

Thermosonication applied to blueberry juice – Impact on quality properties

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Aim: The conventional heat treatment (HT) is still used by the food processing industry as a solution to inactivate pathogenic agents and to extend the shelf-life of juice products. However, pasteurization involves quality modifications of the final product by losing part of its nutritional value and properties. This factor is critical in industrial juice manufacture, whose freshness is essential. This study aims to evaluate if thermosonication (TS) can be considered a potential alternative to the pasteurization of blueberry juice.

Method: Juices were prepared by defrosting the frozen blueberries and then using a cold centrifugal juicer. Freshly prepared juices were thermosonicated with a sonicator probe (700 W, 20 kHz, 100% amplitude) at 45 and 55 °C for 25 and 1 min and using an ultrasonic bath (230 V, 35 kHz) at the same temperatures for 30 and 60 min. These processes were compared to the traditional pasteurization by the juice heat-treated at 75 °C for 1 min. The temperature/time binomials were chosen based on the 5-log₁₀ *L. innocua* reduction. Physicochemical parameters, anthocyanins content, total phenolics, antioxidant activity, and enzyme activity were monitored before and after treatments.

Results: The TS applied with the probe (TSP) had significant positive effects on blueberry juice, such as the increase of antioxidant activity (according to the ABTS scavenging method), the inactivation of enzymatic activity (a residual activity of about 25% and 1% was achieved for POD and PPO), and the decrease on the browning index. However, a significant reduction of phenolic compounds and anthocyanins was observed. HT had the most impact on juice colour parameters but was the most effective method in totally inactivating the POD enzyme. TS with ultrasonic bath (TSB) showed no significant differences in antioxidant activity and anthocyanins compared with the untreated juice. However, also juice colour was significantly changed.

Conclusion: TSP and TSB effectively maintained or improved most blueberry juice quality characteristics compared with HT and untreated samples. Nevertheless, since TSB needs a higher treatment time for the 5log₁₀ microbial inactivation, physicochemical parameters were more negatively affected. Therefore, thermosonication (especially TSP) seems a possible processing option to preserve blueberry juice quality.