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

2024 MULTIDISCIPLINARY CONFERENCE ON SUSTAINABLE DEVELOPMENT

Effects of aqueous chili pepper extracts on various strains of microorganisms

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Abstract: Hot peppers, commonly called chili peppers, are varieties of peppers of the genus *Capsicum* belonging to the family Solanaceae, cultivated for their spiciness. Capsaicin, a substance soluble in alcohol and less soluble in water, is responsible for the hot taste of chili peppers, and its content ranges from zero to millions of heat units on the Scoville scale. The effects of chili pepper extracts are studied and their antimicrobial, antioxidant, anticancer, metabolic stimulant potential is known. In this study, the effect of crude aqueous extracts of 8 varieties of *Capsicum* was investigated on different strains of microorganisms: *Escherichia coli*, *Enterobacter cloacae*, *Staphylococcus aureus*, and *Candida albicans.*

Introduction

Capsicum is a genus of plants in the Solanaceae family, including sweet and hot peppers, originating from Central and South America. Widely cultivated for their edible fruits, *Capsicum* is essential in cuisines worldwide, providing diverse flavours and nutritional benefits. The plants have green leaves, white flowers, and colourful fruits in various shapes and sizes. Capsaicin is an active chemical compound in hot peppers, responsible for the burning sensation. This alkaloid stimulates pain receptors, causing the characteristic heat. Capsaicin has multiple uses, including in creams and patches for pain relief due to its analgesic and anti-inflammatory properties, and in self-defence sprays. In moderate doses, capsaicin offers health benefits such as boosting metabolism and reducing appetite.

FIG.1 Different species of *Capsicum* genus

Materials and methods

Different concentrations of *Capsicum* aqueous extract added to Luria Bertani (LB) culture medium and yeast extract peptone dextrose (YPD), along with 2 µL of each strain: *Escherichia coli*, *Staphylococcus aureus*, *Enterobacter cloacae*, and *Candida albicans*. Optical density (OD) at 600 nm was measured initially (time 0) and after 24 hours of incubation. The change in OD was calculated for each extract concentration by subtracting the initial OD value (time 0) from the OD value after 24 hours of incubation. The graphs represent the change in optical density after 24 hours of incubation minus the initial OD at time 0 on the y-axis and the *Capsicum* extract volume in µL on the x-axis. Each bacterial strain is represented by a separate line. Positive values on the y-axis denote bacterial growth. The pattern of lines/dots at different extract volumes indicates the sensitivity or resistance of each bacterial strain to *Capsicum* aqueous extract.

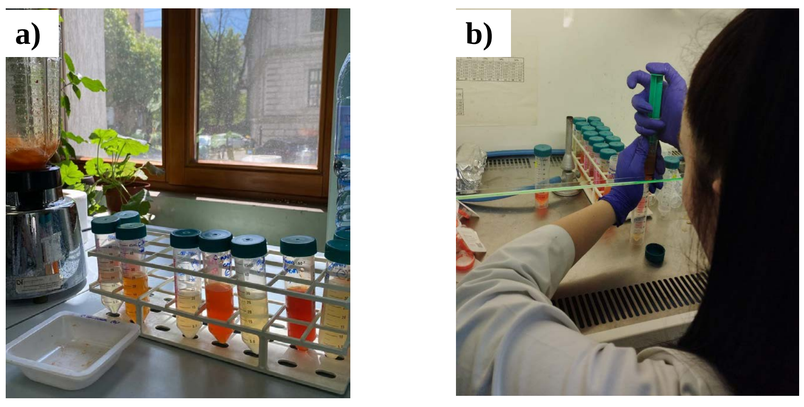

FIG.2 a) Preparation of the aqueous extract of various species of the genus *Capsicum*, ***b)*** Sterilization by filtration of aqueous extract from different species of the genus *Capsicum*

