

Abstract

The spores of bacteria of the genus *Alicyclobacillus* have the ability to survive in the normal conditions used to pasteurize fruit and vegetable juices. This is due to the specific construction of the spore, which allows bacteria to survive in adverse environmental conditions. For a long time heat treatment, namely in the case of acidic juices, pasteurization at the temperature below 100 °C, was regarded as an universal method for preventing spoilage. Spores of *Alicyclobacillus acidoterrestris*, are however resistant to pasteurization, therefore, it is necessary to use the intensive heat treatment (UHT – *Ultra High Temperature*), which in turn may affect the sensory and nutritious quality of the final product. That is why the industry is constantly looking for alternative, non-thermal methods for juice preservation. More and more often the high hydrostatic pressure processing is used. Recently some works on the biocide effect of carbon dioxide have appeared, showing its usefulness of for juice decontamination, including inactivation of *Alicyclobacillus acidoterrestris*.

The aim of the work was to prove the hypothesis that physical stress associated with the use of innovative and applicable techniques of food preservation, including High Hydrostatic Pressure (HHP) and supercritical carbon dioxide (SCCD), and also the availability of biochemical substances initiate and affect the process of germination and inactivation of *Alicyclobacillus acidoterrestris* spores.

The obtained results indicate that the dynamic of spore germination and inactivation depended on the time, pressure and temperature of the process, as well as the medium and the test strain. The longer was time of pressure and higher temperature, the more intense was the germination process, both in the case of high hydrostatic pressure and supercritical carbon dioxide. Also, the type of medium used had an impact on this process. Germination and inactivation of spores occurred most intensely in the reconstituted apple juice of 11.3 °Brix, pH 3.4, slightly less in buffer pH 4 buffer, and at neutral pH spore germination was inhibited. A high level of soluble solids prevented the germination of spores which limits the use of these techniques to single strength juices.

Germination was also observed in the presence of L-alanine and AGFK mixture, in the case of L-alanine greater stimulation was observed. A positive correlation of the amount of dipicolinic acid released with the number of germinating spores was noted.

Separation of proteins in polyacrylamide gel under denaturing conditions allowed for determining the amount of proteins involved in the germination of spores and observing changes in the level under the influence of external factors. Applied processes carried out in

appropriate conditions and activating agents, allowed to initiate the process of germination of spores of *Alicyclobacillus acidoterrestris*, making them more susceptible to external factors and increased inactivation. This indicates a need to further explore the mechanisms of germination and include this knowledge in designing of technological processes.