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# Weighted Moth-Flame Optimization Algorithm for Edible Oil Quality Detection Using Microwave Technologies

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**Food Analytical Methods** 

Aims and scope Submit manuscript

## R. Ashok 🖂, M. Sundaram, G. Jaffino & J. Prabin Jose

## Abstract

Edible oil acts as an essential part in diet and nutrition, and it is important for a healthy life. Edible oils are susceptible to quality degradation, due to decomposition and microbial decay, which causes nutritional loss and undesirable effects. Consumption of unhealthy edible oil creates hazardous health effects such as dementia, heart-related disorders, cancer, Alzheimer's, and Parkinsons diseases. The food safety concern has increased globally, and there is a need for food quality analyzing system. Chemical methods have been widely used to measure the quality of edible oils but the chemical methods consume more time for evaluating the quality of edible oil, and the oil ingredients are changed, due to chemical reactions. This research work proposes a non-destructive technique, which is based on microwave technologies and deep learning methods to measure the quality of

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edible oil. The waveguide method at 8-12 GHz frequency to measure the microwave parameters such as attenuation constant, dielectric constant, dielectric loss factor, penetration depth, and permittivity of edible oils. The experimental methods use horn antenna, isolator, frequency meter, and microwave detector. The microwave parameters are utilized to train the deep residual network (DRN). The DRN training algorithm is designed by using proposed weighted moth-flame optimization (WMFO) algorithm. The proposed method (i.e., WMFO-DRN) is compared with four well-known techniques, such as cat swarm optimization (CSO) algorithm, particle swarm optimization (PSO) algorithm, genetic algorithm, and gray wolf optimization (GWO) algorithm. The experimental results validate that proposed WMFO algorithm is very aggressive and achieve maximum accuracy of 0.911, sensitivity of 0.916, and specificity of 0.906.



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# Data Availability

None.

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## **Author information**

## **Authors and Affiliations**

Department of Electronics and Communication Engineering, Kamaraj College of Engineering & Technology, Madurai, India R. Ashok

Department of Electronics and Communication Engineering, Erode Sengunthar Engineering College, Erode, India M. Sundaram

School of Electronics Engineering, Vellore Institute of Technology, Vellore, India G. Jaffino

Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India J. Prabin Jose

## Contributions

All authors contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

## **Corresponding author**

Correspondence to <u>R. Ashok</u>. **Ethics declarations** 

## **Ethical Approval**

This paper does not contain any studies with human participants or animals performed by any of the authors.

## **Conflict of Interest**

R. Ashok declares that he has no conflict of interest. M. Sundaram declares that he has no conflict of interest. G. Jaffino declares that she has no conflict of interest. J. Prabin Jose declares that he has no conflict of interest.

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