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OZONATION OF VEGETABLE OILS AND STUDY ON THEIR PHYSICOCHEMICAL AND BIOLOGICAL CHARACTERISTICS

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[Rosdi, Nur Amira](#) ; [Nor, Yusilawati Ahmad](#) ; [Jimat, Dzun Noraini](#) ; [Azmi, Azlin Suhaida](#) ;
[Jawahar, Bassam Mohamed](#)

Department of Chemical Engineering and Sustainability, Kulliyah of Engineering, International Islamic University Malaysia (IIUM), Jalan Gombak, Kuala Lumpur, 53100, Malaysia

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Abstract

Free ozone offers significant benefits in biological applications due to its efficacy as a disinfectant, but toxicity and instability are associated with it. Hence, producing ozonated vegetable oil (OVO) has been explored as a potential solution, yielding stable ozonation by-products with medical potential, such as antimicrobial activity. Several studies have explored OVO's characteristics and biological effects, including olive oil, sunflower oil, and canola oil. However, optimizing ozonation conditions is still lacking, with many other types of vegetable oils yet to be studied. This research comprises three phases: i) ozonation of selected oils: red palm oil (RPO), rice bran oil (RBO), peanut oil (PO), and virgin coconut

oil (VCO), ii) screening for the most effective OVO against three bacteria (*Staphylococcus aureus*, *Bacillus subtilis*, and *Escherichia coli*), and iii) physicochemical testing. Results show increased peroxide and acidity values in most OVO and a decrease in iodine value compared to untreated oil. Ozonated virgin coconut oil (OVCO) exhibits the highest antibacterial activity by showing a zone of inhibition of 11.3 mm and 84.35% killing rate at 30 minutes incubation time, particularly against *S. aureus*. Further optimization using Design Expert®6.0.8 software identifies the most effective ozonation conditions for OVCO, achieving a peak killing rate of 100% against *S. aureus* with 360 mins of ozone exposure and ozone flow rates of 1 l/min. Kinetic studies confirm rapid bacterial eradication, with over 90% of *S. aureus* killed by OVCO within 2 mins. Moreover, OVCO proved to be non-toxic to human foreskin fibroblast (HFF1) cells, maintaining 80% viability even after exposure to 1 mg/ml OVCO treated with ozone for 120 and 240 mins. These findings underscore the promising medical potential of OVCO, particularly in treating skin diseases. © (2025), (International Islamic University Malaysia-IIUM). All rights reserved.

Author keywords

Antibacterial; Cytotoxicity; Killing rate; Ozonated vegetable oil

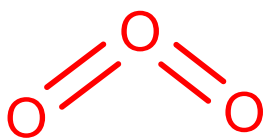
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