ABSTRACT

Palm oil used in food products must undergo a refining process, which has the potential to produce 3-monochloro-1,2-propanediol ester (3-MCPDE) contaminants, a carcinogenic substance that poses long-term health risks. Conventional methods such as Gas Chromatography–Mass Spectrometry (GC-MS), although accurate, have drawbacks in complicated sample preparation and expensive operational costs. This study proposes an alternative method using a Polymer Inclusion Membrane (PIM)-based ion-selective electrode containing polyeugenol and D_2EHPA to detect 3-MCPD compounds. This electrode is made through the polymerization of eugenol into polyeugenol, followed by the creation of a PIM membrane that is characterized using FTIR and SEM-EDX spectroscopy. The performance of the optimized electrode shows a 3-MCPD measurement result of 4225 µg/kg or 84.5 ppm in palm oil samples, with an average recovery percentage of 105.5%. These results compare favorably with GC-MS measurements on the same sample, which showed a concentration of 2646.96 µg/kg or 52.9 ppm. Based on these findings, this ion-selective electrode could be a promising alternative for detecting 3-MCPD more efficiently and economically.

Keywords: Palm oil, 3-MCPD, Ion selective electrode, Polyeugenol, D_2EHPA, Sensor