UNIVERSITY OF LIFE SCIENCES
"KING MIHAI I" FROM Timisoara
Multidisciplinary Conference on Sustainable Development
30-31 May 2024

THE ANTIMICROBIAL ACTIVITY OF *CITRUS AURANTIUM* AMARA

Miroslava Kačániová, Andrea Verešová, Natália Čmiková
Institute of Horticulture, Faculty of Horticulture and Landscape Engineering, Slovak University of Agriculture, Tr. A. Hlinku 2, 94976 Nitra, Slovakia

Abstract: *A number of studies have been carried out on the bioactivity of substances extracted from C. aurantium. The main objective of this paper is to assess the antibacterial efficacy of C. aurantium essential oil against five plant bacterial pathogens both in vitro and in situ. C. aurantium essential oil (EO) has the potential to be used in various food applications due to its natural antibacterial properties. Using the disc diffusion method, we found the best antimicrobial potential against Pectobacterium carotovorum. Using vapor phase antimicrobial activity on carrot model, the best microbial activity was found against Xanthomonas arboricola bacteria.*

• Introduction

Vegetables and fruits provide ecological niches for a dynamic and diversified microbiota. To keep fresh produce fresher for longer, it is essential to control the growth of microbial populations. Foods are shielded by natural products from bacteria and pathogens that cause food spoilage, rancidity, discoloration, and auto-oxidation-related degradation. Plant oils and extracts contain many components with potent antibacterial activity against infections resistant to multiple drugs as well as biofilms. The purpose of this study was to evaluate the antibacterial activity of *Citrus aurantium* Amara against selected plant pathogens using the disc diffusion method, minimal inhibition concentration *in vitro*, and vapor phase on a carrot model.

• Material and method

The fresh pericarp of bitter oranges, *Citrus aurantium* Amara (CAEO), that were purchased from Hanus s. r. o. in Nitra. Among the Gram-positive bacteria (G+) group's strains were *Bacillus subtilis* CCM 2217 and *Priestia* (*Bacillus*) *megaterium* CCM 2007. *Xanthomonas arboricola* CCM 1441, *Pectobacterium carotovorum* CCM 1008, and *Pseudomonas putida* CCM 7156 were among the Gram-negative (G-) bacteria. The bacterial strains listed above were used in the disk diffusion susceptibility experiment. A variety of bacterial species, including both G+ and G- bacteria, were tested *in situ* to see how efficient CAEO was as an antibacterial agent. One kind of model vegetable that was utilized as a substrate to promote bacterial growth was carrots.

• Results and discussions

The antibacterial activity of CAEO ranged from 3.33 to 7.67 mm. The strongest antibacterial effect of CAEO was found to target the G- bacteria *P. carotovorum* and the G+ bacteria *B. subtilis. P. carotovorum* and *X. arboricola* were the bacteria most susceptible to the antibiotics gentamycin and chloramphenicol, respectively. It was discovered that *B. subtilis* exhibited the highest levels of suppression at concentrations of 500 µg/L (75.63%) and that CAEO was most effective against *P. megaterium* at concentrations of 62.5 µg/L (55.44 %) after assessing the inhibitory effects on G+ bacterial strains in the carrot model. Notably, the vapor phase of CAEO had the highest efficacy against G- bacteria at a higher dosage (500 µg/L), with reported inhibitory effects of 94.26% against *X. arboricola* in the carrot model.

• Conclusions

This investigation explores the potential use of EOs on fresh vegetables as a substitute for artificial chemicals used to preserve carrot slices. Although *Citrus aurantium* Amara EO appeared to show promising activity as a preservative in carrots in the in vitro study reported in this work, more investigation is required to determine whether using them as natural sanitizing agents in the post-harvest processing of vegetables is technically feasible. Consequently, this plant offers a unique natural source for the extraction of antimicrobial compounds for use in functional foods and pharmaceuticals.

Acknowledgement: This research was funded by the grant APVV-20-0058 "The potential of the essential oils from aromatic plants for medical use and food preservation" and VEGA 1/0059/24 "Chemical properties and biological activity (*in vitro*, *in vivo* and *in situ*) of plant volatile mixtures, their main components and inclusion systems.