is accelerated by the process of active or occasional shaking. Troy. R. (2007). Food

chemistry and technology. Tirana. Since coliform bacteria, yeasts and molds can be pathogenic and spread toxins then we think that the treatment has had considerable success. It is known that heterotrophic bacteria are not pathogenic, but with enormous numbers, they can change the environment through the life process, the release of gases, the conversion of nutrients, and the increase in temperature (Plakolli, M, 2001) (Stalinovic, B, 1992) . If the microbes live in moist anaerobic conditions, they will cause decay (rotting) of trees and vegetables, while molds will infiltrate the surface (Fields, M, 1979). A large number of heterotrophic bacteria, then coliforms, yeasts and molds have also been evidenced by other authors (Godon, A, Loisel, N 1984 cited by Sinani. A, 2008,). Based on the fact that microorganisms in general bacteria multiply relatively quickly (eg a generation doubles within 30 minutes)

Table 1. Summary tabular presentation. Situation on the density of three groups of microorganisms in six food items.

Group of microorganisms	Samples (trees and vegetables)					
	Pears	Onions	Lemons	Potatoes	Cabbage	Apples
Hetretrophe	260 x10 <sup>6</sup>	100x10 <sup>6</sup>	150x10 <sup>6</sup>	15.000x10 <sup>6</sup>	7.800x10 <sup>6</sup>	400x10 <sup>6</sup>
Total coliforms	160x10 <sup>6</sup>	260x10 <sup>6</sup>	180x10 <sup>6</sup>	17.000x10 <sup>6</sup>	4.200x10 <sup>6</sup>	550x10 <sup>6</sup>
Maya e Myce	130x10 <sup>6</sup>	650x10 <sup>6</sup>	72x10 <sup>6</sup>	160x10 <sup>6</sup>	550x10 <sup>6</sup>	45x10 <sup>6</sup>

From table 1, it can be seen that the potato tuber is invaded by an enormous number of heterotrophic bacteria: 15,000 x 10<sup>6</sup> cells per 100 ml of the sample. Also, the potato tuber had the highest density of coliform bacteria, 17,000 x 10<sup>7</sup> cells/100 ml. In the case of the onion bulb, there were mostly yeasts and molds: 650 x 10<sup>6</sup> cells/100 grams of the sample. This phenomenon can be explained by the fact that the potato tuber and onion bulb are plant organs that grow and develop in soil - soil enriched primarily with artificial fertilizers.



Graph 1. Graphic presentation of the results obtained on the density of three groups of microorganisms in six food items from some fruits and vegetables.

#### 4. CONCLUSIONS

Based on all that was presented before, it can be concluded as follows:

Trees and vegetables, respectively fruits, leaves, tubers, bulbs, pears, onions, lemons, potatoes, cabbage, and apples are carriers of a rich bacterial and fungal microflora. The trees and vegetables mentioned above are constantly attacked by heterotrophic bacteria, total coliforms and yeasts and molds. The largest number of heterotrophic bacteria was recorded in the potato tuber 15,000,000,000/100ml, the smallest number of heterotrophs was recorded in the onion 100,000,000/100ml. Fungi, whether in the form of spores or vegetative cells, are permanent carriers in trees and vegetables, so the largest number of fungi was recorded with 650,000,000 cells in 100 milliliters of the sample. Molds are particularly dangerous as producers of poisonous substances such as: Aflatoxins, Trichothecenes, Zearalenones, etc. Humans and animals on one side and micro-organisms on the other attack trees and vegetables and vegetation in general as do micro-organisms.

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