

PECULIARITIES OF STORING LEAF LETTUCE IN CONTAINERS WITH MODIFIED GASEOUS ATMOSPHERE

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Abstract: The present Article deals with results of researches of appropriateness to use semi–permeable selective membranes for preservation of plant products. There has been substantiated efficacy of the means for preservation of products in cooling equipment.

Key words: module, modified gaseous atmosphere (MGA), selective membranes.

The main objective of the work has been to determine efficacy to use modified gaseous atmosphere (MGA) for storing leaf lettuce which is the most perishable vegetable product. In order to achieve the goal there have been applied compact modules–containers with semi–permeable membranes of polymer materials, selective gas permeability of which assures self–regulated gas exchange between MGA within the container and gaseous atmosphere in the refrigerator.

For barrier mechanism at filtration of gaseous atmosphere there have been applied membranes of two main types as follows:

- One–piece film assuring filtration of CO₂ and O₂ through the membrane surface;
- Perforated film with small holes or micro–perforation as initial gas–exchange transport network.

Permeability of membranes has been regulated by selection of molecular structure of membranes material, thickness and surface area thereof, as well as by gradients of temperature and pressure gaseous atmosphere.

Permeability of CO₂ and O₂ of one–piece films increases at increase of temperature, while diffusion of gases through perforated holes is almost non–sensitive to temperature changes.

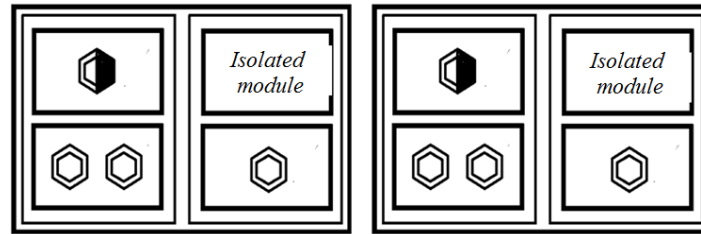
Main indices of polymer membranes applied for experiments:

- Diameter of work area – 23,0 ± 0,5 mm;
- Thickness of membranes – 0,120 ± 0,020 mm;
- Membrane area – 4,15 cm²;
- Capillary diameter of membranes – 5 ... 25 μm.

Modified atmosphere has been created as the result of gas–exchange between the leaves and atmosphere within the closed space of the module, as well as between the atmosphere and external air through the membranes, material of which is characterized by selective permeability for components of gaseous atmosphere.

The atmosphere concerned is created naturally by the “breath” of plants.

It has been found out that the gaseous atmosphere has been created by breath of the product within three days from the moment of encapsulation.



1) upper part

2) the lower part

Fig. 1. Location of modules in refrigerator

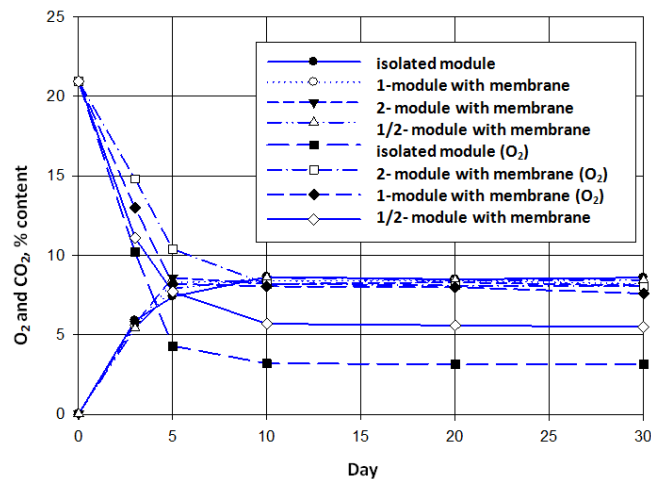
The studied 4 location variants of membranes in the package–module are as follows: one isolated module (without membrane), one second part of the membrane, one membrane, two membranes;

Second measuring upon the initial one has been made in 3, 5, 10, 20, 30 days (until spoiling). Average weight of portion equals to 811 ± 5 g. During the researches temperature has been maintained at $t = 2...3$ °C with relative air humidity not less than $\varphi = 95$ %.

Gaseous content has been determined by *Tsvet 5000* Gas Chromatograph. According to specifications deviation of the device is not exceeding 0,5 % (Fig. 2).

Storing of leaf lettuce in modules with modified gaseous atmosphere has made it possible to slow the process of maturing and to prolong the storage period with no breakdown of market quality.

Organoleptic characteristics in 4 weeks has shown that the worst indices (namely, complete withering) are peculiar for isolated modules.

**Fig. 2.** Change in gas content of CO₂ and O₂ inside the modules

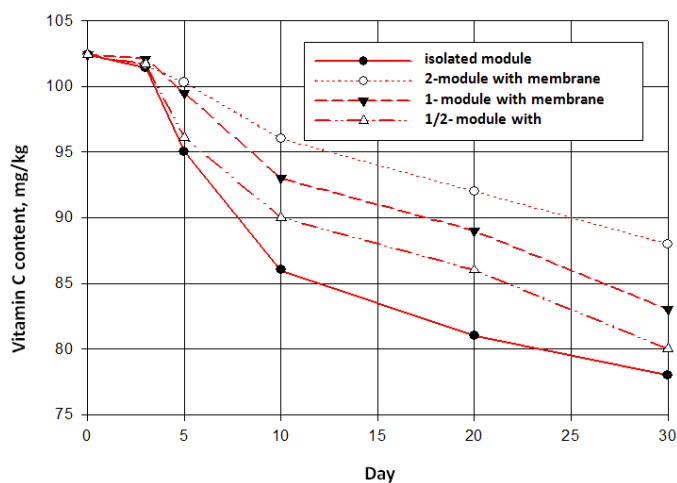


Fig. 3. Change in Vitamin C content

Initial content of Vitamin C has been 102.4 mg/kg. Fig. 3 shows the change diagram of Vitamin C content in the process of storing leaves in modules with modified gaseous atmosphere. As the diagram shows change of Vitamin C content has started in 3 days of storage. After that, the best indices of Vitamin C content have been revealed in the module with two membranes.

Results of the study have made it possible to conclude that storing technology with modified gaseous atmosphere applied as additional factor of influence is an efficient way to reduce losses and to prolong storage period of perishable products in operating refrigerators.

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