

## **Raw vegan dessert - Evaluation of microbiological parameters**

**I.A. Pop<sup>\*1</sup>, C.D.Misca<sup>\*2</sup>**

<sup>1</sup>Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara,  
Faculty of Food Engineering, Calea Aradului 119, Timisoara 300645, Romania..

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### **Abstract**

Every person loves sweets in one way or another, or at least that's what I learned in the years that I learned and studied in the baking industry. For this study, we will present something that nowadays is very often found in bakeries, and that is a raw-vegan dessert which is healthy and sugar-free and appeals to many people today because mankind is more and more attracted to the raw vegan lifestyle.

In the four years that I have studied at USAMVBT, I have learned just how important a healthy diet is, and that most of the products that are found on supermarket's shelves contain many additives and artificial extracts, which, if consumed during a long period of time, can produce serious health damage for consumers. Because of this, I was determined to present you with a product that is both delicious and healthy.

In the second year of college, one of the subjects I studied was microbiology. I liked it so much that I decided right then and there that my paper for my diploma would be based on this subject.

Microbiology is the study of microscopic organisms, such as bacteria, viruses, archaea, fungi and protozoa. This discipline includes fundamental research on the biochemistry, physiology, cell biology, ecology, evolution and clinical aspects of microorganisms, including the host response to these agents [1].

Thus, I followed two things I loved, baking and microbiology, added knowledge from the human nutrition field and a matter of actuality (a healthy lifestyle) and combined all of them in a paper that follows isolation of contaminating microorganisms from a baking product.

**Keywords:** raw vegan, coliforms, *E.coli*, *Salmonella*, *Staphylococcus aureus*, *Streptococcus faecalis*, fungi

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### **1. Introduction**

I have always been fond of cooking, but what I was most drawn to from the large sphere of gastronomy, were desserts, hence the motivation for choosing a raw vegan dessert for this paper.

Raw veganism is a diet that combines the concepts of veganism and raw foodism. It excludes all food and products of animal origin, any food that is processed or altered from its natural state, and food cooked at a temperature above 48 °C.

In addition to the ethics of eating meat, dairy, eggs and honey, raw vegans may be motivated by health, spiritual, financial, or environmental reasons, or any combination of these.

In the following paragraphs we will present the process of obtaining this product and the microbiological test that are necessary to prove that the product is safe for eating, due to the fact that the product does not go through thermal treatments over 60°C that would favor the decrease of the titre of microorganisms.

The targeted microbiological parameters are NTG, total number of coliform germs, presence and number of *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, *Streptococcus faecalis* germs and fungal load for the raw vegan cake.

The microbiological exam offers insight on the safety of the product that is subjected to tests.

## 2. Materials and Methods

The technological process is simple and does not involve too much effort. Being a RAW product, means that it has not been subjected to thermal processing, other than freezing before consumption.

I used a round pan for the cake. To obtain the base, I sprinkled the bottom of the pan with coconut flakes. Next, using a blender, I mixed oatmeal flour with walnuts, hydrated almonds, dates, cocoa and maca powder, adding a pinch of salt. I let it blend until everything was properly mixed and then I added coconut butter to create a mixture for the base. I poured the mixture in the pan, layed it with a spatula and put in in the freezer until I made the vanilla filling.

To obtain the vanilla filling, I used hydrated cashews, salt, vanilla extract, a bit of lemon zest and honey. I mixed all the ingredients in the blender. Then, to make it more creamy, I added coconut oil and cocoa butter, and a few tablespoons of water to make it a bit more fluid. I proceeded to lay the vanilla cream on top of the base in the pan and put in back in the freezer.

The next step is the caramel filling. The ingredients that I used were hydrated dates, maca powder and coconut oil that were blended together to create a creamy mixture. Layed this one on top of the now frozen vanilla layer in the pan, and put it again in the freezer. After about 20 mins, I took out the pan from the freezer to create a décor on top. I used the fork to draw a few lines as a decor and also sprinkled a couple of walnuts on top. Afterwards, I took out the cake from the pan, cut it into slices and voila! The cake is now ready to serve.

