Comparison of osmotic membrane distillation and forward osmosis membrane processes for concentration of anthocyanin

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ABSTRACT

The present work deals with comparison of osmotic membrane distillation and forward osmosis membrane processes for concentration of anthocyanin extract as well as to study the effect of various process parameters such as osmotic agent concentration, flow rates of feed and osmotic agent on transmembrane flux. Mechanism of mass transfer in case of osmotic membrane distillation and forward osmosis has been explained. Mass and heat transfer coefficients for feed side, osmotic agent side, membrane mass transfer coefficient and overall transfer coefficient have been determined. In case of forward osmosis, the anthocyanin extract was concentrated from 49.63 mg/l to 2.69 g/l in 18 h; however, it was coupled with migration of sodium chloride (0.21 moles/m²s). However, in case of osmotic membrane distillation process, the concentration of anthocyanin was achieved up to 72 mg/l for the same time without any transfer of osmotic agent. The transmembrane flux in case of osmotic membrane distillation was low as compared to forward osmosis. These techniques may prove to be potential techniques for concentration of natural colorant. The concentration of kokum extract using forward osmosis membrane process has advantages over the thermal concentration in terms of higher stability, lower browning index and less conversion of hydroxycitric acid to its lactone form.

Keywords: Osmotic membrane distillation; Forward osmosis; Heat and mass transfer; Anthocyanin