Dedicated to my beloved parents,

Mr. Udoi Bhaskar Puzari (Deta)

and

Mrs. Sangeeta Puzari (Maa)

for bestowing me with unconditional love,
blessings, endless support and encouragement

In loving memory of my grandmother (Aita)

Late (Mrs.) Amiya Sharma

DECLARATION BY THE CANDIDATE

I hereby declare that the thesis **"Development of Analytical Methods for Identification of Indian Snake Venoms and Indian Red Scorpion Venom"** being submitted to Department of Molecular Biology and Biotechnology, Tezpur University, Tezpur, Assam in partial fulfillment for the award of the degree of Doctor of Philosophy in Molecular Biology and Biotechnology, has previously not formed the basis for the award of any degree, diploma, associateship, fellowship or any other similar title or recognition. Due to unavailability of proper facilities in Tezpur University, the following experiments/sample analyses were carried out at other institutes:

1. LC-MS/MS analysis of protein samples were performed at National Centre for Cell Science, NCCS, Pune 411007, India.
2. *In vivo* experiments and biophysical characterisation of gold nanoparticles are performed at Institute of Advanced Study in Science and Technology (IASST), Guwahati 781035, India

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CERTIFICATE OF SUPERVISOR

This is to certify that the thesis entitled **"Development of Analytical Methods for Identification of Indian Snake Venoms and Indian Red Scorpion Venom"** submitted to the School of Sciences, Tezpur University in requirement of partial fulfilment for the award of the degree of Doctor of Philosophy in Molecular Biology and Biotechnology is a record of research work carried out by Ms. Upasana Puzari under my supervision and guidance. All help received by her from various sources have been duly acknowledged. No part of this thesis has been submitted elsewhere for award of any other degree.

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ABBREVIATIONS

Abbreviation	Full form
3D	Three-dimensional
3FTx	Three-finger toxin
20WBCT	20-min whole blood clotting test
AB-microELISA	Avidin-biotin micro enzyme-linked immunosorbent assay
AChE	Acetylcholinesterase
ACN	Acetonitrile
APase	Aminopeptidase
AFM	Atomic force microscopic
ANOVA	Analysis of variance
ASPro	Aspartic protease
ATP	Adenosine triphosphatase
ASA	Commercial equine anti-scorpion antivenom
AuNP	Gold nanoparticle
BLASTp	Protein-protein BLAST
BPP	Bradykinin potentiating peptide
BSA	Bovine serum albumin
β-BuTx	β-bungarotoxin
cDNA	Complementary Deoxyribonucleic Acid
ChE	Cholinesterase
CP	Custom peptide
CCSEA	Committee for Control and Supervision of Experiments on Animals
CMYK	Cyan, magenta, yellow and black
CRISP	Cysteine-rich secretory protein
CSL	Commonwealth Serum Laboratories
CTL	C-type lectin
CVF	Cobra venom factor
DMF	dimethyl formamide
DNase	Deoxyribonuclease
DTT	Dithiothreitol

Abbreviation	Full form
EcV	*Echis carinatus* venom
ECL	Enhanced Chemiluminescence
EDC	1-Ethyl-3-(3-dimethylaminopropyl) carbodiimide
EIA	Enzyme immunoassay
EIS	Electrochemical impedance spectroscopy
ELAA	Enzyme-linked aptamer assay
ELISA	Enzyme-linked immunosorbent assay
ExPASy	Expert Protein Analysis System
FELISA	Fluorogenic enzyme-linked immunosorbent assay
Fmoc	9-fluorenylmethoxycarbonyl
FPAb	Purified polyclonal snake venom toxin-specific antibody formulation
FTIR	Fourier-transform infrared spectroscopy
GC	Glutaminyl cyclase
GQDs	Graphene quantum dots
HAP	High-abundance protein
HCL	Hydrochloride
HMG CoA	Hydroxymethylglutaryl-coenzyme A
Hya	Hyaluronidase
HRP	Horse radish peroxidise
HSS-Abs	Hemorrhagic species-specific antibodies
IgG	Immunoglobulin G
ISFET	Ion-sensitive field-effect transistor
K_D	Dissociation constant
KLH	Keyhole Limpet Hemocyanin
KSPI	Kunitz-type proteinase inhibitor
KV	*Bungarus caeruleus* venom
LAAO	L-amino acid oxidase
LC-MS/MS	Liquid chromatography-tandem mass spectrometry
LFA	Lateral flow assay
LMMPT	Low molecular mass peptide toxins
LoD	Limit of detection

Abbreviation	Full form
LoQ	Limit of quantitation
LPP	Lipolysis potentiating peptides
LSPR	Localised surface plasmon resonance
mAb	Monoclonal antibody
MALDI-TOF	Matrix-assisted laser desorption/ionization -Time of flight
MBS	Maleimidobenzoyl-Nhydroxysuccinimide ester
MTV	*Mesobuthus tamulus* venom
MSI	Match Precursor Intensity
MUA	Mercaptoundecanoic acid
NCBI	National Center for Biotechnology Information
NEI	North-East India
NGF	Nerve growth factor
NHS	N-Hydroxysuccinimide
NnV	*Naja naja* venom
NkV	*Naja kaouthia* venom
NP	Natriuretic peptide
NSS-Abs	Neurotoxic species-specific antibodies
OIA	Optical immunoassay
OLP	Ohanin-like protein
PAb	Purified polyclonal antibody
PAbF	Purified polyclonal scorpion venom toxin-specific antibody formulation
PAV	Commercial equine anti-snake antivenom
PBS	Phosphate buffered saline
PCR	Polymerase chain reaction
PDB	Protein Data Bank
PDE	Phosphodiesterase
PIR	Protein Information Resource
PLA_2	Phospholipase A_2
PLB	Phospholipase B
PSVPL	Premium Serum and Vaccine Pvt. Ltd.
PVDF	Polyvinylidne fluoride

Abbreviation	Full form
Qdots	Quantum dots
RGB	Red, green and blue
RGI-MDS	Registrar General of India-Million Death Study
RIA	Radioimmunoassay
RP-HPLC	Reversed-phase high-performance liquid chromatography
RT-PCR	Reverse transcription polymerase chain reaction
RvV	Daboia russelii venom
SDS-PAGE	Sodium dodecyl sulfate-polyacrylamide gel electrophoresis
SELEX	Systematic Evolution of Ligands by EXponential
SPI	Serine protease inhibitor
SPLP	Serine protease-like protein
SPPS	Solid-phase peptide synthesis
SPR	Surface plasmon resonance
SSAbs	Species-specific antibodies
SVDK	Snake venom detection kit
SVMP	Snake venom metalloprotease
SVSP	Snake venom serine protease
SVTLE	Snake venom thrombin-like enzyme
TBS	Tris buffered saline
TBS-T	Tris buffered saline with 0.05% tween-20
TEM	Transmission electron microscope
TEMED	Tetramethylethylenediamine
TMB/H_2O_2	3,3,5,5’-tetramethylbenzidine/hydrogen peroxide
TiO_2	Titanium dioxide
UniProtKB	Universal Protein Resource Knowledgebase
UV-Vis	Ultraviolet-visible
VDET	Venom Detection ELISA Test
VEGF	Vascular endothelial growth factor
Vesp	Vespryn
WHO	World health organization