The 8th International Electronic Conference on Medicinal Chemistry (ECMC 2022)
01–30 NOVEMBER 2022 | ONLINE

Bioactive potential of *Hibiscus rosa sinensis* and *Jasminum sambac* extracts against food borne pathogens

Chaired by DR. ALFREDO BERZAL-HERRANZ;
Co-Chaired by PROF. DR. MARIA EMÍLIA SOUSA

pharmaceuticals MDPI

Laiba Rasheed[1], Rabia Tanvir[1], Fatima Ahsan[1] and Wasim Shehzad[2]

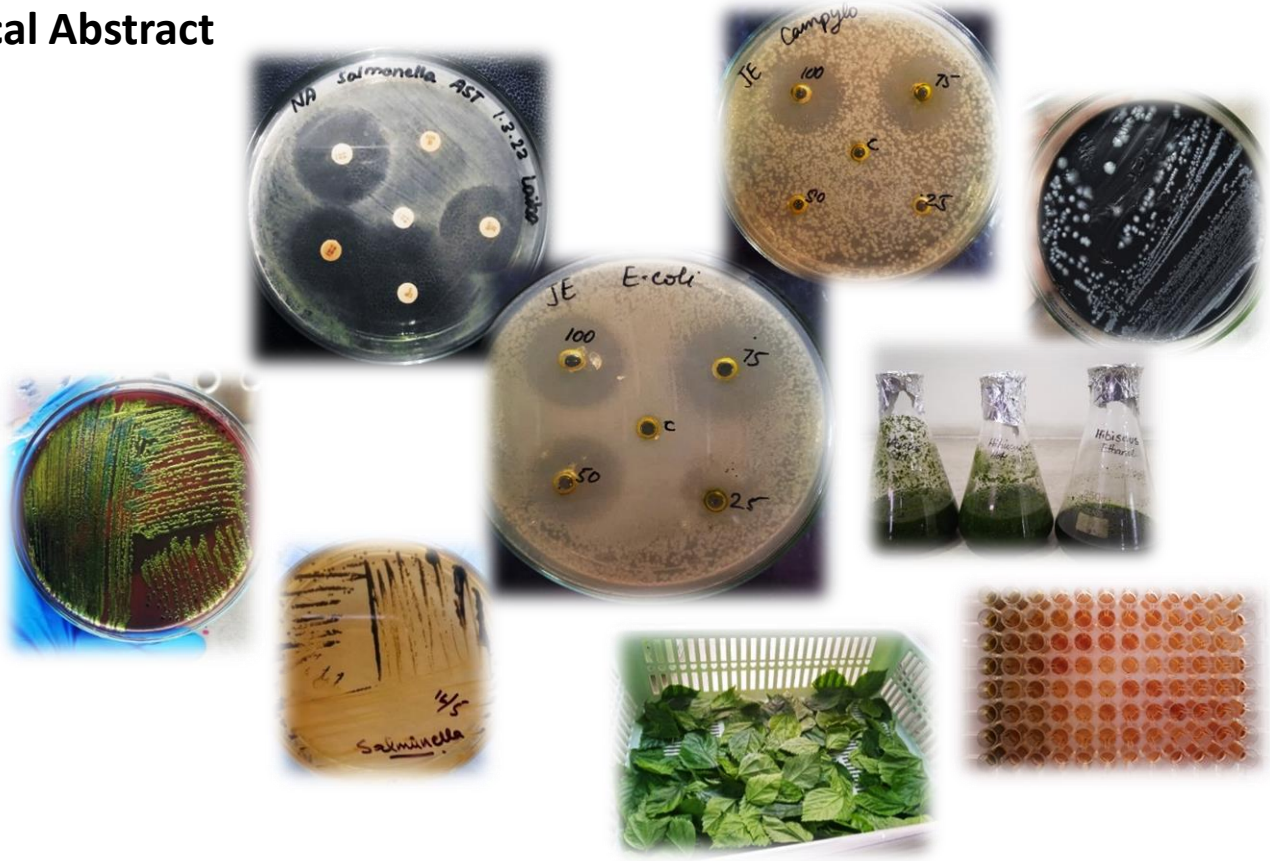
[1]Institute of Microbiology (IOM), University of Veterinary and Animal Sciences (UVAS), Lahore 54000, Punjab, Pakistan
[2]Institute of Biochemistry and Biotechnology (IBBT), University of Veterinary and Animal Sciences (UVAS), Lahore 54000, Pakistan

