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Effects of Pulsed Electric Fields on Properties and Structure of Plant Tissues

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Abstract

The objective of this study was to review the influence of pulsed electric field on properties and structure of plant tissues. The PEF-treatment as a nonthermal method, which allows to preserve the natural quality, color, and vitamin constituents of food products. This processing is based on electroporation phenomena. Applications of PEF in food processing are discussed.

Introduction

Amongst various non-thermal processing techniques used in food technologies, the pulsed electric field (PEF) treatment is one of the most perspective. It involves a short bump of high voltage application to a food placed between two electrodes. As high electric voltage is used, a large flux of electric current runs through food materials, which may act as electrical conductors due to the presence of electrical charge carriers such as large concentration of ions (Barbosa-Cánovas et al. 1999).

Application of PEF in food industry

Generally, applications of PEF in food processing have been directed to two main categories: microbial inactivation and preservation of liquid foods, and enhancement of mass transfer and texture in solids and liquids. Large portion of works on PEF have been focused on reducing microbial load in liquid or semi-solid foods in order to extend their shelf life and ensure their safety. The products that have been mostly studied include apple juice and orange juice. These studies and others have reported successful PEF-inactivation of pathogenic and food spoilage microorganisms as well as selected enzymes, resulting in better retention of flavors and nutrients and fresher taste compared to heat pasteurized products (Barbosa-Cánovas et al. 1999). Another area that is showing a great potential is applying PEF on plant tissues as a pre-treatment to enhance subsequent processes such as juice extraction and dehydration (Vorobiev E., Lebovka N. et al. 2008).

Conclusions

Pulsed electric field (PEF) treatment has a promising future for agro-food processing. The emerging and new technologies presented are at different stages of development with high hydrostatic pressure technology for food preservation and quality retention being the most advanced. Pulsed electric field applications are on the verge of industrial use. It possess a great potential for food modification purposes and are generally more sustainable technologies than conventional thermal ones.

References

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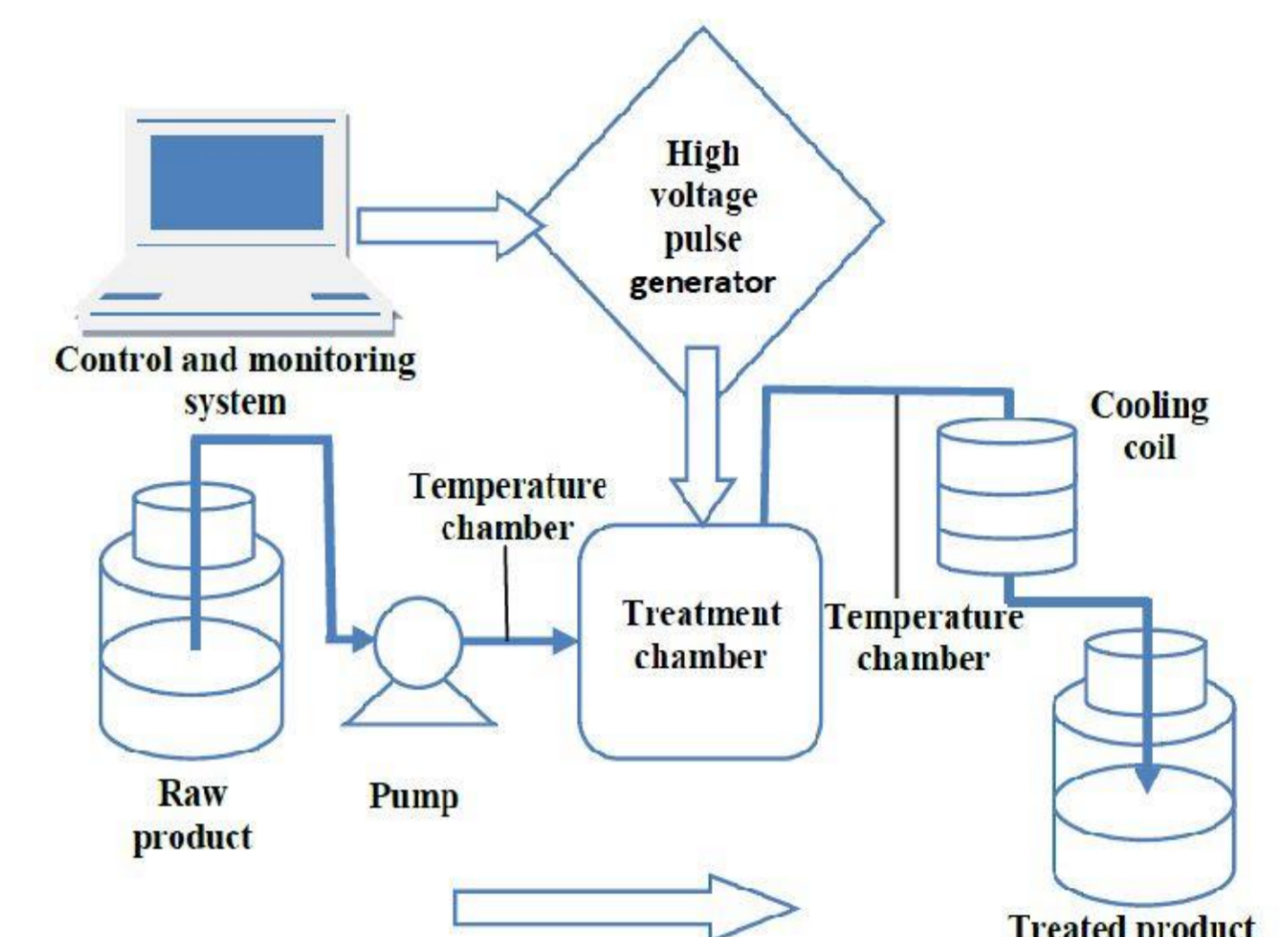


Fig. 1. Experimental setup