FIG.3 Filtered extracts of various *Capsicum* species

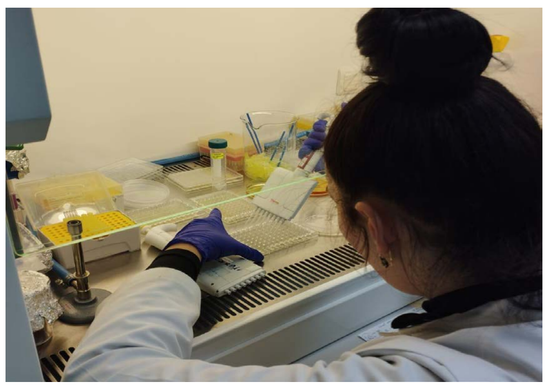

FIG.4 Addition of bacterial strains to microtitre plates

Results and discussions

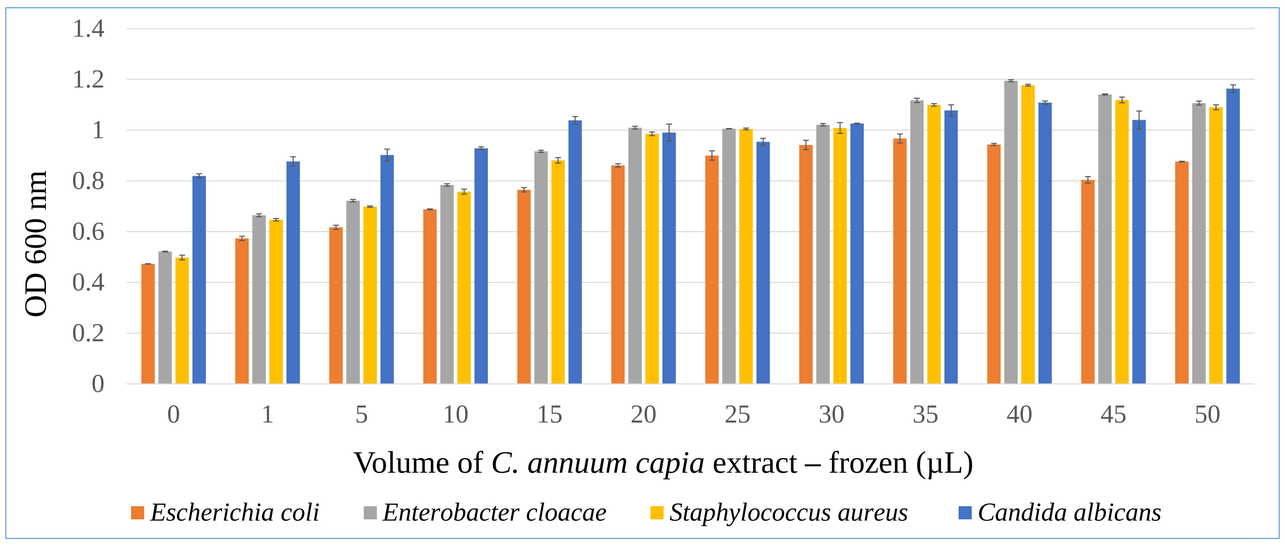

FIG.5 Growth of different strains of microorganisms in the presence of aqueous extract of frozen *C. annuum Capia*

