

Forward osmosis process to concentrate coconut water and membrane fouling behaviour: Improved shelf life

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Abstract:

Membrane processing for fruit juice clarity and concentration is becoming increasingly popular due to its low cost and greater fruit juice quality retention. Researchers are encouraged to adopt membrane methods in fruit juice concentration because of many benefits. Among these membrane processes, forward osmosis is on the rise. The water is removed from the feed side and transferred to the draw side due to osmotic pressure differential between the two sides of the membrane. Coconut water is concentrated using commercial and laboratory membranes. One of the most important parameters in forward osmosis (FO) is membrane fouling resistance. The influence of concentration on fouling resistance is investigated in this study, and critical process condition as function of concentration factor was achieved for further processing. Cellulose tri acetate (CTA) Commercial membranes were able to concentrate coconut water by 25% volume with 2M NaCl Solution in 12 hours, and lab membranes made from PVDF support layer and active layer of amide, produced nearly identical result of 20% concentration under identical experimental conditions. Commercial membranes were able to concentrate coconut water by nearly 40% with a greater concentration of draw solute (4M NaCl). The fouling resistance as function of draw solute concentration, time, and concentration factor has been investigated. The fouling behaviour of membrane increases with increase in concentration of coconut water as process is interested to keep all original ingredients into the final concentrated product. The shelf life of coconut water has been increased through this non-thermal based concentration process. Thus, FO process can be explored to concentrate coconut water to increase its shelf life.

Keywords: Membrane process, fruit juice processing, membrane fouling, osmotic-driven process.