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The comparison of antimicrobial and antioxidant activity of essential oil of *Oliveria decumbens* and its nanoemulsion preparation to apply in food industry

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Abstract

The aim of this study was to compare the antibacterial and antioxidant effects of essential oil (*Od*-EO) and nanoemulsion (*Od*-NEO) of *Oliveria decumbens* for practical use in food industry. The plant was collected from the North-East of Khuzestan province and essential oil was extracted by Clevenger device. The components of *Od*-EO were identified by GC–MS analysis. The *Od*-NEO was prepared by stirring tween 80, distilled water and *Od*-EO and then using a sonicator with a power of 200 W and a piezoelectric crystal with a probe diameter of 15 mm. The antibacterial effects of *Od*-EO and *Od*-NEO were evaluated on *Escherichia coli O157:H7*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Listeria monocytogenes* by disk diffusion agar and microdilution methods. Antioxidant effect was also evaluated using DPPH and ABTS scavenging methods. Data showed that thymol (53.4%), γ-terpinene (20.48%), p-cymene (18.02%) and myristicin (2.7%) were the most predominant compounds of *Od*-EO. The particle size of *Od*-NEO was 45.71nanometer and the Zeta potential was -36.3 mV. The value of IC_{50} in the DPPH test for BHT, *Od*-EO and *Od*-NEO were 18.57, 1456.95 and 757.29 (µg/ml), respectively. In ABTS method, the IC_{50} rates were 12.32, 565.83 and 507.89 (µg/ml). The MIC of the *Od*-EO and *Od*-NEO ranged between 0.312 to 20 mg/ml. The lowest MIC value was obtained for *S. aureus* and highest value was obtained for *P. aeruginosa*. Data showed that the antioxidant activity of *Od*-NEO was significantly higher than *Od*-EO ($p<0.05$). Also, *Od*-NEO had a greater inhibitory effect on the studied bacteria than *Od*-EO and gram positive bacteria showed more sensitivity. Due to higher antioxidant and antimicrobial properties of *Od*-NEO, need for increased attention to this issue and the *Od*-NEO could potentially be used in the food industry.

Keywords: Antimicrobial, Antioxidant, Essential oil, Nanoemulsion, *Oliveria decumbens*

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