ABSTRACT

Vegetables and fruits are important elements in the diet, due to the protein, fat and carbohydrates, minerals, their use throughout the year is beneficial to health. Due to seasonality, relatively short harvest periods and high perishability makes their use in fresh can be possible only after a demanding and expensive storage. An advantageous method of preserving fruits and vegetables for longer periods of time is the drying/dehydration.

Since ancient times there was a tradition regarding the preservation of fruit and vegetable by drying, especially plums, apples, bean, mushrooms, carrots etc. In households, the natural drying is carried out using the heat of the sun, which result in minimizing cost of preservation but also introduces a number of disadvantages, such as high during drying, insect infestation etc.

Work process of controlled products drying proved it beneficial for the possibility of keeping and using them for long periods, being found technical solutions for installations for drying fruits and vegetables, higher yields while maintaining power and sensory properties.

It may be proved that using relatively simple equipment the drying process can be conducted in a way that the final products have best quality and preservation costs are minimized. The investigations carried out by different authors shows that the highest influence on the drying process has the temperature of the drying agent, the velocity drying speed and humidity.

In this context enroll the researches conducted in this thesis, in which, starting from the analysis of the current state of knowledge and technical achievements in the field of preservation by drying fruits and vegetables were analyzed several options to optimize work flow for drying fruits and vegetables, to obtain high quality products.

The doctoral thesis has 262 pages, and is structured in 9 chapters. In the thesis are inccluded 78 figures, 74 tables, 118 mathematical relations, 259 bibliography titles.

In Chapter I, entitled ”***General aspects***” are made specification about the importance of fruits and vegetables in human nutrition, are presented physical and chemical characteristics of some species of vegetables and fruits, namely apples, pears, apricots, plums, onions, carrots and

potatoes, products that have been investigated in this thesis. Also are made details about volumetric mass, specific heat, water content, vitamins content, elements required for preservation of qualitative assessment of drying for some types of vegetables and fruits. After presenting the current status of production and export of fresh fruits and vegetables, it notes that the concern for preserving by drying steadily decreased in Romania, balance import/export is favorable for imports.

Chapter II, entitled "***Current stage of research regarding technology and machinery for vegetables and fruits drying***" includes several important parts. The first subchapter deals with the theoretical foundations of the drying process, namely: product forms water binding, equilibrium moisture, water activity and sorption isotherms, the mechanism of moisture transfer inside and on the surface of products, the process of drying and its characteristics curves etc. Further are made details of the current state of technology for drying fruits and vegetables under batch, semi-continuous or continuous (in drying tunnel), including the use of solar energy.

Chapter III, entitled ”***Theoretical studies regarding the optimization of the drying process***” approaches issues of heat and mass transfer, which it is achieved by heat conduction, heat convection and thermal radiation. However, there are references on the mathematical modeling of the drying process and CFD simulation (Computational Fluid Dynamics).

In chapter IV, named ” ***Aims and objectives of phd thesis***” provides a brief summary of the previous chapters of the thesis from which result that the aim of the thesis is very topical. It states that the main objective of the doctoral thesis concerns the optimization work for drying vegetables and fruits, and to achieve it is deemed necessary to resolve other secondary objectives, through:

- the analyze of the role and importance of fruits and vegetables in the diet, the analyze of dehydrated fruit and vegetable consumption;
- the study of relevant literature to inform the process of drying fruits and vegetables;
- the study of specialty literature to inform about current state and trends in the construction of equipment for preservation by drying of fruits and vegetables;
- establishment of a general experimental plan for conduction of experimental studies;
- carrying out of the experimental research on the drying of fruits and vegetables by using a convective drying plant;
- interpretation of experimental results and comparing them with the results of theoretical research;
- determination of the optimum drying of fruits and vegetables in order to obtain products according to standards;

- development of conclusions and recommendations to optimize the drying of fruits and vegetables.

Also in this chapter are presented the general experimental plan based on experimental research that will be held.

Chapter V, "***Materials and Methods***" presents in detail the biological material and the applied methods. The biological material used in the experiments are fruits: apples, pears, apricots, plums; and vegetables: onions, carrots, potatoes. The working methods were:

- sensory and organoleptic analysis of raw materials;
- determination of moisture content;
- determination of ascorbic acid content by titrimetric method dichloro phenol indophenol 2.6;
- analysis of color method CIE Lab - 76;
- statistical interpretation of test results using LSD (Least Significant Difference) and the Student test for color parameters apples.

This chapter presents the stages of the drying process, the equipment used in experimental research, and laboratory equipment necessary to carry out experiments.

Chapter VI "***Modeling and simulation of the drying of apricots***" approaches the mathematical modeling and simulation of CFD (Computational Fluid Dynamics) for apricot drying process (unblanched and blanched).

Chapter VII, entitled "***Experimental research regarding optimization of work process for fruit drying***" presents the results obtained from the drying of fruits (apples, pears, apricots, plums), the influence of each parameter on the process of drying, statistical interpretation of them and comparing them with those theoretical. Also, the amount of ascorbic acid content was determined on apples and pears; apple was subjected to chromatic index analysis during the drying process. Finally, the best option is specified for the drying of fruits.

Chapter VIII, "***Experimental research regarding optimization of work process for vegetables drying***" presents the results of the drying process of vegetables (onions, carrots, potatoes), comparing them with the theoretical and statistical interpretation thereof. Finally, the best option is specified for the drying of vegetables.

Chapter IX, "***Conclusions and refferals***" is a summary of the conclusions which ends each chapter of the work, grouped into general conclusions and findings on theoretical and experimental research.