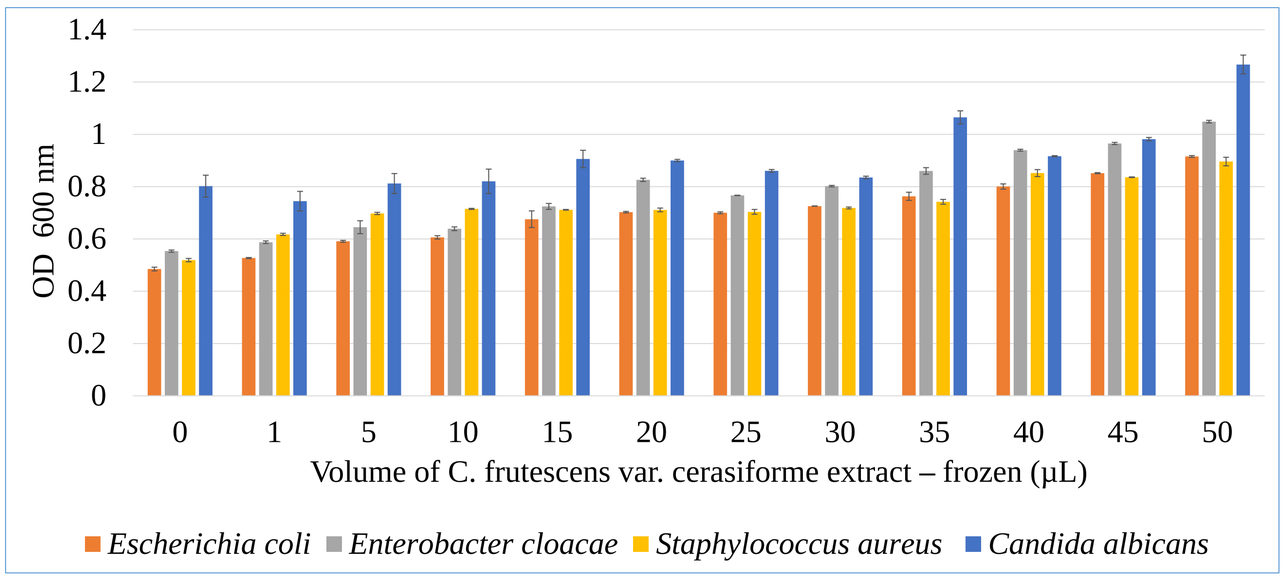

FIG.6 Growth of different strains of microorganisms in the presence of aqueous extract of frozen *C. frutescens* var. *cerasiforme*

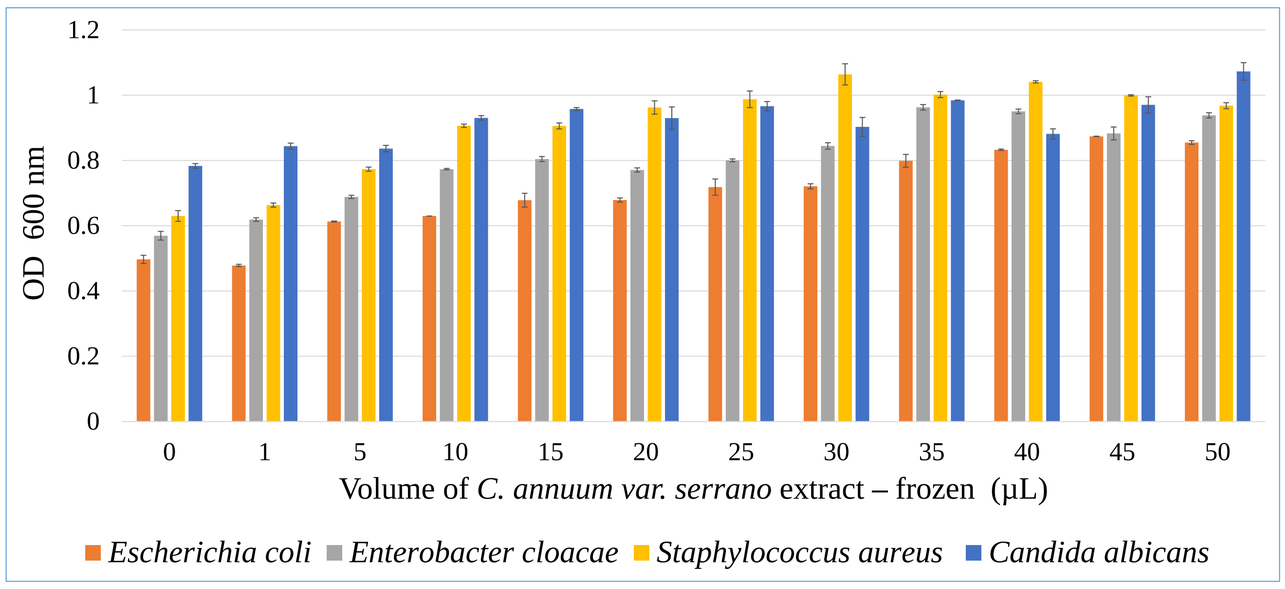

FIG.7 Growth of different strains of microorganisms in the presence of aqueous extract of frozen *C. annuum* var *serrano*

Conclusions

Contrary to expectations, the results showed that the microorganisms grew much better in the media containing *Capsicum* extracts, with the microorganisms reaching optical densities between 0.8-1.0, compared to 0.4-0.6 optical density of the control containing no extracts. *Capsicum annuum* var. *capia* extract had the best effect on the growth of microorganisms for all strains tested, starting with the lowest concentration. *Staphylococcus aureus* and *Candida albicans* grew best on all extracts of *Capsicum* varieties tested, except *Capsicum frutescens var. cerasiforme* extract, which showed an inhibitory effect.

Acknowledgement: This research was funded by the GRANT PNIII-P3-284, ChitoWound—Biotechnological tools implementation for new wound healing applications of byproducts from the crustacean seafood processing industry and by the UVT 1000 Develop Fund of the West University of Timisoara.