Criterion-1: Curricular Aspects

Key Indicator – 1.3: Curriculum Enrichment

Metric: 1.3.3

Programme: M.Sc. Plant Molecular Biology

Syllabus	https://www.du.ac.in/uploads/RevisedSyllabi1/Annexure-18.%20Revised_MSc_Physics_course_version-R1.pdf
List of Students and their projects	Annexure-I
Sample Project Reports	Annexure-II

Annexure-I

List of Students and their projects

DEPARTMENT OF PLANT MOLECULAR BIOLOGY
UNIVERSITY OF DELHI SOUTH CAMPUS
NEW DELHI-110021

January 12, 2024

The strength of M.Sc. students in our Department in the last five years is as follows:

M.Sc. Batch	No. of Students
2017-2019	10
2018-2020	8
2019-2021	10
2020-2022	13
2021-2023	14

Professor Sanjay Kapoor
Head of the Department
Professor Sanjay Kapoor
Head
Department of Plant Molecular Biology
University of Delhi South Campus
New Delhi-110021

Project Title	Semester and year	Name of the student
Functional characterization of *SlMBDII* using virus induced gene silencing and analysis of its role in tomato fruit ripening. (AKS)	Sem-IV (2018-2019)	Aakriti Jain
Characterization of drought responsive *OsEATB* transcription factor in rice. (SR)	Sem-IV (2018-2019)	Ankit
Promoter analysis and sequence variability of Begomoviruses infecting Okra. (IDG)	Sem-IV (2018-2019)	Atreyee Sardar
Insights into the role of hydrogen sulfide in regulating heat shock response in Arabidopsis thaliana. (SK-A)	Sem-IV (2018-2019)	Himanshi Choudhary
Functional Characterization of Stress inducible transcription factor gene, *OsHOX6* in rice. (AKT)	Sem-IV (2018-2019)	Himanshi Gautam
Cloning of Arabidopsis LHY and TOC1 genes and characterization of their mutants in response to phytohormones and sugar. (JPK)	Sem-IV (2018-2019)	Monika Sshrivastva
AtHSP101 plays role in seed germination under heavy metal stress in *Arabidopsis thaliana*.(AG)	Sem-IV (2018-2019)	Nidhi Yadav
Identification of targets of rice PP42 and Arabidopsis DSP4 using Yeast two-hybrid and cloning of *OsPP42* into pGADT7 vector. (GKP)	Sem-IV (2018-2019)	Sarvesh Jonwal
Comparative Analysis of different promoters under various abiotic stress (PK)	Sem-IV (2018-2019)	Shivam Chaudhary
Preparation of dual reporter construct expressing fluorescent proteins under DR5 and TCSn promoters for simultaneous visualization of auxin and cytokinins level in BY-2 cell line.(SK)	Sem-IV (2018-2019)	Shruti Saini
Characterization of OsPLC3 in *Arabidopsis thaliana* and rice. (GKP)	Sem-IV (2019-2020)	Aastha
Overexpression of rice stress associated protein gene *OsiSAP15* in *Arabidopsis thaliana* confers tolerance to drought stress (AKT)	Sem-IV (2019-2020)	Anurag Panchal
Study on role of SlMBD 15, a methyl CpG binding domain (MBD) protein in regulation of ripening of tomato fruits (AKS)	Sem-IV (2019-2020)	Frankie Jonathan Laloo
Kinship of APX2 and HSP101 in birthing and working together is important in protection of *Arabidopsis thaliana* seedlings from heat stress (AG)	Sem-IV (2019-2020)	Haneet Papreja
Characterization of *OsEATB* gene (SR)	Sem-IV (2019-2020)	Mahima Verma
Analysis of the promoter controlling the expression of the coat protein gene of *Sri Lankan Cassava Mosaic Virus* (IDG)	Sem-IV (2019-2020)	Monica Biswas
An Insight into the class C of Heat Transcription Factor (HSF) protein family in Plants (SK-A)	Sem-IV (2019-2020)	Ritesh