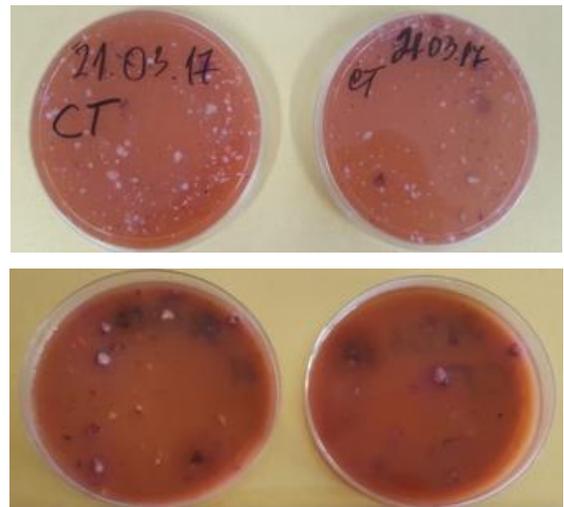
For the bacterial analysis, batch samples were collected from the product in an aseptic manner so that the samples would not get contaminated from outside contamination. The samples we took were 1 gram each.

For the bacterial analysis, the scientific protocol of identification for each of the germs has to be respected. All the microbiological tests were duplicated.

## 3. Results and Discussions

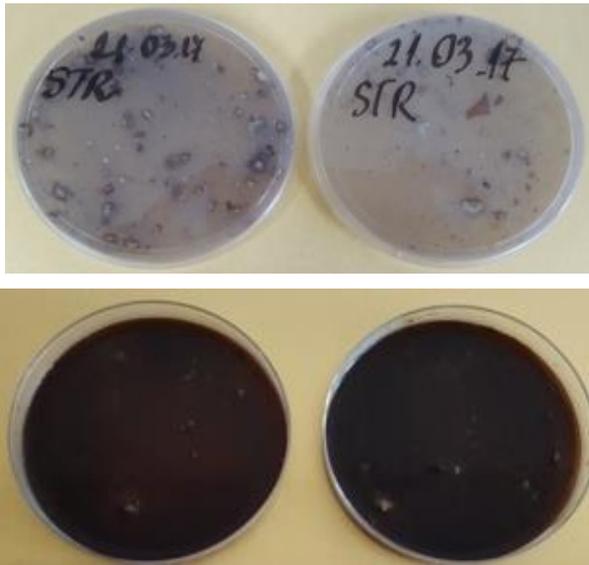
With the purpose of identifying the targeted microbial species, we followed standard procedures. The analyzed product can be seen in the following pictures. The aspect of the Petri dishes is illustrated from the moment of inoculation to the moment of the samples being taken out of the incubator. The contaminating germs in the analyzed product on specific medium of cultures can be seen clearly below.

**NTG:** After 24 hours in the incubator, we can observe the development of 3 colonies on 1gram of analyzed product. If we compare this with the legislation in force, we can see that the product is safe, because the legislation allows a number of 10 to 100 germs per gram of thermally untreated product [2].



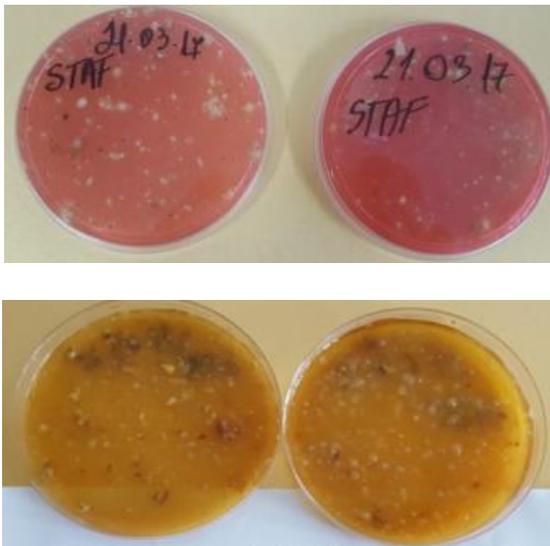
**Photo1.** Petri dishes with MacConkey medium at the moment of inoculation and after 24 hours in the incubator

***Streptococcus faecalis*:** Following the microbiological analysis for determination of the presence and number of fecal enterococci, we can see white colonies have developed on the surface of the dishes, causing the culture medium to change color from white to black as a consequence of biochemical changes that took place [3].



