

STUDY CONSIDERING PRESERVATION FOR LEAFY VEGETABLES THROUGH WHITE FROST METHOD AND CONTROLATE ATMOSPHERE

Mirela Calu, Ioan Tofan

„Dunarea de Jos” University of Galati, Domneasca Street 111, Galati, Romania,
mirelcalu@yahoo.com, ioan_tofan@yahoo.com

Abstract

Preservation of leafy vegetables depends not only from temperatures but even from relative air humidity. For these sorts of vegetables freshness can be kept only with a deep control of refrigerating temperatures and humidity.

During this study we will try to reveal the influence of temperature, air humidity, inside the storage place correlated with quality of the leafy vegetables (spinach, salads) preservation through white frost methods.

Low temperature for some vegetables must be correlated with controlled atmosphere. These conditions are very important because only low temperature can obtain dry consistency and weight degrees for some vegetables (rucola)

All measurements have been done in laboratory conditions with environmental temperatures between 0- 4°C and relative air humidity $\phi=95-98\%$, for spinach, salads and for rucola, temperature of 5°C combined with atmosphere of 3%O₂ and 15%CO₂.

Results will prove that all preserved products stored in those conditions keep all their quality parameters during the time and all their characteristics remain the same like fresh products.

Keywords: *white frost, quality, leafy vegetables, grassy vegetables, controlled atmosphere.*

Introduction

Fruit and vegetables are both major food products in their own right and key ingredients in many processed foods. Consumers increasingly require food products that preserve their nutritional value, retain a natural and fresh color, flavor and texture, and contain fewer additives such as preservatives.

There has been a wealth of recent research both on the importance of fruit and vegetable consumption to health and on new techniques to preserve the nutritional and sensory qualities demanded by consumers.

Eating fruits and vegetables has long been associated with health benefits, though some of the ways in which these foods enhance health have only become clear in recent decades. Rucola is a grassy vegetable, is an aromatic salad green which contains iron more, is very important in Italian cuisine but in occidental Europe, also. Rucola is an important piece in diets and release of the toxins being very efficient in these areas (rucola is well known under name arugula in S.U.A.)

All products of week's ration for one person are processed through cold, respectively by refrigeration combined with controlled atmosphere. We use refrigeration for to avoid loss in storage time and to maintain the products fresh for a long time.

Experimental

This work was achieved for establishing the time of storage of leafy vegetables in the case of moist refrigeration. This method presumes a mass transfer very intense between air and cold water, so that results a wet atmosphere approximately 98%.

This atmosphere assures ideal conditions for leafy vegetables cooling.

We have realized this atmosphere such as: inside refrigerator we set a pot with icy water at 0-5°C. Pent-up air of refrigerator's ventilator in direct contact with water becomes chill and moist.

Other option at wet refrigeration consists in distribution of water like very small drops at products surface (5-30 μ). The maintaining time of products in refrigerator was between 10 and 50 hours.

Controlled atmosphere presumes, not only, control's temperature but composition in oxygen, in dioxide carbon even ethylene release.

This method consists in rarefaction of O_2 or increasing CO_2 level inside storage atmosphere of the vegetables.

Decreasing oxygen's concentration makes breathing becomes slowly and addition of CO_2 increase effect hypoxia. That's why concentration must be kept and controlled at constant value. We used same concentration of O_2 and CO_2 or we increased or decreased these concentration reverse proportional at temperature of 5°C.

This method is very good for preservation rucola because only low temperature usage do not offer us satisfied results. We used 2 type of rucola E.sativa si D.tenuifolia.

Arugula is available year-round, but hot weather makes for hotter leaves. The thinner leaves are more tender and better for salads. For better preservation results we need light green color leaves, nicked leaves, easy round off on border and very clean excluding any yellowing pieces.

