

IDENTIFICATION OF PHTHALATE CONTAMINATION SOURCES AND MITIGATION MEASURES IN VIRGIN COCONUT OIL PROCESSING

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Phthalates are one of the key contaminants that regulatory bodies of many European Union (EU) countries monitor when controlling the food value chain to assure food safety. This research aimed to identify potential sources and preventive measures of phthalate contamination during VCO processing and ensure that the end product complies with EU Standards. The main steps of coconut oil manufacturing were identified and mapped with possible contaminating sources of plastic materials, which were in direct contact with the raw material. The methods involved a systematic 4M (man, machine, material, and method) analysis across the production stages to identify potential contamination sources. Thirty-one phthalate-related compounds were quantified in the final product using liquid chromatography-tandem mass spectrometry before and after implementing corrective actions. Out of the 31 compounds analyzed in the final product, the Diethylhexyl phthalate, Dibutyl phthalate, Diisononyl phthalate, Diethylhexyl adipate, Acetyltributylcitrat, and Diisooctyl phthalate content before implementing the corrective measures were 1.457, 2.083, 0.62, 0.044, and 0.094 mg kg⁻¹, respectively. After implementing the corrective measures, such as replacing plastic components with certified phthalate-free materials and enhancing hygiene protocols, those values were 0.01, 0, 0, 0, and 0 mg kg⁻¹, respectively. All the other analyzed compounds remained undetected before and after implementing corrective actions. Potential sources of phthalate contaminants identified in the raw material and VCO processing line included the use of plastic crates for kernel collecting, plastic knife handles, covering dead ends with stretch film roll, O-rings, nail polish, or any other personal cosmetic applications, and rubber gloves used for kernel cutting and the final product handling. In conclusion, potential phthalate-contaminating materials are utilized in VCO processing. Replacement of such materials and hygiene improvement effectively reduces phthalate contaminations to meet the EU regulatory standards.

Keywords: EU regulatory standards, Food safety, Liquid chromatography-tandem mass spectrometry