

Direct coupling of high intensity ultrasound to a crossflow microfiltration pilot for pulpy fruit juice clarification

DORNIER M. (1), MIRAMONTES-ESCOBAR H. (1,3,4), HENGL N. (4), SERVENT A. (1,2), MERTZ C. (1,2), VAILLANT F. (1,2),
ORT-BASURTO R. (3)

1 QualiSud, Univ Montpellier, Avignon Univ, CIRAD, Institut Agro, IRD, Univ La Rnion, Montpellier, France

2 CIRAD, UMR QualiSud, Montpellier, France

3 Instituto Tecnolico de Tepic, Laboratorio Integral de Investigaci en Alimentos, Tepic, Mexico

4 Univ Grenoble Alpes, CNRS, Grenoble INP, LRP, Grenoble, France

The objective of this study was to evaluate the direct coupling of high intensity ultrasound (HIUS) to a crossflow microfiltration pilot (tubular ceramic membrane of 0.2 μm average pore diameter, laboratory scale) in order to reduce the membrane fouling during the clarification of pulpy fruit juices. The HIUS probe was installed vertically 20 cm before the filtration membrane. The application of 1 min pulses at 30, 40 and 50% of amplitude and with different rest times (from 1 to 10 min) were evaluated. A transmembrane pressure of 76 kPa, a crossflow velocity of 5 m^2s^{-1} and a temperature of 20°C were controlled in the system. The permeate flux (J_p), the volume reduction ratio (VRR), the change in the physicochemical characteristics and the effect on the concentrations of bioactive compounds of jackfruit nectars with different pulp content were determined. The results showed that the fouling of the membrane decreased when the HIUS pulses were applied at shorter rest times. For the pulpiest nectar, J_p dropped by 52% after 40 min without HIUS, but a recovery of 80% was observed when HIUS was applied at 40% amplitude. For the less pulpy nectar, the HIUS efficiency was not highlighted because J_p decreased in all the conditions evaluated. Furthermore, an increase in the concentration of polyphenols in the permeate and of carotenoids in the retentate was shown. Until now, the coupling of HIUS to CMF improved the filtration performance when working with highly pulpy fruits such as jackfruit using as HIUS operating conditions, amplitude of 40-50% and a shorter rest time of pulse application. The coupling of these two technologies provided a solution to the problem of membrane fouling and could enhance the sensory and functional properties of the final products.