Insights into the structure and function of the components of plant nuclear machinery (SK)	Sem-IV (2019-2020)	Vartika Singh
A Compendium of the Transcription Factors Associated with Plant Senescence and an Insight into the Genetic Variability in Promoter and Protein Sequence of HSFC1 in Natural Accessions of Arabidopsis thaliana (SK-A)	Sem-IV (2020-2021)	Apurva Singh
"Functional characterization of Rice Phospholipase C (OsPLC3) (GKP)	Sem-IV (2020-2021)	Atul Bahukhandi
Heat Sensing Mechanisms in Lower Organisms (PK)	Sem-IV (2020-2021)	Gopika Unni
Toward elucidating the function of a plant-specific transcription factor, OsTCP17, in rice. (AKT).	Sem-IV (2020-2021)	K Thanduanlung
Comparative in-silico analysis of PIFs in Arabidopsis and Rice and in-silico based functional characterization of TaPIF4 (PK).	Sem-IV (2020-2021)	Karishma Sahu
Identification of miRNA biogenesis genes in Rice and in-silico analyses of their regulation under drought conditions (SR).	Sem-IV (2020-2021)	Nidhi Maurya
Study of interaction between SlMBD8 & SlIAA17 and characterization of their role in tomato fruit ripening by VIGS (AKS)	Sem-IV (2020-2021)	Nitika Gupta
Expression analysis of heat stress regulated genes at diverse developmental stages by in silico tools and role of Hsp101 in metal stress response by wet laboratory experiments in Arabidopsis thaliana (AG).	Sem-IV (2020-2021)	Shitij Gupta
Regulation of Translation in Plants: Its Impact on Developmental Transitions (SK).	Sem-IV (2020-2021)	Sritama Das
A comparative study of differentially expressed mRNAs in Oryza sativa and Nicotiana benthamiana upon viral infection (IDG)	Sem-IV (2020-2021)	Aashmeen Kaur
Determination of the role of epigenetic regulation in mads -box genes during reproductive development in rice (SK)	SemIV (2021-2022)	Abhishek Kumar
RNAi and genome editing techniques for generating plant virus resistance and testing resistance against tomato leaf curl New Delhi virus in Nicotiana benthamiana by a CRISPR (IDG)	SemIV (2021-2022)	Aditi Soni
Developing Strategies to predict calmodulin-binding sites in rice MADS-box family of proteins (SK)	SemIV (2021-2022)	Ankur
Transactivation of the CP promoter of Srilankan Cassava Mosaic virus with AC2 (IDG)	SemIV (2021-2022)	Hardik
Virus induced gene silencing in crops (IDG)	SemIV (2021-2022)	Kirti
Not Submitted	SemIV (2021-2022)	Kirtishree Yadav

Analysis of the expression of Arabidopsis thaliana HSP101 gene in heat and fungal stresses (AG)	SemIV (2021-2022)	Mansi Pant
Studies on the role of HSP101 in heat and fungal stresses in Arabidopsis thaliana".(AG)	SemIV (2021-2022)	Neha Rawat
Study of the effect of VIGS of VIM1 gene on phenotype of tomato plants (AKS)	SemIV (2021-2022)	Nishita
Functional characterization of calcium and potassium transporters under abiotic stress conditions in plants (GKP)	SemIV (2021-2022)	Niyaz Ahmed
Characterization of the function of novel miRNA M00107 which targets the ERF72 mRNA in silico during tomato fruit ripening using virus-induced gene silencing technology. (AKS)	SemIV (2021-2022)	Shweta
In silico expression analysis of Arabidopsis clade b type 2c protein phosphatases and identification of interacting proteins of AtPP2C5 by yeast-two-hybrid method (GKP)	SemIV (2021-2022)	Sonia
Towards functional characterization of Trub and Pus 10 Pseudouridine Synthase family in Arabidopsis thaliana.(SK-A)	SemIV (2021-2022)	Vaishali Gupta
In silico expression analysis of rice calcium signaling associated kinases, *OsCIPK9* & *OsCIPK23* and identification of interacting partners of *OsCIPK23* by yeast-two-hybrid library screening. (GKP)	SemIV (2022-2023)	Ankit Kumar
Role of COP9 signalosome in meiosis and plant reproduction during heat stress (AK)	SemIV (2022-2023)	Ashwani Kumar
Exploring the Impact of Single Amino Acid Substitutions on BIG SIZE and NINJA Protein Interaction in Legumes. (KK)	SemIV (2022-2023)	Bhawana
Vitamin C Supplementation serves as an antidote to the heat stress damages in *Arabidopsis thalian.* (AG)	SemIV (2022-2023)	Deepshikha Sharma
Investigation of active chromatin marks function in meiosis and plant reproduction during heat stress. (AK)	SemIV (2022-2023)	KVSK Arjun Chowdary
Unravelling the Role of PUS9 (Pseudouridine Synthase 9) in Regulation of Development and Abiotic Stress Responses in *Arabidopsis thaliana*. (SK-A)	SemIV (2022-2023)	Milinda Lahiri
Unraveling the Role of Tetraspanins (TET2 and TET3) in Modulating Abiotic Stress Responses in *Arabidopsis thaliana* (SK-A)	SemIV (2022-2023)	Muskaan Johnson
Development of Molecular Markers for Mapping Race-Specific Fusarium Wilt Resistance Loci in Chickpea. (KK)	SemIV (2022-2023)	Nikita Gupta

