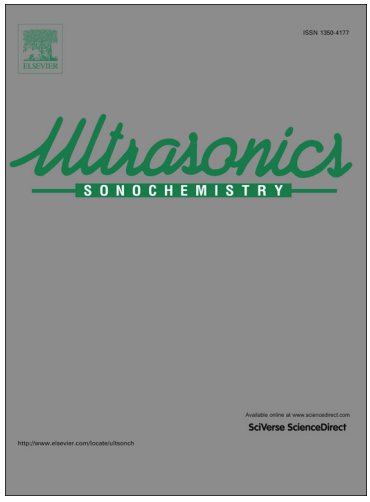

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Aromatic profile and sensory characterisation of ultrasound treated cranberry juice and nectar

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Abstract

Ultrasonication is a nonthermal food processing technology that is used in several applications (extraction, pretreatment before drying, freezing, inactivation of microorganisms *etc.*). The objective of this study was to investigate the effect of high power ultrasound and pasteurisation on the aroma profile and sensory properties of cranberry juice and nectar. Samples were treated according to the experimental design, with high power sonicator at ultrasound frequency of 20 kHz under various conditions (treatment time 3, 6 and 9 min, sample temperature: 20, 40 and 60 °C and amplitude 60, 90 and 120 μm). The aromatic profiles of juices showed that, compared to the untreated samples of juices and nectars, the ultrasonic treatment led to the formation of new compounds or to the disappearance of compounds that were found in the untreated samples. Samples treated at the highest amplitude (120 μm) were used for evaluation and comparison with untreated and pasteurised samples using electronic tongue study. Principle component analysis (PCA) confirmed the results of electronic tongue study, which showed that the ultrasound-treated and pasteurised juices had different scores compared to the untreated samples. Sensory evaluation showed that ultrasonically treated and pasteurised juices received lower scores in comparison with the untreated samples.

Key words: high power ultrasound, cranberry juice and nectar, aroma profile, sensory properties, electronic tongue

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Introduction

Ultrasonication is a nonthermal method of food processing that has the advantage of preserving fruit juices. There are scientific papers that deal about degradative effect of the ultrasound that causes the common side-effects associated with conventional heat treatment.[1,2]. Applications of ultrasound in the processing of fruit juices and the effects of sonication on fruit juices have been studied [3–5]. Sonication is considered as one of the potential nonthermal techniques for the processing of fruit juices that can improve the process through reduced processing time, higher throughput and lower energy consumption [6–8]. The main combination of ultrasound used in any practical application, is in conjunction with pressure treatment (manosonication), heat treatment (thermosonication) or both (manothermosonication). The effect of ultrasound has been mainly attributed to physical phenomena (acoustic cavitation and the resulting high-speed microjets and shockwaves) and/or chemical phenomena occurred due to formation of free radicals (*e.g.* $H^{\bullet}$ and $^{\bullet}OH$) from the sonolysis of water vapour inside collapsing bubbles. The primary effect of usage of non-thermal food processing techniques is inactivation of microorganisms [9,10].

Many researchers have demonstrated reduced effects on quality or nutritional parameters including grapefruit juice [11], melon juice [12], apple juice [13,14], strawberry juice [15] and cranberry juice [16–18]. In order to observe changes of thermosonicated fruit juices and achieve inactivation of microorganisms, it is necessary to understand the mechanical, chemical, physical and sensorial changes in treated media. Thermosonication can be used to inactivate microorganism and specific attention is needed to avoid aromatic, sensorial and organoleptic changes in food. Today, consumers make demands on the quality, flavour and taste of different kinds of fruit juices [1,22,23]. It is important to keep very high quality standards of products including the taste and to make sure that juices and nectars meet predefined chemical and physical parameters. For this purpose, it is important to use sophisticated equipment and technical expertise in sample preparation and analysis and one of it are electronic nose and tongue [24–26]. In the study by Dias et al. [25] the electronic tongue was successfully applied for semi-quantitative discrimination of real juice soft drinks, based on the added fruit level. Non-specific lipo/polymeric membranes were used for the first time, to perform quantitative determination of two major compounds present in those beverages, fructose and glucose. For sensory analysis, industry needs trained panellists, including a substantial amount of resources, time and cost [26–29]. It is important to quickly develop and test new methodologies that will ensure low-cost and reliable alternative to these costly and lengthy procedures. Electronic tongues of several types (potentiometric, voltammetric and impedance) may represent such alternatives. They have many applications and have been used to test several juices with a combination of a gas sensor array and voltammetric electronic tongue [13,25,27]. An electronic tongue functions by combining signals from non-specific and overlapping sensors with pattern recognition