* Corresponding author: rabia.tanvir@uvas.edu.pk; rabiatanvir@outlook.com

UVAS
UNIVERSITY OF VETERINARY AND ANIMAL SCIENCES LAHORE

Bioactive potential of *Hibiscus rosa sinensis* and *Jasminum sambac* extracts against food borne pathogens

Graphical Abstract



ECMC 2022
The 8th International Electronic Conference on Medicinal Chemistry
01–30 NOVEMBER 2022 | ONLINE

Abstract:

Food borne diseases (FBD) are a serious issue that affect not only human health but also has an impact on the global economy. They remain a persistent problem due to the continuing changes in global food trade trends, dietary patterns, food manufacturing, and the emergence of food borne microbes in the food chain. In Pakistan, where meat is considered as an essential component of our meal but due to high nutrient concentration levels, high water activity, minerals and vitamins, and other growth factors such as pH microbes thrive in it. The extensive use of antibiotics has resulted in antimicrobial resistant (AMR) bacteria in *E. coli*, *Salmonella, Campylobacter* and *Listeria spp*. Traditional medicinal practices especially the use of plant extracts continue to play a crucial role in addressing basic healthcare needs in underdeveloped countries. The purpose of our study was to check the antibacterial potential of *Jasminum sambac* (Jasmine) and *Hibiscus rosa sinensis* (China rose) extracts against food borne pathogens i.e. *E. coli, Salmonella* and *Campylobacter*. The hot and cold extracts were prepared using ethanol and distilled water and the antibacterial activity were observed by agar well diffusion method. The minimum inhibitory concentration (MIC) was also carried out the plant extracts gave MIC values of 6 and 12 µg/ml for *E. coli* and *Salmonella* respectively. The minimum bactericidal concentration (MBC) showed that ethanol extracts of both plants possessed bactericidal activity. Our study indicates that the native plants of Pakistan have significant bioactivity against food borne pathogens.

Keywords: Food borne pathogens; *Hibiscus rosa sinensis*; *Jasminum sambac*

Introduction

- Plants are the traditional source for bioactive compounds
- About 80% of individuals from developed countries use traditional medicines made from such plants [1]
- Medicinal plants are the best source to obtain natural medicines as well as finding new ones [1]

[1] Priya Joy and Dr. D. Patric Raja Anti-Bacterial Activity Studies of *Jasminum grandiflorum* and *Jasminum sambac* Ethnobotanical Leaflets 12: 481-483. 2008.

Introduction (cont.)

Hibiscus rosa sinensis

- It belongs to the Malvacae family

- Common names: China Rose, shoe flower, and Chinese hibiscus

- *H. rosa sinensis* possess activity against pathogens causing GIT problems [2]

Photo courtesy: Ms. Laiba Rasheed

Introduction (cont.)

Jasminum sambac

- It belongs to the Oleaceae family
- *J. sambac* has efficacy for bacterial strains causing food borne illness
- It has been found to be active against various gram-negative and gram-positive bacteria

Photo courtesy: Ms. Laiba Rasheed

Introduction (cont.)

Food borne pathogens

- Food borne diseases are caused by pathogenic bacteria, viruses, and parasites and are of global public health concern

- Each year about 600 million people are affected by food borne diseases worldwide

- The bacterial-induced food borne diseases are usually caused by the infections with *Salmonella, Campylobacter spp., Escherichia coli* [3]

Results and discussion

- **Subculturing of food borne bacteria**

The bacterial cultures of *E. coli, Salmonella spp.* and *Campylobacter spp.* were acquired from the culture bank of the institute of microbiology (IOM), UVAS and they were sub cultured on their selective media i.e., EMB agar, SS agar and CCD agar respectively

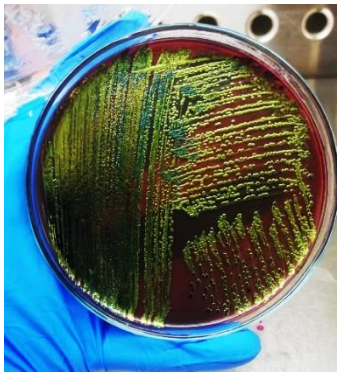


Photo courtesy: Ms. Laiba Rasheed

Results and discussion (Cont.)

