

Research on some factors that decide the span of microbiological settlement of some grocery products of hortical origin

Precis

The issues that occur about trading vegetables and fruits became very complex due to these products` diversity and multiple biological processes involved in their storage.

Losses between production and consumption , respectively the quantity of unconsumable products as a result of diverse adulterations , which may be considerable , especially where means of harvest , transport , storage and distribution are insufficient.

In order to mentain them fresh , it is required to take into consideration the structural characteristics of vegetables and fruits , as well as their wealth in water , of their vital metabolical activities and of external factors involved in their good storage.

Our research developed since 2004-2008 aimed the emphasis of the behaviour of red beet , fresh and processed potatos , tomato paste and of sliced carrots , in vaccum.

The research on fresh red beet , partly transformed , on vaccum package , gave us the opportunity to observe some changes of basic characteristics,as it follows:

-the dimensions of fresh beet slices influence both losses of soluble matter and cellular juice , as a result of the pression exerted during packaging , and also the span of product consumption. The slices of beet that have a larger surface of contact with the air than the beet cubes , have lost a larger quantity of cellular juice , during vaccum packaging , and the span of consumption was 7(seven) days shorter than the beet divided in cubes.

-anaerobic ferment processes have begun faster in sliced beet packages than those divided in cubes , the product acidity has developed very quick and evident. There are also great transformations in the poliphenol and antocians content , emphasized by the mentenance of a vivid , intense colour of the product , when the ripen red beet is sliced , packed in vaccum and kept by refrigeration at 4 degrees Celsius. The product`s texture keeps its shape when boiled and also when slices are ripen , and then vaccum packed and kept stored at 4 degrees Celsius. An interesting phenom can be observed in these cases regarding the aspect of the juice obtained from this product. The juice looks like a concentrated sirup , with a jelly aspect.

Thermical treatments applied to the product before vaccum packaging(boiling or ripen) , stop the enzymatic activity inside the product , leading to an increase of validity up to 60(sixty) days when boiled , and up to 70 days when ripen. It also changes the chemical content of the product and its texture(less strong when ripen). We can also notice the increasing of poliphenol quantity of the product , when beet is ripen , followed by an intensification of its color($A=0,154$ when ripen compared to $A=0,0062$ when boiled).

-The juice quantity resulted from the vacuum packaging is bigger when beet has been ripen , as a consequence of the harsher thermic treatment applied to the product , followed by more noticeable weakness of its texture.

-In the case of boiled beet , we can notice a discreet decoloration of the juice , manifested by the formation of some brown lines on the interior surface of the bags.

-Thermal treatments(boiling , ripen) applied to the product before packaging , inactivate the oxidative enzymes , but do not stop the anaerob fermentative processes , due to the fact that microorganisms are not totally stopped.

-Thermal treatment applied after packaging extend very much the validity of the product(to over 6 months) , and the dimensions of the beet slices influence the loss of chemical substances during packaging. The losses are bigger in the sliced case. Also , the fermentative processes begin faster , in this case , the stored product`s acidity being more intense.

Research on vacuum sliced potatoes , refrigerated , and also on vacuum fried sliced potatoes stored by freezing , lead to extremely important conclusions regarding transformations which have appeared during packaging and storage and established the validity of the product for each and every case.

The potatoes bulbs have been conditioned , respectively : washed,scoured and divided. The ionization was made in slices. After divided , a part of the slices have been boiled at 98 degrees Celsius for 3(three) minutes , followed by vacuum packaging , in polyethilen bags , with a capacity of 150-200 grams. The other part was fried and vacuum packed using the same type of bags and the same packaging installation.

During storage , the experimental cases have been submitted to analyses and lab determinations in order to emphasize the transformations that occur as a result of vacuum packaging and storage of the products. The validity of the products has also been established , for each and every case. After vacuum packaging , chemical analyses have been made in order to observe the effect of slicing bulbs , especially the point of view of losses as results of the pressure exerted by the vacuum.

The results lead to the following conclusions:

-A loss of soluble chemical components can be observed , as a consequence of vacuum packaging , components which are given away by the celluloses , due to the pressure from inside the package ;

-In the case of boiled potatoes , vacuum packed , during refrigeration storage , the chemical modifications occur by losing reserve chemical substances , mainly soluble dry substance and total sugar. After 12(twelve) days of storage , the potatoes maintained their color , and we could not observe any anaerob fermentation processes in the bags. After 50(fifty) days of storage , the potatoes modified chemical dramatically , by massive losses of total sugar and also by a sudden growth of acidity , because of the fermentative processes that have been installed. The bags were protuberant , because of the CO₂ emanation , and the product smelled like fermented and it had a sour , unpleasant taste. Therefore , the validity of boiled potatoes , packed in vacuum is quite restrained , up to 14 to 21 days , influenced by the strength of the applied boiling treatment.

