ABSTRACT

Stevioside is a natural sweetener present in Stevia leaves. The present study was focused for extraction of Stevioside from dried leaves using water extraction followed by clarification and concentration using membrane technology.

For optimizing the extraction process, response surface methodology was used. The independent variables were, leaf to water ratio, heating time and temperature. Optimized results were: temperature of water: 78 °C, time of heating: 56 min and Stevia leaves to water ratio: 1:14 (g:mL).

The crude Stevia extract is dark brown in colour, has foul smell and consists of suspended materials. For primary clarification of the extract, performance of two separate processes, centrifugation and microfiltration were investigated. Clarified Stevia extract was analyzed in terms of colour, clarity, total solid and Stevioside content. Performance of these methods was compared based on the clarified extract quality and the cost of energy.

Ultrafiltration was used for further clarification of pretreated Stevia extract. Performance of four membranes (5, 10, 30 and 100 kDa molecular weight cutoff) was investigated. 30 kDa membrane was found to be most suitable. Analysis was carried out to identify the prevailing mechanism of membrane fouling using a batch unstirred filtration cell. It was observed that the filtration was cake controlling in all the membranes. A systematic study of stirred ultrafiltation experiments under steady state (using 30 kDa membrane) were conducted to analyze the effects of the operating conditions, transmembrane pressure drop and stirrer speed on filtration performance. 45% average recovery of Stevioside was obtained during experiments at lower operating pressure.

Total recycle and batch concentration mode were used during cross flow ultrafiltration. Effects of cross flow rate on the permeate properties were marginal but that of the transmembrane pressure drop was significant. For total recycle mode, recovery of Stevioside in the permeate was in the range of 30% to 56%. In batch concentration mode, it decreased to 38% after 10 hours of operation. Nanofiltration was employed under stirred conditions to concentrate the ultrafiltered liquor. During nanofiltration, the ultrafiltered feed was concentrated maximum twice at 1241 kPa and 1500 rpm within one hour and 93 to 98% Stevioside was retained.

Keywords: Stevioside, Ultrafiltration, Clarification, Extraction, Permeate flux, Response surface methodology, Centrifugation, Nanofiltration.