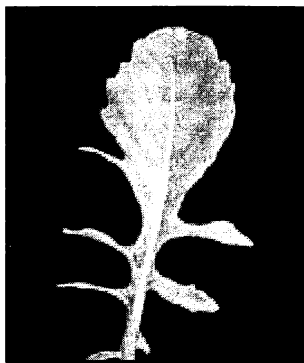


Fig.1: Rucola's leave

Arugula leaves hide sand no matter how clean they appear so cut off the roots and swish in plenty of water.

Wrap roots in damp toweling, then enclose all in plastic. Spin dry, wrap in toweling and chill until serving time. We established best method for preservation s rucola a long time.

Leafy vegetables we used are spinach and lettuce. We used spinach (*Spinacia oleracea*) from Savoy type, with fresh, healthy and clean leaves. The spinach used had tender leaves, with fine bots which are intense colored with pithy taste and specific aspect of type.

Lettuce of house hot culture was harvested in cold and drying weather, when the plant head is very well formed. Net mass is approximately 100g/piece. Harvest lettuce must be fresh, turgescencent, healthy and clean, because was adjusted and sorted, and also cleaned by faded and spoiled leaves.

Before refrigeration spinach and lettuce must be very well washed in special installation, without saving water. It is an important step in this method, because it's reducing the contamination risk of any kind.

After refrigeration we determined the number of microorganisms on the product as well as sensorial characteristics (color, taste, and flavor).

Results and Discussion

E. sativa is a type of rucola who request special conditions of preservation, as we will see:

Moist refrigeration keep very well rucola time 14 days if continue preservation with controlate atmosphere, going on until 21 days.

Moist refrigeration registered decrease s mass with approximate 5%. Treatment with atmosphere of 3%O₂ and CO₂ registered decrease s mass with approximate 3%. In this experimental condition is keep green color. Chromatographic analyze, registered decrease percentage in volatile component, keeping sensorial characteristics: specific color, texture, flavor, and it keep a bitter taste and little spice, hard to define taste.

This method of preserving vegetables in shelf-life follows the maintaining of freshness for a long time. Cooling of products is quickly – rate of cooling is twice bigger than cooling with in dry air and the freshness is maintained for a long period of time.

Spinach and lettuce require an immediately precooling after harvest. Relative humidity obtained through white frost is approximately 98%, when leaves are very well maintained. Spinach and lettuce preserved by method above have following sensorial characteristics: specific color, texture, taste and flavor; and it keep an agreeable sensation of freshness.

In figure 1 we establish the number of microorganisms on lettuce and spinach after 10, 20, 30, 40 and 50 hours. The initial number of indigenous populations was from 10⁶ to 10⁷ CFU g⁻¹.

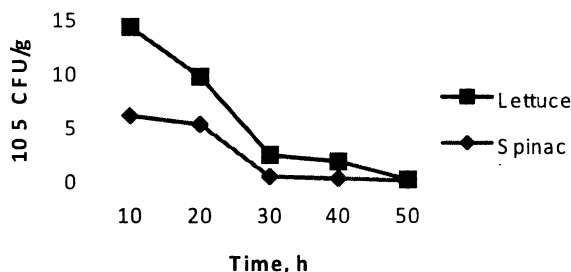


Fig. 2: Variation of microorganisms' number function of maintaining time at white frost for lettuce and spinach leaves

Conclusions

D.tenuifolia is little pretentious in comparison with *E. sativa* where loses in various component is insignificant. Volatil component gradual decrease from day at other day, under controlate atmosphere time of 10 days goes on preservation until 21 days.

Controlate atmosphere is favorable for storage a long time mostly for very perishable products

Preserve spinach and lettuce at the relative humidity 95%; offer a period of preserve by 3-5 days for lettuce and 1-2 weeks for spinach. White frost offers a 14, 18 days period for lettuce and a few weeks for spinach. From energetically point of view is more economic. The consumption is half for white frost comparatively with of classic installation.

White frost stops the growth of banal microflora, reduces physiological activity and determines the extend of product lifetime, avoiding the vitamins loses.

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