

I dedicate this work to my beloved  
Mother Mrs. Joyshree Das and  
Father Mr. Suman Das.

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## DECLARATION BY THE CANDIDATE

I hereby declare that the thesis entitled “**Microbial Infections in Reproductive Organs of Women and the Potential Role of *Lactobacillus***” submitted to Department of Molecular Biology and Biotechnology, School of Sciences, Tezpur University in partial fulfilment for the award of the degree of **Doctor of Philosophy** in Department of Molecular Biology and Biotechnology, is a record of original research work carried out by me under the supervision of Prof. B.K. Konwar. All help received from various sources have been duly acknowledged. Further, I declare that no part of this thesis has been submitted elsewhere for award of any other degree.



**Date:** 03-06-2024

**Place:** Napaam, Tezpur

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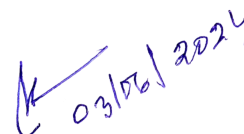
### **CERTIFICATE OF THE SUPERVISOR**

This is to certify that the thesis entitled “**Microbial Infections in Reproductive Organs of Women and the Potential Role of *Lactobacillus***” submitted to the School of Sciences, Tezpur University in partial fulfilment for the award of the degree of **Doctor of Philosophy** in Department of Molecular Biology and Biotechnology, is a record of original research work carried out by Ms. Shreaya Das under my personal supervision and guidance. She has fulfilled the requirements of the rules and regulations related to the nature and prescribed period of research at Tezpur University. The thesis embodies accounts for her own findings and no part of this thesis has been submitted previously anywhere for the award of any degree whatsoever either by him or by anyone else.

All help received by her from various sources have been duly acknowledged.

**Date: 03-06-2024**

**Place: Napaam, Tezpur**



**(B. K. Konwar)**

Signature of Supervisor

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## List of Abbreviations

FRT:	Female Reproductive Tract
LAB:	Lactic Acid Bacteria
BV:	Bacterial Vaginitis
VVC:	Vulva-Vaginal Candidiasis
AV:	Aerobic Vaginitis
LC/C:	<i>L. crispatus</i>
LG/G:	<i>L. gasseri</i>
LV/V:	<i>L. vaginalis</i>
UTI:	Urinary Tract Infection
CFS:	Culture Free Supernatant
MIC:	Minimum Inhibition Concentration
MIV:	Minimum Inhibition Volume
VC:	Vaginal Canal
FSH:	Follicle Stimulating Hormone
LH:	Luteinizing Hormone
PCOD/PCOS:	Polycystic Ovarian Disease/Syndrome
PTL:	Pre-term Labour
PROM:	Premature Rupture of Membrane
UTB:	Uterine Tuberculosis
STD/STI:	Sexually Transmitted Disease/Infection
WHO:	World Health Organization
HPV:	Human Papilloma Virus
HIV:	Human Immunodeficiency Virus
HSV:	Herpes Simplex Virus
TLR:	Toll Like Receptors
NOD-NLR:	Nucleotide Oligomerization Domain Like Receptors
RIG-RLR:	Retinoic Acid-Inducible Gene-I-Like Receptors
CLR:	C-Type Lectin Receptors
PAMP:	Pathogen Associated Molecular Patterns
PRR:	Pattern Recognition Receptors
IL:	Interleukins
CST:	Community State Type

CRH:	Corticotrophin-Releasing Hormone
HRT:	Hormone Replacement Therapy
PTB:	Pre-term Birth
GBS:	<i>Group B Streptococcus</i>
EIA:	Enzyme Immunoassays
PID:	Pelvic Inflammatory Disease
TV:	<i>Trichomonas vaginalis</i>
PCR:	Polymerase Chain Reaction
DNA:	Deoxy Ribo Nucleic Acid
RNA:	Ribo Nucleic Acid
AIDS:	Auto Immune Disease
NAT:	Nucleic Acid Test
IM:	Intra-Muscular
RVVC:	Recurrent Vulva-Vaginal Candidiasis
FDA:	Food And Drug Administration
ART:	Antiretroviral Therapy
GRAS:	Generally Recognized as Safe
TUEC:	Tezpur University Ethical Committee
ICMR:	Indian Council of Medical Research
EDTA:	Ethylenediamine Tetra Acetic Acid
SDS:	Sodium Dodecyl Sulfate
TE:	Tris-EDTA
BLASTn:	Nucleotide Basic Local Alignment Search Tool
MRS:	deMan Rogosa Sharpe
ROS:	Reactive Oxygen Species
NO:	Nitric Oxide
H <sub>2</sub> O <sub>2</sub> :	Hydrogen Peroxide
TNF:	Tumour Necrosis Factor
GI:	Gastro-Intestinal Tract
SCFA's:	Short Chain Fatty Acid
PB:	<i>L. crispatus</i> Cells Bead
CB:	CMC-alginate Bead
FTIR:	Fourier Transmission Infrared Spectroscopy
SEM:	Scanning Electron Microscope
EDX:	Energy Dispersive X-ray

