

## Optimization of palm oil physical refining process for reduction of 3-monochloropropane-1,2-diol (3-MCPD) ester formation.

### Abstract

The reduction of 3-monochloropropane-1,2-diol (3-MCPD) ester formation in refined palm oil was achieved by incorporation of additional processing steps in the physical refining process to remove chloroester precursors prior to the deodorization step. The modified refining process was optimized for the least 3-MCPD ester formation and acceptable refined palm oil quality using response surface methodology (RSM) with five processing parameters: water dosage, phosphoric acid dosage, degumming temperature, activated clay dosage, and deodorization temperature. The removal of chloroester precursors was largely accomplished by increasing the water dosage, while the reduction of 3-MCPD esters was a compromise in oxidative stability and color of the refined palm oil because some factors such as acid dosage, degumming temperature, and deodorization temperature showed contradictory effects. The optimization resulted in 87.2% reduction of 3-MCPD esters from 2.9 mg/kg in the conventional refining process to 0.4 mg/kg, with color and oil stability index values of 2.4 R and 14.3 h, respectively.

**Keyword:** 3-MCPD ester reduction; Magnesium silicate; Response surface methodology (RSM); Water degumming.