Clarification of guava juice by an ultrafiltration process: analysis on the operating pressure, membrane fouling and juice qualities

ABSTRACT

Fresh guava juice was clarified using ultrafiltration (UF) process on a laboratory scale in this study. The observation was undertaken to determine the effect of the operating pressure (OP) on the permeate flux (J) behaviour, the fouling mechanisms as well as the quality attributes of the guava juice i.e. pH, turbidity, colour, total soluble solids (TSS), total phenolic content (TPC) and ascorbic acid content (AAC). The clarification of guava juice was performed in a batch mode using a 100 kDa polymeric membrane in a dead-end module at an operating pressure OP of 1.0, 1.5, 2.0 and 2.5 bar. The results showed that a high OP resulted in high flux during the UF process. The flux-pressure curves exhibited no increase for an OP higher than 2.0 bar (Plim), with a limiting flux (Jlim) identified at 17.22 kg/m2 /hr. Intermediate and total pore-blocking has been identified as the major fouling mechanisms in the process. The resulting juice after filtration showed a reduction of more than 97% turbidity with a lower TSS by 7 to 17%, compared to the fresh juice. The UF process permitted a good level of clarification with improvement in colour properties with a stable pH at 3.8. However, a 19 to 27% and 18 to 22% reduction of TPC and AAC, respectively were found in the filtered juice with respect to the fresh juice. For appropriate flux behaviour and juice quality attributes, the process UF should be conducted at 2.0 bar.

Keyword: Fruit juice; Guava; Juice clarification; Membrane process; Ultrafiltration