

ADVANCED TECHNOLOGIES FOR THE PUTTING TO GOOD USE OF VEGETABLES AND FRUITS BY COATING FILMS

TEHNOLOGII AVANSATE DE VALORIFICARE A LEGUMELOR ȘI FRUCTELOR PRIN PELICULE PROTECTOARE

ANGHEL Roxana Mihaela

University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

Abstract. *Due to the high level of perishability they have, the maintenance of products' quality in fresh state imposes the application of some adequate technologies for the entire cycle they go through from producer to consumer. The procedures to prevent degradation of horticultural products' quality during storage include treatments of coating the surface with an inert film. This method represents an actual trend which is studied in all countries with an advanced horticulture. The inert films prevent the phenomena of evaporation of the moisture from fruits and vegetables during storage by reducing the respiratory activity of fruits, they are a barrier against the UV radiations and, last but not least, they prevent the contact with diseases and pests. The maturation of the products covered with inert films lead to the better keeping of their quality as compared to the classical maturation processes. The pulverization with inert films led to the significant reduction of their biodegradation processes. The method has a special potential as an alternative for the improvement of the oxidative stability and the increase of validity for fruits and vegetables.*

Key words: advanced technologies, quality, treatments of coating films

Rezumat. *Datorită gradului ridicat de perisabilitate pe care îl au, menținerea calității produselor în stare proaspătă impune aplicarea unor tehnologii adecvate pentru întregul ciclu pe îl parcurg de la producător la consumator. Procedeele de prevenire a degradării calității produselor horticoale pe timpul depozitării includ și tratamentele de acoperire a suprafeței cu peliculă inertă. Această metodă reprezintă o tendință actuală care este studiată în toate țările cu o horticultură avansată. Peliculele inerte previn fenomenele de evaporare a umidității din fructe și legume în timpul depozitării prin reducerea activității respiratorii a fructelor, constituie de asemenea o barieră împotriva radiațiilor UV și nu în ultimul rând previn contactul cu bolile și dăunătorii. Maturarea produselor acoperite cu pelicule inerte conduc la păstrarea mai bună a calitatii lor decât în procesele de maturare clasice. Pulverizarea cu pelicule inerte a condus la reducerea semnificativă a proceselor de biodegradare a acestora. Metoda are un potențial deosebit ca alternativă pentru îmbunătățirea stabilității oxidative și a măririi valabilității legumelor și fructelor.*

Cuvinte cheie: tehnologii avansate, calitate, tratamente cu peliculă protectoare

INTRODUCTION

Consumers' increasing demand for healthier and more ecologic food products determined the researchers to develop new systems to prolong the life of products and that are non-polluting at the same time.

At present, the protection of foodstuffs is made by a mixture of synthesis chemical compounds that are not totally biodegradable. One of the most popular alternatives in recent years is the edible film acting like a barrier against moisture and air. Moreover, in this film they may also introduce other edible substances that may preserve the product's properties or merely improve its aspect.

Despite all these advantages, there is a series of obstacles in the full development of this alternative system for life prolongation of foodstuffs. The main obstacle is the cost price. Being still in the research stage, edible films are not yet produced in the macro industrial system. Companies do not have yet the technology necessary to produce these protecting films on a large scale.

MATERIAL AND METHOD

Besides the study of specialized literature in the field containing scientific articles published at the international symposia or specialized magazines and doctoral theses, we have also consulted different internet pages of some foreign non-governmental agencies that have as object of activity the research in the field of public alimentation.

The final or partial results of the researches conducted by the Department for Researches in Agriculture within prestigious universities from the United States or Spain are presented in this article.

RESULTS AND DISCUSSIONS

MB Pérez-Gago and his collaborators (2003) studied the effect of applying the edible films on the mandarins kept at low temperatures so as to maintain their qualities. They affirm that covering the fruits with a protective film may lead to the creation of a modified atmosphere inside fruits. Thus, due to this fact, the products' breathing is slowed down and consequently the quality of mandarins may be preserved longer in storage conditions.

Their study supposed the use of an edible film from bee wax and polysaccharides in different ratios and concentrations. After discovery, fruits were stored for 4 weeks at the temperature of 4⁰C. They noticed the following aspects: for all the fruits covered with an edible film they delayed the internal dehydration and they also noticed that these fruits registered a lower production of ethanol.

They demonstrated that this film acted like a barrier against moisture, due to the effective closing of pores from fruit epidermis.