- **Antibiotic susceptibility profiling**

The table shows the suceptibility and resistance patterns of food borne pathogens i.e. *E. coli, Salmonella* and *Campylobacter* against commonly prescribed antibiotics (CLSI standard 2020)

Food-borne pathogens	SXT	FOX	AK	TE	CIP	VA
E. coli	S	R	S	S	S	R
Salmonella spp.	S	R	S	S	S	R
Campylobacter spp.	R	R	S	R	S	S

R=Resistance, S=Sensitive, I=Intermediate,SXT=Trimethoprim/Sulfamethoxazole, FOX=Cefoxitin, AK=Amikacin, TE=Tetracycline, CIP=Ciprofloxacin, VA=Vancomycin

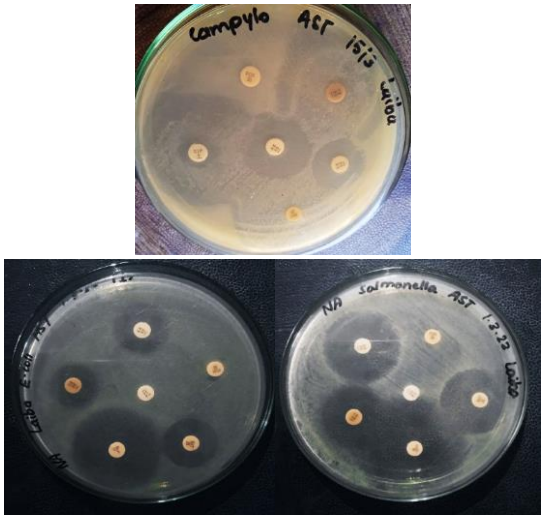


Photo courtesy: Ms. Laiba Rasheed

Results and discussion (Cont.)

Preparation of plant extracts

- Extracts were prepared using leaves of *H. rosa sinensis* and *J. sambac*
- Two different solvents, ethanol and water were used
- Crushed leaves were immersed for 24 hours in ethanol and in distilled water separately
- The same quantity of powdered leaves was added in hot water (at 100°C) with intermittent shaking, then left undisturbed for 24 hours [4]
- The mixture was then filtered with muslin cloth, centrifuged for 10 minutes at 4000 before being filtered with a filter paper for a clear filtrate [5]

[4] Nagarajappa R, Batra M, Sharda AJ, Asawa K, Sanadhya S, Daryani H, Ramesh G. 2013. Antimicrobial effect of *Jasminum grandiflorum* L. and *Hibiscus rosa-sinensis* L. Extracts against pathogenic oral microorganisms-An in vitro comparative study.
[5] Karnwal A. 2021. *In vitro* antibacterial activity of *Hibiscus rosa sinensis*, *Chrysanthemum indicum*, and *Calendula officinalis* flower extracts against gram negative and gram positive food poisoning bacteria. 1-13.

Results and discussion (Cont.)

Preparation of plant extracts

- The filtrates were dried and weighed
- They were re-suspended in their respective solvents and stored at 4°C in glass tubes

Photo courtesy: Ms. Laiba Rasheed

Results and discussion (Cont.)

- **Antibacterial activity of plant extracts against Foodborne pathogens**

Antibacterial activities of plant extracts of plants (*J. sambac* and *H. rosa sinensis*) against *E. coli, Salmonella spp.* and *Campylobacter* spp. were determined by agar well diffusion method

