

Mitigation of 3-MCPD esters and glycidyl esters during the physical refining process of palm oil by micro and macro laboratory scale refining

ABSTRACT

The reduction of the 3-monochloropropane-1,2-diol esters (3-MCPDE) and glycidyl esters (GE) was successfully achieved by the optimization of four processing parameters: phosphoric acid dosage, degumming temperature, bleaching earth dosage, and deodorization temperature by response surface methodology without the need for additional processing steps. The optimized processing conditions were 0.31% phosphoric acid dosage, 50 °C degumming temperature, 3% bleaching earth dosage, and 240 °C deodorization temperature. The optimization resulted in more than 80% and 65% reduction of 3-MCPDE and GE levels, respectively with color and FFA contents maintained in the acceptable range specified by Palm Oil Refiners Association of Malaysia. The optimized refining condition was transferred to macro scale refining units of 1 kg and 3 kg capacities to investigate its successful application during scale-up process.

Keyword: 3-MCPD esters; Glycidyl esters; Mitigation; Physical refining; Response surface methodology