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Comparison of antimicrobial and antioxidant activities of essential oil and Nano-emulsion of *Ferulago angulata* (Chavir) collected from the western regions of Iran

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Abstract

Natural preservatives are widely used in the food industry, today. In this study, the essential oil of Chavir plant (*Ferulago angulate)* was formulated as a water-dispersible nano-emulsion (diameter = 42 nm) using high pressure ultrasonic method. Analysis of essential oil composition showed that monoterpene hydrocarbons and oxygen monoterpenes comprised the main compounds of essential oil. The antimicrobial activity of essential oil and Nano-emulsion oil was evaluated with determination of the minimum inhibitory concentration (MIC) and the minimum biocidal concentration (MBC) as well as the disc diffusion agar methods on four pathogenic bacterial strains and two important fungi that cause foodborne illness. In addition, antioxidant activity was measured using DPPH free radical scavenging method and $ABTS^{+}$ radical cation. The results showed that the antimicrobial activity of the essential oil increases when it is converted to Nano-emulsion due to easier access of Nano-emulsion to the bacterial cell membrane. In general, gram-positive bacteria displayed more susceptibility to the Nano-emulsion than gram-negative bacteria. *Listeria monocytogenes* was the most susceptible bacteria to the antibacterial activity of essential oils and Nano-emulsion. In addition, essential oils and Nano-emulsion had significant effects on inhibiting the growth of *Aspergillus niger* and *Candida albicans*. Although the antioxidant activities of essential oils and Nano-emulsion were significantly lower than the standard group (BHT), the antioxidant activity of Nano-emulsion was higher than in free essential oils using both methods. The results of this study showed that by converting essential oil to the Nano-emulsion of Chavir essential oil, its antimicrobial and antioxidant properties can be increased.

Key words: Antimicrobial activity, Antioxidant, Chavir, *Ferulago angulata*, Nano-emulsion

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