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Improvement of Fish Sauce Flavor by Using Ultrafiltration Method

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Fish sauce is a condiment made from fermented fish. Some people, however, dislike fish sauce due to its some strong unpleasant flavors. In this study, a membrane separation technique for improving the flavor of fish sauce was developed.

Some polymers solutions including sodium carboxymethyl cellulose, sodium alginate, dextran, chitosan, gelatin, polyethilene glycol were mixed with trimethylamine or butyric and iso-valeric acids and then were ultrafiltrated and subsequently both the permeate and feed were assayed. At the next stage, ultrafiltration experiments of the polymer solutions with total recirculation mode were carried out, and the model of ultrafiltration of polymers solution was developed. A simple optimization technique was set up in order to find the optimum energy for filtration. Simulation of the batch-wise ultrafiltration the polymer in fish sauce solution was carried out and sensory evaluation was applied to compare the original fish sauce and the treated ones.

It was found that sodium carboxymethyl cellulose (CMC) and sodium alginate (SAG) could bind with trimethylamine while chitosan could bind with lower fatty acids. Gelatin could slightly bind with the lower fatty acids. The model based on resistance-in-series model can explain the permeate data obtained. Feed flow velocity ranging from 0.073 to 0.298 m/s has significant effect to the resistance only at higher trans-membrane pressures while temperature ranging from 25 to 45℃ has the effect at both higher and lower trans-membrane pressure. However, the temperature effect was lower than that of feed flow velocity. In the range of targeted permeate flux of 0.00003 to 0.00007 m^3/m^2-s, optimum inlet pressure for all solutions are occurred at similar values but the corresponding feed flow velocity of chitosan in 0.01 N HCl solution, and therefore its pressure energy, is significantly higher than those of CMC and SAG solution. At the curve J_v vs ΔP, the required optimum energy points do not necessarily to occur at the region where the curve deviates from linear.

The permeate flux of polymers in fish sauce is severely lower than those in aquaeous solutions, i.e. less than a quarter for all polymers. Furthermore, the CMC in fish sauce solution has permeate flux much lower than that of SAG at the same trans-membrane pressure whereas their optimum values are approximately same in the aquaeous solution. The model for batch-wise simulation was agreed with data only for SAG.

Sensory evaluation showed that ultrafiltration of CMC, SAG, chitosan and mixture of SAG and chitosan in fish sauce solution can significantly change the odor and taste of the fish sauce at 95% confidence interval. CMC, SAG and mixture of SAG and chitosan improved significantly the odor of fish sauce, while chitosan and mixture of SAG and chitosan improved significantly the taste of fish sauce.