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Storage of Citrus Fruits Using Electron-Ion Technology

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Abstract

In this article, technological process in agriculture based on the latest achievements of science and technology, one of the actual problems of all industries that use process of storage of citrus fruits is presented. Technical progress, on the one hand, offers prospective ways and techniques to solve this task, and on the other, makes it more difficult for her, as is accompanied by many negative phenomena. Electron-ion technology is an integral part of several directions of physics and technology in agriculture used in storage fruit and berry products, in the electrical separation of grain, convective and contact drying of milk, refrigeration equipment for cooling various products and fluid dynamics. It is known that the development potential of each of these areas is high enough, but together, these directions are not examined. Especially with regard to storage of citrus fruits under the influence of electron-ion technology.

Keywords: Agriculture; Citrus fruits; Storage; Electron-ion technology; Ozone

Introduction

Agriculture is currently in need of innovative processing technologies in order to meet consumers' demand of fresher and safer ready-to-eat products [1].

To citrus fruits, include oranges, tangerines, lemons and Grapefruits. Other types of citrus (pumelo, kumquat, limeand etc.) not widespread and practical implications are not. At present, the rotting of citrus fruits in connection with the activities pathogens is one of the main causes of the loss of citrus fruits.

Blue mold (Penicillium italicum Wehmer) and green mold (Penicillium digitatum) are the main, which cause diseases of citrus worldwide [2-4].

For example in Spain, citrus fruits postharvest losses due to blue and green molds may reach up to 10-15% under normal environmental conditions. However, if climatic conditions favorable to mold development, these losses might exceed more 50%. The purpose of the study is to make optimal use of known methods and technology of preservation of citrus fruits. Offer based on electron-ion technology to increase the percentage of preservation of citrus fruits.

Materials and Methods/Methodology

Currently, these diseases are primarily controlled by application of synthetic fungicides. However, the use of these fungicides can lead to important problems such as chemical residues accumulation in citrus fruits.

Citrus fruits are very sensitive to low temperatures, thus lowering the temperature may be carried out only up to a certain limit. At temperatures close to 0°, there is an increasing deterioration of the fruit.

The most susceptible to cooling lemons and tangerines are more resistant to low temperatures. Oranges occupy between them an average place. Therefore, different kinds of citrus fruits should be stored at different temperatures.

Attention is now focused on ozone as powerful sanitizer that may meet expectations of the industry, approval of the regulatory agencies, and acceptance of the consumers [1,5].

For example, the occurrence of ozone, as a component of the electric potential of a powerful impact on atmospheric air, you can use the following positive aspects to storage of citrus fruits:

a. Ozone is approximately 300 times faster than other disinfectants may destroy all known in nature, microscopic organisms that spoil of citrus fruits;

b. Ozone is a good disinfectant and can apply in any technological production;

c. Ozone treatment does not affect the "pH" H_2O and not synthesizes from water molecules negative environmental components;

d. Ozone does not form toxic by-products, turning at the molecular level in O_2;

e. Ozone produce very simple, without requiring storage and transport in industrial conditions [6].

f. Ozone reduces the number of viruses and germs, so the shelf life of different substances, including citrus fruits is significantly increased. But, ozone is effective only in short time interval [7].

Conducted delve into to get the best results when storing citrus fruits. Before storing citrus fruits irrigated specially treated liquid (3.5 pH) in the form of a misty dust. This solution liquid received using the electron-ion technology with the following parameters: U- 600 Volts;

Impulse frequency F- 200 Hertz;

Duty cycle S- 3.

This method was named "Impulse therapy irrigated of citrus fruits".

Results

The most rational way to store citrus fruit at the following temperatures. Mandarins with 2-3, oranges at 4-5, lemons with 6-7. Relative humidity in storage rooms shall be 85% as the most favorable to store citrus fruit.

Ozone significantly reduces the impact of the blue mold (*Penicillium italicum* Wehmer) and green mold (*Penicillium digitatum*) in citrus fruits.

Using method "Impulse therapy irrigated of citrus fruits" can reduce the loss of citrus fruit up to 7-10%. While all the traditional technology of preservation of citrus fruits can also be used.

Authors' Contributions

This work was carried out in collaboration between all authors. Author Burlev M.Ya. did all the research for 30 years and wrote this article. Author Kharitonov V.D. supervised the part of the research and adjusted this article. Author Nikolaev N.S. supervised another part of the research and did the literature searches. All authors read and approved the final manuscript.

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