

Optimum use of the elderberry fruits and the microbiological evaluation of finished product

Denisa Ramona Negomireanu ^{*1}, Corina Dana Miscă ^{*1}

¹¹*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..*

Abstract

This paper aims to highlight the health benefits of elderberry fruit consumption, recommending their use in the food industry in terms of beneficial elements held and at the same time, to perform the microbiological analysis of the jam obtained from the elderberry fruit. Verified microbiological parameters are coliform bacteria and fungal load.

Particular importance has been given to the technological process of obtaining the jam, the role of the raw materials and other ingredients that give the consistency, appearance and flavour of the finished product and to the same degree, their physico-chemical and microbiological characteristics and their contribution to the improvement of the technological processes, with the purpose to avoid the alteration of future food products. The technological flow highlights the main operations required for the production of quality products in terms of taste, physico-chemical and microbiological, characteristics that contribute to the obtaining of clean and safe products for the consumer.

The physicochemical and microbiological methods used are congruent with the current legislation, and the results obtained are referenced to the product quality standards.

Conclusions from our assessments have highlighted organoleptic quality products, clean and safe for human consumption, with nutritional and taste properties that recommend them for industrial propagation.

Keywords: elderberry fruits, jam, coliforms, *E. coli*, fungi.

1. Introduction

In order to lead a healthy life and provide the necessary nutrients needed for the proper functioning of the body, the humans need a daily intake of nutrients such as carbohydrates(sugars), lipids(fats), proteins, water and vitamins offered by food products consumed in certain quantities. They are found in both the plant kingdom and animal kingdom. The nutrients needed for human consumption within 24 hours form the food ration. To put it together, the state of health, sex, age, work and effort of a person should be taken into account. Fruits and vegetables play an important role in

alimentionation, both by the special taste given to the food and by the nutrients contained [1,2].

Regarding the daily fruit requirement, consumption should not decrease during the winter, because the human body needs an average of 500 g of fruits per day. Taking into account the fruit requirements and the period of its occurrence, the fruits are kept both fresh and under different forms of preservation for the nutritional supply of the human organism. The elderberry fruits have a particular importance in human nutrition due to the high content of nutrients needed by the body. The vitamin A, B, C, mineral salts, potassium, iron, polyphenolic compounds and antibacterial properties, reduce the risk of cancer,

exert a hypotensive effect, improve the immune system and maintain a good functioning of the digestive system. [5].

2. Materials and Methods

Elderberry fruits, sugar, water, Himalayan salt are used to obtain elderberry fruit jam. The technological scheme includes the specific steps: material reception, sorting, washing, boiling, cooling, dosing, closing, pasteurizing, labelling and storing. Throughout the process, hygiene conditions must be met in order to avoid the contamination of the product.

Microbiological analysis refers to the fungal content as well as isolation and identification of the presence of coliform germs. The sowing is accomplished by incorporating, in the following way: an amount of specific culture medium - Sabouraud agar, melted and cooled to about 400 ° C is poured over each millilitre of inoculum to completely cover the plate - for the purpose of isolating and identifying filamentous fungi and yeast fungi as well; ADCL agar (lactose citrate deoxycholate agar), on which lactose-positive enterobacteria (develops red colonies) or lactose-negative (develops pink colonies) differentiate. Following the development of the Enterobacteriaceae on selective environments under optimal temperature conditions, the confirmation of the genotypes of coliform germs is done with biochemical tests on simple or multitest environments, which allow the highlighting of several biochemical characteristics of a strain [3].

All evaluations were done in duplicate.

The description of the technological flow: After receiving the raw materials (elderberry fruits), an organoleptic assessment should be done taking into account the examination of the following parameters: the degree of freshness and maturity, the external appearance, fruit consistency, size, shape, colour, flavour and taste. The degree of freshness and ripeness of the elderberry fruit of the visual impact shall be carried out by checking the firmness of the fruit.

Sorting has the role to eliminate, from the total quantity of product, the altered fruits, leaves, stalks or any other impurities resulting from the harvest. It is carried out manually, eliminating the raw or damaged fruits from the quantity of product.

The fruit washing is made with, clean, clear, cool and drinkable water. This operation is done to reduce the number of pesticide residues and epiphytic microflora that exists, as well as to remove any impurities (dust, earth, sand) which have not been eliminated as a result of the operation of sorting. Fruit washing is made through an easy fruit friction between them, in a continuous stream of water.

The operation of boiling is a complex process which has many effects on the elderberry fruit : removing air from tissues, fixing the colour of the product, reducing the number of micro-organisms, inactivation of enzymes, soaking the texture of the fruit, improvement of the process of osmosis and diffusion between the elderberry fruit, water and the sugar added.