**Photo 2.** Petri dishes with sodium agar azide at the moment of inoculation and after 24 hours at 37°C

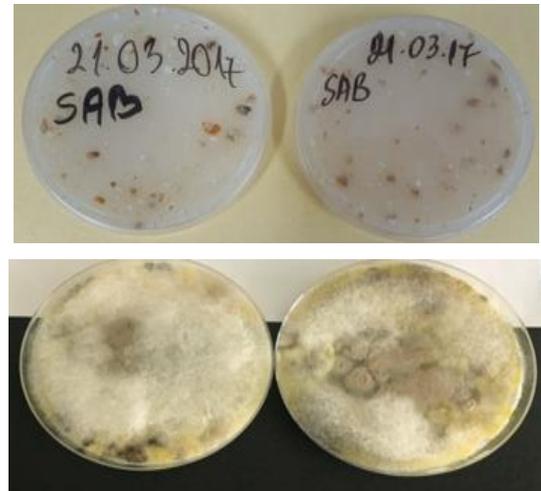
**Coagulase - positive staphylococci:** After the analysis done to determine the presence and number of coagulase-positive staphylococci from the product, we can see the change of color from red to a golden yellow and the presence of more coagulase-positive staphylococci colonies. In general, for edible products, the number of germs belonging to this species varies among 1-100 germs per gram, depending on the analyzed product [2].



**Photo 3.** Petri dishes with Chapman culture medium at the moment of inoculation and after 24 hours at 37°C exposure.

**Determination of fungal load:** After performing microbiological analyzes for the isolation of filamentous fungi, we established that within 72 hours from the moment of the inoculation, about 6

fungal colonies have developed. Depending on the composition of the alimentary product, the number of filamentous fungi per gram of product can vary from 10 to 100 [3].



**Photo 4.** Petri dishes with Sabouraud culture medium at the moment of inoculation and after 24 hours at 25°C exposure

Although for some microbiological parameters such as coagulase-positive staphylococci and streptococcus faecalis, the number of colonies is rather big, with over 10 per gram of product, we cannot state that the germ load of the product exceeds the legislation in force, because there is no clear ruling for the raw vegan products stated in the Romanian legislation.

Taking things from a different perspective, that of the product not being pasteurized and comparing them with the parameters provided in the legislation for other unpasteurized products, we can see that the legislation allows up to 100 germs per gram which is a way higher number than the one resulted from the analysis we did on our raw vegan cake.

Thereupon, we state that from the microbiological point of view, our product, the raw vegan cake, complies with the microbiological legislative requirements.

#### 4. Conclusions

- The microbiological tests revealed that a product that we considered salubrious, since it was created in a properly sanitized space, proved itself to be charged with quite a lot of germs.
- Normally, the majority of the processed foods go through pasteurization or sterilization or another process that has the purpose of removing microorganisms from said product.

- Still, we believe that lab analysis should not be neglected even in those circumstances and that the legislation should state clear requirements for these types of products (raw vegan ones).
  - The raw vegan is a very tasty dessert based on the reviews of tens of people who tasted and appreciated it.
  - Although a very good product from the organoleptic point of view – smell, taste and aspect - solutions should be found to inhibit excess microorganisms in the product, given the fact that the product does not go through any type of thermal process (with the exception of a short freezing).
  - The presented product is an innovative one, due to the fact that it contains unordinary ingredients for cake baking, so in order for it to be intended for larger consumption, we will have to find information and solutions for both improving it and eliminating any microbiological risk.
- It is, therefore, very important that a product is subjected to microbiological analysis for it to be deemed salubrious and safe for consumption.

**Compliance with Ethics Requirements.** Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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