

ABSTRACT

The issues of antimicrobial resistance and the use of synthetic antioxidants have attracted global concern, highlighting the need to develop safe and sustainable natural compounds with strong biological activities. Clove flower essential oil and basil leaf essential oil are known to possess antioxidant and antibacterial properties, while their combination may enhance these activities synergistically. This study aimed to evaluate the antioxidant and antibacterial activities of clove flower essential oil, basil leaf essential oil, and their combinations. Essential oils were obtained through hydrodistillation and characterized for their physical properties, while their chemical compositions were analyzed using GC-MS. Antioxidant activity was determined using the DPPH method, and antibacterial activity was evaluated by the well diffusion method against *E. coli* and *S. aureus*. The results showed that clove flower essential oil contained eugenol (75.22%) as the main component, with a total phenolic content of 952.896 ± 6.825 mg GAE/g and very strong antioxidant activity ($IC_{50} = 7.387$ mg/L). Basil leaf essential oil was dominated by linalool (53.62%), with a total phenolic content of 30.352 ± 0.039 mg GAE/g and weaker antioxidant activity ($IC_{50} = 215.404$ mg/L). All combinations of both essential oils exhibited very strong antioxidant activity and enhanced antibacterial effectiveness compared to single use. Clove flower essential oil showed bactericidal activity against *E. coli* and bacteriostatic activity against *S. aureus*, while basil leaf essential oil demonstrated bacteriostatic activity against both bacteria. These findings indicate that the combination of clove flower and basil leaf essential oils has synergistic potential as a natural antioxidant and antibacterial agent.

Keywords: Essential oils, clove, basil, antioxidant, antibacterial.