ABSTRACT

Keywords: fresh recovery, film coatings, heat treatment

The areas where the apple tree is cultivated comprise all continents but it is cultivated more in the temperate area. Here, the apple tree represents the most important species being cultivated on surfaces occupying more than 4.7 hectares and having yields of about 70 million tones annually.

In Romania,the apple tree culture enjoys highly favorable pedoclimatic conditions for the obtaining of high quality productions.

At the same time, the apple tree culture occupies at present the second place among cultures after the plum tree though there were years when it occupied the first place and it represents about 30% of all surfaces occupied by orchards. The current apple tree assortment from our country approved for breeding and legislated by the species official list comprises 42 species divided into three groups, namely: summer species, autumn species and winter species.

Once with Romania's accession to the European Union, the requirements related to the product quality have been harmonized with the European standards to facilitate commerce, on one hand and to increase the life standard at the same standards, on the other hand.

Thus, at European level, by STAS FFV-01 from CEE-UNO norms, they have issued guidelines regarding the quality of apple fruits for sale. These provide the minimum quality characteristics that must be met by the apples so as to be sold.

The quality classes for apples are three in number, namely*extra class, class I* and*classII* and they contain the minimum characteristics that the fruits must have as well as the accepted tolerances fir each quality class.

To obtain a superior quality, besides the technological processes applied in the orchard, the fruit must be valorized according to an adequate technology that might allow the maintaining of quality at high levels from harvesting until the delivery to the consumer.

The competition at the level of internal and external markets determines producers and processers to improve the culture systems and the valorization process of apples.

That is why there are permanent preoccupations to modernize the material basis and technologies in terms of valorization of fresh apples.

This paper presents a synthesis of the main researches carried out so far in this field, mainly on an international level, as well as a model of improvement of fresh apple valorization technologies and the results obtained give fresh apple producers and processers effectual help.

The main objectives of this study are:

1. Application of treatments to the harvested fruits before their introduction into the cooling cells for storage.

2. Monthly observations during frigorific storage of certain qualitative parameters of fruits.

3. Evaluation of quantitative and qualitative differences between the treated fruits and the control sample made up of fruits stored in cooling cells to which no treatment was applied.

4. Statistic analysis of the results obtained.

The structure of this paper comprises two main parts - the stage of knowledge and our own contributions - each part being divided into three chapters.

In **Part I** – Stage of knowledge, **Chapter I**we presented information about the current stage of researches regarding the importance of apple consumption.

Among them, there is the nutritional and dietetic importance of apples and we underlined the consumption period and the storage possibilities as well as the main components of apples that establish the nutritional value and we continued with the economic importance of apples, importance which is highlighted by the surfaces occupied by this culture and the national and world yields.

Chapter II presents the frigorific storage technology for apples starting with the need to space out the fresh apple consumption by their frigorific storage and continuing with quality criteria of apples necessary for long-term storage and underlining the pre and post-harvest factors influencing this quality of fruits.

The flow sheet related to the apple frigorific storage in Sârca frigorific storehouse of SCDPP Iaşi is described in this chapter and we followed each technological stage from harvest to delivery.

In this chapter we also made a short presentation of apple post-harvest physiology by presenting the biosynthesis and biodegradation processes in the harvested fruits and the extent to which they influence the fruit quality during the frigorific storage.

Chapter IIIpresents the different ecologic post-harvest testament technologies for apples, information mainly taken from the foreign specialized literature.

The pellicular and thermal treatments, in hot water, applied to fruits and vegetables are common techniques used in the countries having an advanced horticulture ever since the past decade, and some of them have been used much earlier.

Despite all these, there are many aspects that have not been studied sufficiently yet, the preoccupations of many research centers in the agro-alimentary domain focusing on issues related to the manners to maintain quality and extend the storage period of fruits and vegetables by using non-polluting methods.

As for the films, we presented their basic characteristics, the recipe components of a possible coat as well as their preparation and application to products.

We presented information about the use of bee wax films, chitosan films, carboxymethyl cellulose films and other films (modified starch, calcium chloride).

The studies carried out at world level and national level regarding these films showed the importance of their use, the benefic actions for the maintaining of horticultural product quality and they also represent an information basis for the subsequent researches in this domain.

The hot water thermal treatment is being studied in many research units due to its effects on the inhibition of ethylene production and also as an alternative to remove the pathogen microflora on the surface of horticultural products.

