

## ANTIBACTERIAL PROPERTIES OF COMMERCIAL LAVENDER ESSENTIAL OIL AGAINST SOME GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA

<sup>1</sup>Tkachenko Halyna, [halyna.tkachenko@apsl.edu.pl](mailto:halyna.tkachenko@apsl.edu.pl)

<sup>2</sup>Opryshko Maryna, [Oprishko.M.V@nas.gov.ua](mailto:Oprishko.M.V@nas.gov.ua)

<sup>2</sup>Gyrenko Oleksandr, [Gyrenko.O.G@nas.gov.ua](mailto:Gyrenko.O.G@nas.gov.ua)

<sup>2</sup>Maryniuk Myroslava, [Mariniuk.M.M@nas.gov.ua](mailto:Mariniuk.M.M@nas.gov.ua)

<sup>2</sup>Buyun Lyudmyla, [Buyun.L.I@nas.gov.ua](mailto:Buyun.L.I@nas.gov.ua)

<sup>1</sup>Kurhaluk Natalia, [natalia.kurhaluk@apsl.edu.pl](mailto:natalia.kurhaluk@apsl.edu.pl)

<sup>3</sup>Kryvenko Anna, [kryvenko35@ukr.net](mailto:kryvenko35@ukr.net)

<sup>1</sup>Institute of Biology and Earth Sciences, Pomeranian University in Slupsk,  
Poland

<sup>2</sup>M.M. Gryshko National Botanic Garden, National Academy of Science of  
Ukraine, Kyiv, Ukraine

<sup>3</sup> Odessa State Agrarian University, Odessa, Ukraine

Lavender essential oil (EO) has been used both cosmetically and therapeutically for centuries (Cavanagh and Wilkinson, 2002). The lavender essential oil has been used as an anxiolytic drug, a mood stabilizer, a sedative, spasmolytic, antihypertensive, antimicrobial, and analgesic agent as well as a wound healing accelerator (Sasanejad et al., 2012). Several studies have investigated the antinociceptive, immunomodulatory and anti-inflammatory properties of compounds found in lavender essential oil (Silva et al., 2015). It is traditionally used in herbal medicine to relieve stress and anxiety confirmed by positive results in models of anxiety and depression using some animal and clinical studies (López et al., 2017). The two primary terpenoid constituents of lavender essential oil, linalool and linalyl acetate, may produce an anxiolytic effect in combination with inhibition of voltage-gated calcium channels, reduction of 5HT1A receptor activity, and increased parasympathetic tone (Malcolm and Tallian, 2018). Sasanejad and co-workers (2012) have studied the efficacy of lavender essential oil inhalation for the treatment of migraine in a placebo-controlled clinical trial. That study suggests that inhalation of lavender essential oil may be an effective and safe treatment modality in the acute management of migraine headaches (Sasanejad et al., 2012). Also, the current body of literature suggests a potential therapeutic benefit of lavender essential oil in wound healing. The studies of Samuelson and co-workers (2020) have demonstrated a faster rate of wound healing, increased expression of collagen, and enhanced activity of proteins involved in the tissue remodeling process in wounds treated with lavender essential oil.

Herbs and essential oils (EOs) have been used in medicine and veterinary, agriculture, the food industry, and cosmetology. Many EOs possess various

biological properties, i.e. antibacterial, analgesic, anti-inflammatory properties, antioxidant, fungicide, larvicidal, antitumor activities, etc. Lavender oil is one of the most valuable aromatherapy oils. Its antibacterial and antifungal activities have been revealed in many studies. In the current study, the antibacterial properties of commercial lavender EO against some Gram-positive and Gram-negative bacteria were studied. To this intent, the antimicrobial susceptibility test was used (the Kirby–Bauer disk diffusion test for measuring zone diameters of bacterial growth inhibition). In the current study, Gram-negative strains such as *Escherichia coli* (Migula) Castellani and Chalmers (ATCC® 25922™), *Escherichia coli* (Migula) Castellani and Chalmers (ATCC® 35218™), *Pseudomonas aeruginosa* (Schroeter) Migula (ATCC® 27853™) and Gram-positive strains such as *Staphylococcus aureus* subsp. *aureus* Rosenbach (ATCC® 29213™), methicillin-resistant (MRSA), *mecA* positive *Staphylococcus aureus* (NCTC® 12493), *Enterococcus faecalis* (Andrewes and Horder) Schleifer and Kilpper-Balz (ATCC® 51299™) (resistant to vancomycin; sensitive to teicoplanin) and *Enterococcus faecalis* (Andrewes and Horder) Schleifer and Kilpper-Balz (ATCC® 29212™) were used.

Results of the current study revealed that resistant to the lavender EO were Gram-negative bacterial strains, such as *E. coli* (Migula) Castellani and Chalmers (ATCC® 25922™), *E. coli* (Migula) Castellani and Chalmers (ATCC® 35218™), *P. aeruginosa* (Schroeter) Migula (ATCC® 27853™) strains. The diameters of inhibition zones after the application of lavender EO were similar to control samples (96% ethanol). On the other hand, Gram-positive strains such as *S. aureus* subsp. *aureus* Rosenbach (ATCC® 29213™), methicillin-resistant *S. aureus* (NCTC® 12493), *E. faecalis* (Andrewes and Horder) Schleifer and Kilpper-Balz (ATCC® 51299™) and *E. faecalis* (Andrewes and Horder) Schleifer and Kilpper-Balz (ATCC® 29212™) were sensitive to lavender EO. The highest diameters of inhibition zones after the application of lavender EO were observed for *E. faecalis* strains. The highest diameters of inhibition zones after the application of lavender EO were observed for *E. faecalis* strains. This study demonstrates the potential of commercial lavender essential oil as an antibacterial agent and for use in the treatment of MRSA infection. The data contributes to the ongoing scientific investigation regarding the application of essential oils as natural antibacterial agents.

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