When talking about the behavior of sliced fried potatoes in storage , we can notice that after 12 days there was no major change of the product's characteristics. After 50 days , the sugar content has diminished , but the titrated acidity did not increase and fermentation was not installed. Even

though the bag aspect did not change , the product became a little musty and because of that it can not be used. Therefore , the product prepared like this has a longer validity(up to 30-40 days) , limited by the mustation process of the oil ;

-The vaccum packed and then freezed potato , have not registred significant chemical transformations , during storage , their validity being very long(at least 6 months). The product can be used for French fries , both with a forth defreezing , and for usage on the spot. Still , when defreezing , we can observe the connection between vaccum packaging effect and the breaking of the cellular membranes , because of the ice crystals. After defreezing , the potato slices have an excellent aspect , similar to that before packing , the texture being identical to that of boiled potato slices.

The tomato paste has a long validity(at least 6 months). The product looks very good and it can be portioned in a proper quantity for one culinary use. In this case , we can see a minor quantity of juice is produces also , but there are no substantial differences from the product which is not vaccum packed. The vaccum packed tomato paste , kept at 20 degrees Celsius , with light , has significant variations of color , more noticeable than those of the paste kept in a recipient(in the presence of oxygen , but in the dark). Therefore , the light determins the darkening of the tomato paste` color.

The tomato paste kept in vaccum , but sterilized , establishes in a long period of time , but the freezing chain must be assured until the product is used.

Research on the behavior of sliced carrots , packed in vaccum and treated thermical by sterilization , at 100 degrees Celsius for 25 minuts ,

confirmed that this product has a very extended validity(over 6 months) ; the package is well stretched on the product and it still keeps its original aspect(after colding). The carrots` texture is softer , but the slices are still unbroken. The carrots do not change their color in any way. The titrable acidity did not change. The product is ready to be used , in a simple way ; the only thing required is rewarming and seasoning. The high validity expected to be (over 6 months) , is guaranteed only if the refrigerating chain is guaranteed.

Our research also concerns the behaviour of fresh sliced carrots , boiled and packed in modified atmosphere.

The research was made on fresh sliced carrots , packed in modified atmosphere and refrigerated at 4 degrees Celsius , and also on carrots boiled and packed at 95 degrees Celsius , for 3 minuts , in modified atmosphere and refrigerated at 4 degrees Celsius. The transformations occurred during packaging were observed and we could establish the products` validity for each and every case studied , compared with the sliced carrots packed in poliethilen bags , inside a normal atmosphere , kept by refrigerating at 4 degrees Celsius.

The carrots have been submitted to conditioning operations : scouring , washing and dividing. After being sliced , part of the slices was boiled in water at 95 degrees Celsius , for 3 minuts , and then they were packed in modified atmosphere , in poliethilen bags , with the capacity of 200 grams , using a vaccum packaging installation with gas injection , Mecaplastic. The other part was boiled and packed in modified atmosphere , using the same type of bags and the same packing installation.

The results lead to the following aspects:

-The water content decreased constantly , while the total dry substance content rised up to the 6th days , due to the slight dehydrate of the product.After that,the T.D.M. began to decrease because of fermentation processes which occur.This also reflects in the diminish of S.D.M. after the 6th day of storage. The acidity rised after the 6th day of storage , and the ph diminished at the same time. The ascorbic acid content diminished constantly during storage.

The ascorbic acid content has diminished less in the first days of storage when packed in modified atmosphere than it did when packed in normal atmosphere (5,2%to 9,07% after two days in storage). The boiling of the sliced carrots has determined a 11,7% loss of the initial ascorbic acid content , while losses in storage were bigger than in the case of unboiled carrots , respectively 13,24% after two days in storage.

Even though in the first days of storage the products packed in modified atmosphere behaved well , from the point of view of the dehydrate degree , which was very reduced in comparison to that of the product packed in normal atmosphere , and also of the variation of acidity and of the ascorbic acid content. After six days in storage , the fermentative processes begin , more significant in the case of unboiled carrots. In this context , after six days of storage , the samples packed in modified atmosphere were having an unpleasant smell , and the slices became sticky. For the boiled samples the physical-chemical and organoleptic transformations that proved a fermentative activity , occurred after 7-8 days in store.

Even though we were expecting a positive variation of store behaviour for the modified atmosphere packed samples , the total lack of oxygen inside the pack led to the occurance of anaerobic fermentative processes , that caused physical-chemical , biochemical and organoleptic

transformations that were much more noticeable at the end of storage , in the case of the samples packed in modified atmosphere , compared to those packed in normal atmosphere.

This is why we recommend the experiment to be done again , using for the atmosphere inside the package a gas mixture , composed of 2-4% oxygen , for carrots optima is 3%oxygen.