In **Part II**dedicated to our own contributions, in**chapter IV**we presented the goal and objectives of this study and the material and research method as well.

The material under study is represented by four apple species from the zonal assortment having a goodand very good storage capacity harvested from the fruit-growing basin of Iaşi.

The description of Generos, Starkrimson, Idared and Ionagold species highlighted their characteristics and consumption period.

The films were prepared of wax, chitosan and carboxymethyl cellulose and the concentrations used and the mode of preparation are described in this chapter.

We also describe the manner in which the hot water thermal treatment is applied, temperatures and the exposure time.

These are followed by the description of the work variants, the setting up of experiments and the manner of sample taking off.

The chemical tests and physical determinations in apples focused on:

- The qualitative determination of the starch content by the iodine test, according toCTIFL European code;
- The determination of soluble dry substance content, according to ISO 2173:2003;

- The determination of titration acidity by titrimetric method, according to ISO 750:1998;
- The determination of breathing intensity by means of Pettenkofer device;
- The determination of catalasis activity via Lobeck gasometrical method;
- The determination of structural textural firmness via the penetrometric method by means of Setamatic Controller 17200-6lab penetrometer.

The research methods used are the ones described in the specialized literature and are in accordance with the legislation in force.

We also ran some researches regarding the mass loss in fruits by qualitative and quantitative depreciation. Weightings were effectuated both at the beginning of the frigorific storage, every month after having removed the specimens seriously depreciated representing a danger for the spreading of some pathogen agents, and at the end of the frigorific storage period.

The economic efficiency of the treatments applied was highlighted through the calculation of the profitability threshold.

The statistic interpretation of the results obtained focused on the analysis of variance by using Fisher testso as to highlight the influence of the treatments applied on certain qualitative indicators such as the soluble dry substance content, the content of organic acids and the evaluation of structural-textural firmness. By the same variance analysis we also studied the influence of the production year on the same qualitative parameters of apples.

The correlation index was used to establish the interdependence between some qualitative and physiological indices of apple species under study. Thus we correlated the results obtained to evaluate the starch content with the structural textural firmness and the results related to breathing intensity with those of catalasis activity.

Chapter V describes the organizational and institutional framework where the research activity took place by underlining the importance of using post-harvest treatments to maintain the quality of apples during frigorific storage.

Sârca fruit frigorific storehouse is the place where we carried out the experiments and the physical determinations and chemical tests taken off monthly were carried out in the research lab of Agro-alimentary product technology Department from the University of Agricultural Sciences and Veterinary Medicine of Iasi.

Chapter VIcomprises the results obtained in the category of chemical tests, physical determinations and losses registered. Finally, we present the statistic interpretation of the results obtained.

For each analysed species, the results were presented separately for the two years of scientific research.

All treatments applied had a positive influence to a larger or smaller extent on the maintenance of quality of apples during the frigorific storage.

Some treatments had a high efficiency only for certain species. For others they proved to be inferior even if the results obtained were better than for the control samples as compared to other treatments.

The treatments effectuated registered lower quantitative losses as compared to the control sample both in terms of preventing moisture loss j fruits and the limitation of pathogen agent attack.

The statistic analysis showed that the production year influenced to a smaller extent the fruit quality, but these differentiations had a certain effect during the frigorific storage. The influence of the treatments applied was statistically appreciated as being a very significant one in most cases, mainly in terms of the dry substance content and organic acid content.

The starch content and structural textural firmness are in a perfect correlation this meaning that the fruit firmness decreases together with starch hydrolysis.

It has been statistically demonstrated that catalasis activity is in a very good correlation with breathing intensity, both measurements showing the health state of fruits at a given moment.

Conclusionsshowed the need for such a study in the context of research activity at national level and mainly world level as well as the trend to promote a healthy diet. The efficiency of treatments with wax film was more obvious in Idared and Ionagold species.

The chitosan film resulted in the maintaining of a higher soluble dry substance content in the fruits of Generos, Starkrimson and Ionagold species, and the maintaining of a high acidity in Idared and Ionagold species.

The carboxymethyl cellulose film positively influenced the fruits of all species under analysis.

The hot water thermal treatment had very good and good results in all treated fruits, especially in terms of the organic acid content where we noticed significant and distinctly significant differences.

The **bibliography** comprises145quotations, most publications belonging to the foreign specialized literature.