

Washing crude epoxidized oil is an indispensable step for the removal of residual acetic acid and unreacted hydrogen peroxide after epoxidation. There are many studies on the epoxidation of vegetable oils but there are many discrepancies in the washing process which likely leads to water wastage, excess use of neutralizing agent, and additional processing time. Hence, this study aims to optimize the washing step by analyzing the quality of each washing step and developing a model that can predict the amount of acid removed. Soybean oil (1.5 kg) was epoxidized at 60°C for 5.5 h using Amberlite IR 120H as a heterogeneous catalyst. To determine the optimum water washing level, process parameters such as number of washing cycles (1–5), proportion of epoxidized oil to water volume (1:0.5, 1:1, 1:2, 1:3, 1:4, 1:5), and water temperature (20, 40, and 60°C) were examined. The main responses were the residual acid value and pH of the washed epoxidized oil. Results revealed that 64% of the acid was removed after 5 washing cycles irrespective of the washing water temperature and proportion. In contrast, approximately 57% of the acid was removed in the first two washing cycles. Increasing the temperature of the water affected acid removal; with approximately 54% of acid removed at 20°C compared to 60% at 60°C. Doubling or tripling the amount of water needed above a 1:0.5 ratio did not significantly affect the amount of acid removed. The model developed was significant with a predicted R² of 96% and a root mean square error (RMSE) of 1.1 when the model was validated at different washing scenarios. Therefore, this study shows that it is possible to significantly reduce the amount of water used and processing time while maintaining resin qualities.