NWF:	Non-Woven Fabric
ZOI:	Zone of Inhibition
ZOC:	Zone of Clearance
PBS:	Phosphate Buffered Saline
OD:	Optical Density
Hrs/h:	Hours
Secs	Seconds
Min:	Minutes
RPM:	Rotation Per Minute
nm:	Nano-Meter
°C:	Centigrade
%:	Percentage
HCl:	Hydrochloric Acid
N:	Normal
nM	Nano-Molar
μM:	Micro-Molar
mM:	Milli-Molar
M:	Molar
μL:	Micro-Litre
mL:	Milli-Litre
L:	Litre
ηg:	Nano-Gram
μg/mcg:	Micro Gram
G:	Gram
AU:	Absorbance Unit
NaOH:	Sodium Hydroxide
YPD:	Yeast Potato Dextrose Broth
RPMI:	Roswell Park Memorial Institute
SC:	Secondary Colonization
TC:	Tertiary Colonization
XTT:	2,3-Bis-(2-Methoxy-4-Nitro-5-Sulfophenyl)-2H-Tetrazolium-5-Carboxanilide
NaCl:	Sodium Chloride
NA:	Nalidixic acid
COT:	Co-Trimoxazole

K:	Kanamycin
NX:	Norfloxacin
FLC:	Fluconazole
IT:	Itraconazole
mm:	Milli-Meter
cm:	Centi Meter
R:	RPMI
RM:	RPMI + MRS broth
RW:	RPMI + Water
G:	RPMI+ LGCFS
C:	RPMI + LCCFS
V:	RPMI + LVCFS
PAR:	Protease-Activated Receptors
AMP:	Anti-Microbial Peptide
MAPK:	Mitogen-activated protein kinase
ATCC:	American Type Culture Collection
GC-MS:	Gas Chromatography Mass Spectrometry
LC-MS:	Liquid Chromatography Mass Spectrometry
LB:	Luria-Bertani
PDB:	Potato Dextrose Broth
bp:	Base Pair
TET:	Tetracycline
E:	Erythromycin
GEN:	Gentamicin
CD:	Clindamycin
AMC:	Augmentin
OF:	Ofloxacin
C:	Chloramphenicol
CFM:	Cefixime
CTX:	Cefotaxime
NIT:	Nitrofurantoin
CXM:	Cefuroxime
CV:	Crystal Violet
IVF:	In-Vitro Fertilization
MIP:	Macrophage Inflammatory Protein

RANTES:	Regulated On Activation, Normal T Expressed and Secreted
LPS:	Lipo-Polysaccharide
EMMPRIN:	Extracellular Matrix Metallo-Proteinase Inducer
MCT:	Monocarboxylate Transporter
MMP-8:	Matrix-Metallo-Protease
SLPI:	Secretory Leukocyte Peptidase Inhibitor
NGAL:	Neutrophil Gelatinase-Associated Lipocalin
NF- $\kappa$ B:	Nuclear factor kappa B
CVF:	Cervical-Vaginal Fluid
EPS:	Exopolysaccharides
MBL:	Mannose Binding Lectin
L-type:	Legume Type
INF:	Interferon
RCT:	Randomised Clinical Trials
Ae:	Adverse Events
SAE:	Serious Adverse Events
DPPH	2,2-diphenylpicrylhydrazyl radicals
Ig	Immunoglobulin
SAP	Secreted Aspartyl Protease
MIP	Macrophage Inflammatory Proteins
RB	Reticulate Body