Candidate's Declaration

I hereby declare that the thesis entitled "**Assessment of Phyto-pharmaceutical compounds present in the food-based medicinal formulation of macerated garlic (*Allium sativum* L) in boiled mustard (*Brassica nigra* L.) oil**" has been submitted to the **Department of Molecular Biology and Biotechnology, Tezpur University**, Tezpur, Assam in partial fulfilment for the award of degree of Doctor of Philosophy in Molecular Biology and Biotechnology is an original work undertaken by me. Further, I declare that no part of the work has been previously considered for the award of any other degree from any University, Institute, or other organization.

Date: 29/4/2025

Joydeep Singha

Place: Tezpur

TEZPUR UNIVERSITY
(A Central University established by an Act of Parliament)
Department of Molecular Biology and Biotechnology
NAPAAM, TEZPUR-784028, ASSAM, INDIA

CERTIFICATE OF THE SUPERVISORS

This is to certify that the thesis entitled "**Assessment of Phyto-pharmaceutical compounds present in the food-based medicinal formulation of macerated garlic (*Allium sativum* L) in boiled mustard (*Brassica nigra* L.) oil**" submitted to the School of Sciences, Tezpur University in part 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 Mr. Joydeep Singha under my supervision and guidance.

All help received by him from various sources has been duly acknowledged. No part of the thesis has been reproduced elsewhere for the award of any other degree.

29/4/2025
DR. JYOTI PRASAD SAIKIA

Signature of Supervisor

Designation: Assistant Professor

School: Sciences

Department: Molecular Biology and Biotechnology

29/04/2025
PROF. BOLIN KUMAR KONWAR

Signature of Co-Supervisor

Designation: Professor

Affiliation: Department of Molecular Biology and Biotechnology, Tezpur University, Tezpur.

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Designation: Assistant Professor

School: Sciences

Department: Molecular Biology

and Biotechnology

Signature of Co-Supervisor

Designation: Professor

Affiliation: Department of Molecular Biology and Biotechnology, Tezpur University, Tezpur.

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Date: (Joydeep Singha)

Place: Tezpur

LISTS OF FIGURES

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List of abbreviation

GMM	Garlic mustard oil macerate
GMM80	Garlic mustard oil macerate heated at 80^{o}C
GMM160	Garlic mustard oil macerate heated at 160^{o}C
AITC	allyl isothiocyanate
BITC	1-Butene, 4-isothiocyanato-
VD	2-vinyl-4H-1,3-dithiin
AJ	ajoene
DAS	Diallyl sulfide
DADS	Diallyl disulfide
DATS	Diallyl trisulfide
MO	Mustard oil
RSM	Response surface methodology
h	Hours
^{o}C	Degree Celsius
VOC	Volatile organic compounds
SX	Staphyloxanthin
UV	Ultraviolet
FTIR	Fourier Transformed Infra-Red
SEM	Scanning electron microscopy
SA	*Staphylococcus aureus*
CA	*Candida albicans*
LPS	Lipopolysaccharide
IL-1β	Interleukin-1β
IL-8	Interleukin-8
Cox2	Cyclooxygenase-2
TNF-α	Tumor necrosis factor- α
IL-6	Interleukin-6
NO	Nitric oxide
PGE_2	Prostaglandin E_2
DAS	Diallyl sulfide
USDA	United States Department of Agriculture
TLC	Thin layer chromatography
HPLC	high-performance liquid chromatography
LCMS	Liquid chromatography-mass spectrometry
GCMS	Gas chromatography-mass spectrometry
OSCs	Organo-sulfur compounds
NSAIDs	Non-steroidal anti-inflammatory drugs
EPS	Extracellular polymeric substance
TDDS	Transdermal drug delivery system
Z-10-DA	Z-10-devinylajoene
FFA	Free fatty acid value
PV	Peroxide value
AV	Acid value
IV	Iodine value
SV	Saponification value

DPPH	2,2-diphenyl-1-picrylhydrazy
LF	Lipophilic fraction
HF	Hydrophilic fraction
CCD	Central composite design
MIC	Minimum inhibitory concentration
MBC	Minimum bactericidal concentration
MFC	Minimum fungicidal concentration
PMNs	Polymorphonuclear leukocytes
QS	Quorum sensing
RNA	Ribonucleic acid
HSV1	Herpes simplex virus type 1
HSV2	Herpes simplex virus type 2
PV3	Parainfluenza virus type 3
VV	Vaccinia virus
HRV2	Human rhinovirus type 2
HIV	Human immunodeficiency virus
Mpro	Main protease
PLpro	Papain-like protease
SARS CoV-2	Severe acute respiratory syndrome coronavirus 2
mm Hg	Millimetres of mercury
g	Grams
N	Normality
M	Molarity
HCl	Hydrochloric acid
Na_2CO_3	Sodium carbonate
H_2SO_4	Sulfuric acid
AOAC	Association of Official Agricultural Chemists
rpm	Revolution per minutes
CH_3COOH	Acetic acid
$CHCl_3$	Chloroform
$Na_2S_2O_3$	Sodium thiosulfate
NaOH	Sodium hydroxide
KI	Potassium iodide
KBr	Potassium Bromide
PTFE	Polytertrafluroethylene
eV	Electron volts
NIST	National Institute of Standards and Technology
MHA	Mueller Hinton Agar
MHB	Mueller Hinton Broth
SDA	Sabouraud dextrose agar
CFU	Colony forming unit
ANOVA	Analysis of variance
PBS	Phosphate buffer saline
RCSB	Research Collaboratory for Structural Bioinformatics
DMSO	Dimethyl sulfoxide
FBS	Fetal bovine serum
DMEM	Dulbecco’s modified Eagle media
PMA	1-phorbol-12-myristate-13-acetate
RPMI	Roswell Park Memorial Institute

MTT	3- (4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
SDS	Sodium dodecyl sulphate
nm	Nanometres
ADME	Absorption, Distribution, Metabolism and Excretion
HMO	Heated mustard oil
N.D.	Not detected
GMLF	Garlic mustard oil lipophilic fraction
GMHF	Garlic mustard oil hydrophilic fraction
MLF	Mustard oil lipophilic fraction
MHF	Mustard oil hydrophilic fraction
GAEAC	Gallic acid equivalence antioxidant capacity
GTE	Garlic toluene extract
TIC	Total ion current
3D	Three dimensions
ASN	Asparagine
ARG	Arginine
HIS	Histidine
ASP	Aspartame
GLY	Glycine
GLN	Glutamine
TYP	Tryptophane
THR	Threonine
LEU	Leucine
LYS	Lysine
VAL	Valine
CRA	Congo red agar
ZOI	Zone of inhibition
m/z	Mass by charge ratio
nmt	N-myristoyltransferase
BBB	Blood-brain barrier
Oligo dT	Deoxythymidine nucleotide
dNTP	Deoxynucleotide triphosphate
RT	Reverse transcription
DTT	Dithiothreitol
SAC	S-allyl cysteine
MUFA	Monounsaturated fatty acids