Unlocking Safety and Efficacy: Innovations in Nanoemulsion Formulations from Fish By-products and Lemon Oil

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1.

Figure illustrates how the Nanoemulsion of Fish by-product and Lemon Oils (NE-FLO) is prepared at the lab.

INTRODUCTION

This study explores a halal oil-in-water nanoemulsion (NE-FLO) containing lemon and fish by-product oils, designed for enhanced stability and efficacy. Characterized by small particle size (44.40 nm), low polydispersity (PDI 0.077), and slight negative charge (zeta potential -5.02 mV), NE-FLO exhibits potent antioxidant, antibacterial, and anti-inflammatory properties, meeting halal standards. Safety assessments using zebrafish and brine shrimp models suggest low toxicity at lower concentrations, highlighting NE-FLO's potential in halal cosmetics, pharmaceuticals, and food sectors.

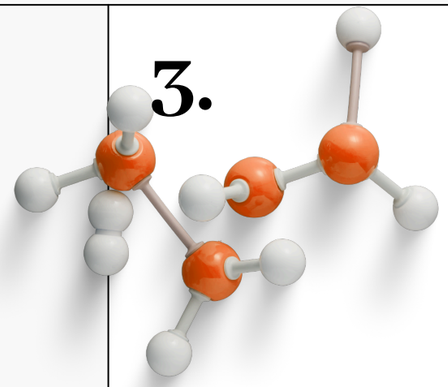
OBJECTIVE

1. Evaluate the stability and efficacy of a halal oil-in-water nanoemulsion (NE-FLO) containing lemon and fish by-product oils.
2. Determine the safety profile of NE-FLO using zebrafish and brine shrimp models, focusing on toxicity at varying concentrations.
3. Explore the potential applications of NE-FLO as a halal-compatible ingredient in cosmetics, pharmaceuticals, and food sectors.

2.

Figure shows the NE-FLO developed at IIUM INHART laboratory.

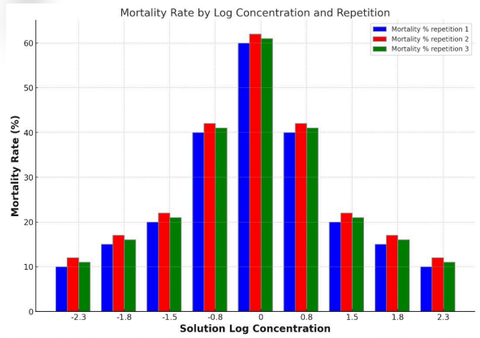
3.



METHODOLOGY

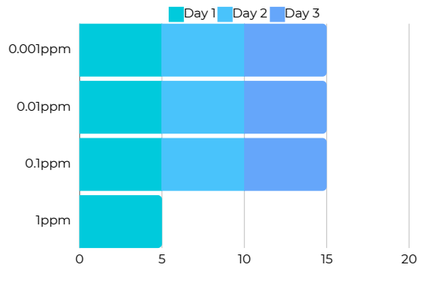
- Nanoemulsion Preparation
- Diluting Fish Oil Nanoemulsion for Toxicity on Brine Shrimp
- Experiment Setup for Artemia Larvae
- Administration of diluted samples to brine shrimp for toxicity testing
- Preparation of Adult Zebrafish
- Exposure of zebrafish to different concentrations of NE-FLO in covered tanks
- Preparation and Administration of NE-FLO

4.



A bar chart showing the relation between the brine shrimp mortality percentage and the log concentration.

5.



A bar chart showing the relation between the adult zebrafish mortality percentage and the log concentration.

RESEARCH / FINDINGS

Preliminary observations of this formulation suggest no toxicity at lower concentrations, while higher concentrations intimate probable concerns, accentuating the necessity for exhaustive safety appraisals. These outcomes emphasize the encouraging potential of NE-FLO as a halal transitional ingredient across varied sectors, clearing the path for further investigation and utilization in halal cosmetics, pharmaceuticals, and food fields.

6.

ANALYSIS

- Biological Activities:
  - Non-toxicity towards regular skin cells, even at elevated concentrations, confirmed its safety profile.
- Toxicity Evaluation:
  - Brine shrimp toxicity testing indicated minimal toxicity at lower concentrations but raised concerns at higher concentrations, warranting further safety assessments.

CONCLUSION

- Efficacy and Safety:
  - NE-FLO exhibits promising stability, efficacy, and safety, making it a viable candidate for various halal sectors.
  - The formulation's ability to deliver bioactive compounds while meeting halal standards highlights its potential for broader applications in cosmetics, pharmaceuticals, and food industries.