In his researches, Javier Fernández Osés (2006), from the Public University of Navarre (Spain), studied diverse edible films so as to find eventual applications for different types of foodstuffs.

He analyzed films based on proteins extracted from milk and whey, different vegetal gums and different types of modified starch.

To test the effectiveness of these edible products for fruit cover, as compared to the synthetic films, Javier Fernández Osés prepared a number of samples and stored them for 6 months at different moisture levels.

He noticed that the mechanical properties of edible films change in time. The films obtained from sorbitol suffered modifications in terms of flexibility and the glycerol films suffered composition modifications.

After several tests, he obtained a mixture of vegetal gums and milk proteins. This film product is resistant and maintains its mechanical properties in time.

The researcher team from the University of Iowa (USA) is working at present to a project by which they try to replace the aluminum protective foils, used nowadays on some foodstuffs, by edible films from milk proteins or related products.

The researchers from the University of Llída, Spain, Department for Agriculture, enterprise a complex study by which they want to obtain an edible film to cover fresh vegetables and fruits that might have a destructive action over the strains of *Escherichia coli*. This film has in its structure apple puree and oregano oil and acts as a natural antibacterial agent.

They also tested for edible films other compositions that might constitute barriers for other pathogen agents, including *Salmonella*. It is estimated that these pellicular products will appear on the market in two years at the latest.

The researcher team from the Service for Agricultural Research within the University of Albany (California, USA), have also conducted a similar study anticipating that they will obtain an edible cover product from vegetables or fruit puree by which they might also increase the food quality of the protected products by the contribution of vitamins, minerals and antioxidants contained in the edible film.

The same researcher team tried 3 years ago to introduce essential oils in edible films so as to increase the food safety but, unfortunately, the obtained product proved not to have antimicrobial properties.

At present they are testing a pellicular product based on volatile oils of oregano, cinnamon, lemongrass in solutions of apple puree to follow their efficiency against *Escherichia coli*. Each compound, in diverse concentrations, was tested on *E. coli* strains. The obtained results confirmed the inhibition of *E. coli* proliferation by the volatile oils. Oregano oil was the most efficient, inhibiting the action of more than 50% of the strain samples in only 3 minutes, at a concentration of 0.034 %. The second oil in terms of efficiency was the lemongrass volatile oil followed by cinnamon one. At the opposite pole, the apple puree solution was the only one that did not have any influence on the *E. coli* strains. The only advantage of it was to contain compounds (glucides, lipids) that form a film adhering to the vegetable and fruit surface for a longer period of time.

There is also a project studying the possibility to introduce a spray containing etheric oils with an antimicrobial effect. Researchers affirm that it is

possible for the fresh fruits and vegetables to have a slight taste of oregano after its application.

Researchers from California Original Foods (California, USA) have also taken into consideration, besides the apple puree, other products that might constitute antimicrobial edible films. They are testing at present products from broccoli, tomatoes, carrot, mango, peaches and pears.

CONCLUSIONS

These edible films represent nowadays a target in the development of the fresh state preservation systems for fruits and vegetables on one hand, and the packing systems of foodstuffs, on the other hand, at least for two reasons:

- they will prolong the life span of foodstuffs in a healthy manner;
- at a global level, they will gradually reduce the use of plastic materials used nowadays in packing fruits and vegetables and, consequently, the environment pollution will also decrease.

REFERENCES

1. **Beceanu D. și colab., 2000** - *Valorificarea în stare proaspătă a fructelor, legumelor și florilor. Tehnologii specifice, de la recoltare la păstrare și livrare*, Editura "Ion Ionescu de la Brad", Iași, ISBN 973-8014-09-3
2. **Beceanu D. și colab., 2003** - *Tehnologia produselor horticole. Valorificare în stare proaspătă și industrializare*. Editura Economică, București, ISBN 973-590-744-5
3. **Javier Fernández Osés, 2006** –*Development, characterisation and applications for foodstuffs of edible coatings based on milk serum proteins, starch and mesquite gum*. Teză de doctorat, Universitatea publică din Navarro, Spania
4. **Pérez-Gago M.B., Rojas C., M.A. del Río, 2003** - *Edible coating effect on postharvest quality of mandarins CV. 'Clemenules'*. International Society for Horticultural Science, ISHS Acta Horticulturae 600, VIII International Controlled Atmosphere Research Conference
5. [www.food-info.net/Wageningen University](http://www.food-info.net/Wageningen_University), Olanda - accesat martie, aprilie 2009
6. www.fffost.org. – *European Federation of* accesat martie, aprilie 2009