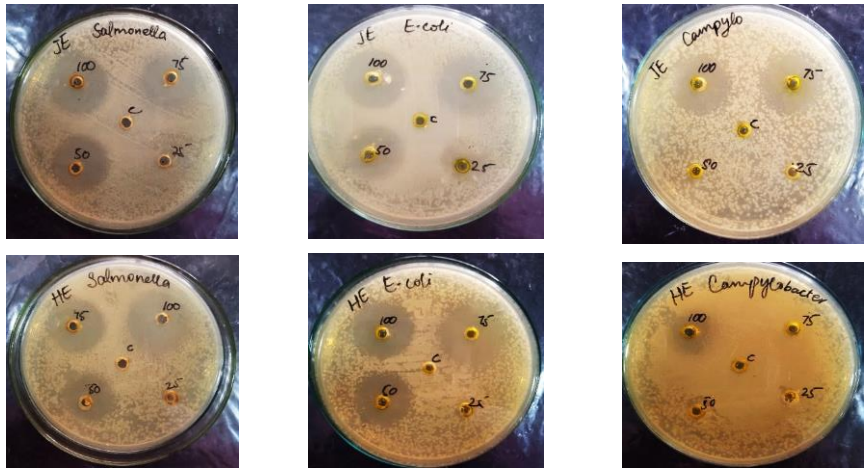


Photo courtesy: Ms. Laiba Rasheed

Results and discussion (Cont.)

- **Antibacterial activity of plant extracts against Food borne pathogens**

Ethanolic extracts of both plants showed good activity against *E. coli, Salmonella spp.* and *Campylobacter spp.*

Plant extract	Zone of inhibition (mm)		
	E. coli	***Salmonella spp.***	***Campylobacter spp.***
Jasminum sambac	28	26	18
Hibiscus rosa sinensis	27	26	17

Results and discussion (Cont.)

- **Combined antibacterial activity of plant extracts against Food borne pathogens**

The extracts were combined to determine the antibacterial activity against the food borne pathogens

Plant extract	Zone of Inhibition (mm)		
	E. coli	*Salmonella spp.*	*Campylobacter spp.*
JE + HE	27	25	19
JH + HH	29	27	-

JE: *J. sambac* ethanolic extract, HE: *H. rosa sinensis* ethanolic extract, JH: *J. sambac* hot aqueous extract, HH: *H. rosa sinensis* hot aqueous extract

Results and discussion (Cont.)

- **Minimum inhibitory concentration (MIC) of plant extracts**

The MIC of plant extracts was determined by broth microdilution method

Plant	Extract	MIC values (Mean ± S.D)) µg/ml		
		E. coli	***Salmonella spp.***	***Campylobacter spp.***
Jasminum sambac	Cold aqueous (JC)	8.3 ± 3.60	7.29 ± 4.77	-
	Hot aqueous (JH)	10.4 ± 3.60	8.3 ± 3.60	-
	Ethanol (JE)	6.25 ± 0.00	4.1 ± 1.8	10.4 ± 3.60
Hibiscus rosa sinensis	Cold aqueous (HC)	8.3 ± 3.60	12.5 ± 0	-
	Hot aqueous (HH)	5.2 ± 1.80	8.3 ± 3.60	-
	Ethanol (HE)	6.25 ± 0	6.25 ± 0	16.6 ± 7.21

Results and discussion (Cont.)

- **Minimum Bactericidal Concentration (MBC)**

The MBC values of different extracts showed bacteriostatic as well as bactericidal activity for different bacteria as shown in table below

Plant	Extract	MBC values		
		E. coli	***Salmonella spp.***	***Campylobacter spp.***
Jasminum sambac	Cold aqueous (JC)	Bacteriostatic	Bacteriostatic	No activity
	Hot aqueous (JH)	Bacteriostatic	Bacteriostatic	No activity
	Ethanol (JE)	Bactericidal	Bactericidal	Bacteriostatic
Hibiscus rosa sinensis	Cold aqueous (HC)	Bacteriostatic	Bacteriostatic	No activity
	Hot aqueous (HH)	Bacteriostatic	Bacteriostatic	No activity
	Ethanol (HE)	Bactericidal	Bactericidal	Bacteriostatic

Conclusions

Jasminum sambac (Jasmine) and *Hibiscus rosa sinensis* (China rose)

- Ethanopharmacologically important medicinal plants

Our study

- These plants possess significant activity against food borne pathogens *including E. coli, Salmonella spp.* and *Campylobacter* spp.
- The combined extracts of the plants showed enhanced antibacterial activity

Future exploration

- Testing their antimicrobial activities against other pathogens of human and veterinary importance
- Determining the structure of the active compounds

Acknowledgments

Our sincere thanks to Prof. Dr. Tahir Yaqub, Director IOM, UVAS Lahore, for his support by making available the facilities in the institute