Boiling is influenced by two important factors: time and temperature. Boiling time is 15 minutes and the temperature varies between 75 and 80°C. The vessel which is chosen for boiling the jam must be perfectly clean, without deposits of rust or limestone.

For the liquid to evaporate as quickly as possible, the vessel must not be very high nor too large to avoid the excessive soaking of the fruits, they lose the form, transforming it into the marmalade. After choosing the boiling vessel, add water together with Himalayan Salt and brown sugar. Boil them for 2 minutes, then add the elderberry fruit, which were previously sorted and washed.

During the boiling, the thin layer of foam must be removed in order to avoid further deterioration of the product. Boiling shall be deemed completed when a drop of syrup poured on a plate holds its shape, having a sticky aspect.

When the jam is boiled, leave for a few minutes to cool down. This operation is obligatory in order to avoid the development of residual micro-organisms. The advantage of this operation is to avoid caramelisation and the breaking of the jars ,and the creation of conditions to continue the process of diffusion and easier handling of the containers.

Jam cooling must not be exaggerated, because otherwise, its viscosity increases and the filling process is difficult.

The dosing operation is performed in the glass jars which have first been washed and dried. In the case in which the jars have not been dried there is the possibility of jam alteration.

Closing the containers shall be carried out manually by air-tight sealing the jars and has the role to preserve the product for a longer period of time. By closing the containers, water vapor is formed in the space between the lid and the jam which forms an propitious environment for the development of micro-organisms. To avoid this pasteurization of the containers should be done for the formation of a vacuum.

Pasteurization of the jars should be of a short duration in order to avoid breaking the containers and for a better air vapor flow. Should be made at temperatures below 100°C for 10 minutes, without taking into account the preheating period.

The labelling shall be carried out manually by the application of a label around the bowl.

The storage of the jars with the jam is done in a clean room, frost-free, well ventilated and dry. Temperatures greater than 20°C and humidity greater than 80% can reduce the contents of vitamins and can cause degradation of the consistency, color and taste. In the case in which the temperatures are very low, the product can freeze , in this way producing a depreciation of the quality of the consistency. Low temperatures play an important role in the process of degradation and the humidity of the air in the processes of corrosion of the lids.

Throughout the technological process, it is necessary to meet the terms of hygiene in order to avoid contamination of the product.

3. Obtained results

No anaerobic or partially anaerobic coliform bacteria should be present and sporulated in air-tight sealed sugary products according to the Ministry of Health, order 611/1995 [4].

In the following pictures the appearance of Petri dishes immediately after sowing is presented. Photo 1. shows the appearance of the Sabouraud culture medium immediately after sowing, noting the absence of colony development.



Foto 1. The appearance of Petri dishes with Sabouraud medium inoculated with the suspension obtained from elderberry jam immediately after sowing

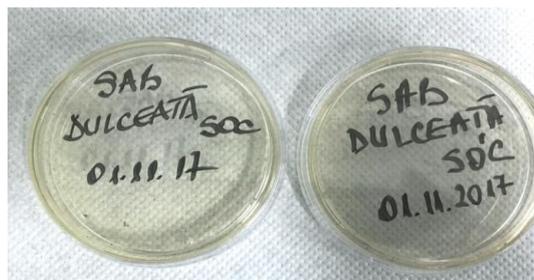


Foto 2. The appearance of Petri dishes with Sabouraud medium inoculated with the suspension obtained from elderberry jam 72 hours after thermostatisation.

Analyzing the obtained results and comparing them with the current law regulations, it can be stated that the fungicidal content of the elderberry jam is within the legal limits, the maximum value for this kind of product being 100 germs / gram.

Checking the plates at 72 hours after thermostatisation, it can be said that the product obtained and analyzed by us - the elderberry fruit jam, is in accordance with the current norms, within the limits of the legislation [4].

In the case of total coliforms, the Petri plates with the ADCL culture medium for the development of gram positive organisms were observed, in which it was found that, at 24 hours after thermostatisation, the development of coliform germs is absent.





Foto 3. The appearance of the culture medium - ADCL, immediately after sowing and 24 hours after thermostataion, observing the absence of coliforms.

4. Conclusions

- Elderberry fruit jam is an innovative product that attracts the consumer through color, appearance, consistency, as well as smell and flavour;
- As a result of the analyzes made in the newly obtained product, total coliforms and the number of fungi, the contamination indicators were absent;
- It can be said that the elderberry fruit jam belongs among the food products that are safe for the consumer.

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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