Pulsed Electric Field pretreatment for cost and energy efficient processing of industrial peach cultivars

DIMOPOULOS G. (1), STOUKOGIORGOS G. (1), TAOUKIS P. (1)
1 Laboratory of Food Chemistry and Technology, School of Chemical Engineering, National Technical University Of Athens, Zografou, Greece

In temperate climates, peach harvesting spans a short period, from mid-July to mid-September. In order for the fruit processing industry to prolong this period, certain cultivars are used which can be harvested up to late September. However, these cultivars exhibit increased firmness, requiring frequent cutting blade replacement, and resulting in low juicing yields. To avoid these issues, thermal pretreatment or prolonged ripening storage is required, causing significant handling and cost issues. Pulsed Electric Fields can soften plant tissues at a fraction of the energy required compared to thermal treatments. This work explores the applicability of PEF pretreatment on whole peaches, prior to juicing and cutting.
Mild PEF treatments (2.0 kV/cm,0-2.73 kJ/kg) were applied on whole peaches (Everts variety) subsequently assessed in terms of firmness, using a texture analyzer and puree yield using a benchtop screw juicer. Juicing efficiency was expressed as % of destoned fruit mass. Quality parameters such as total soluble solids, pH, color and Bostwick consistency were determined on the resulting purees. PEF treatments were compared to thermal blanching (90°C, 5 min) and freeze-thawing (-20°C, 25°C).
All PEF treatments led to a decrease in fruit firmness by 28% (10 kg/cm2) compared to untreated samples. This decrease was estimated to reduce the cutting blade replacement frequency from once every 8 h shift to once every 7 days. The decrease in firmness also led to a significant increase of juicing yield from 65% to 79%. A specific energy input equal to 0.2 kJ/kg was adequate to achieve this increase in juice yield, corresponding to energy savings of 170 kJ/kg, compared to thermal blanching. The quality parameters of the resulting puree were equivalent to those of untreated samples, except for lower but still within acceptable limits Bostwick consistency (8 cm/30 s). These results underline the applicability of PEF treatments in a real case industrial setting and highlight its suitability as an energy saving process.
Acknowledgment: This work was performed in the framework of the National Recovery and Resilience Plan "Greece 2.0" funded by the European Union-NextGenerationEU (Project No. FRUIVEF-TAEDK-06176).