Study on the roles of ethylene responsive factors (ERFs) of tomato in tolerance against Oxidative stress (AKS)	SemIV (2022-2023)	Pooja Solanki
Establishment of cytokinin and auxin sensors TCSV2 and DR5 in *Arabidopsis* for spatio-temporal analysis of these hormones in planta. (SK)	SemIV (2022-2023)	Rinki
Establishment and characterization of fluorescence-based reporter systems for spatio-temporal analysis of cytokinin accumulation and cell divison in *Arabidopsis*.(SK)	SemIV (2022-2023)	Sheena Shah
Glutathione, the major ROS scavenger, supplementation serves as an antidote against heat stress damages in *Arabidopsis thaliana*. (AG)	SemIV (2022-2023)	Smrity Jha
Comparative in silico investigation of putative interactors of *AtCIPK9* and their interaction analysis in Arabidopsis (GKP)	SemIV (2022-2023)	Sneha Pathak
Study on the roles of ethylene responsive factors (ERFs) of tomato in tolerance against salt stress. (AKS)	SemIV (2022-2023)	Aditya

Annexure-II

Sample Project Reports

Characterization of drought responsive *OsEATB* transcription factor in rice

Thesis Submitted to the University of Delhi

in the Partial fulfilment for the Degree of

Master of Science

in

Plant Molecular Biology and Biotechnology

2019

Professor Paramjit Khurana
Head
Department of Plant Molecular Biology
University of Delhi South Campus
New Delhi-110 021 India

ANKIT

Department of Plant Molecular Biology

University of Delhi South Campus

New Delhi 110021, India

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Promoter Analysis and Sequence Variability of Begomoviruses Infecting Okra**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in the planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Atreyee Sardar

Signature of the Candidate

Atreyee Sardar

Date: May 21, 2019

Indril Dasgupta

Signature of the Supervisor

Prof. Indranil Dasgupta

Paramjit Khurana

Signature of the HOD

Prof. Paramjit Khurana

Benito Juarez Road, New Delhi. 110021, **India**. Tel. 24111208, Fax:24110669, Website: www.dpmb.ac.in

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Functional characterization of stress inducible transcription factor gene, *OsHOX6*, in rice**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi, South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in the planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Himanshi

Date: 21st May, 2019

Signature of the Candidate

(Himanshi Gautam)

Signature of the Supervisor

(Prof. Akhilesh K. Tyagi)

Paramjit Khurana

Signature of the HOD

(Prof. Paramjit Khurana)

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation thesis entitled, **"Cloning of *Arabidopsis LHY* and *TOC1* genes and characterization of their mutants in response to phytohormones and sugar"** during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in the planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures originality of the work as well as presentation.

Date: May 21, 2019

Monika

Monika Shrivastava

(Signature of the Candidate)

Jitendra Khurana

Prof. Jitendra P. Khurana

(Signature of the Supervisor)

Paramjit Khurana

Prof. Paramjit Khurana

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DEPARTMENT OF PLANT MOLECULAR BIOLOGY

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"*At*HSP101 plays role in seed germination under heavy metal stress in Arabidopsis thaliana"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology.The work presented here demonstrates that the candidate has been trained in the planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 21-05-2019

Nidhi

Signature of the Candidate

NIDHI YADAV

Signature of the Supervisor

PROF. ANIL GROVER

Signature of the HOD

PROF. PARAMJIT KHURANA

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Date: 20 May, 2019

Signature of the Candidate

(Sarvesh Jonwal)

Signature of the Supervisor

(Prof. Girdhar K. Pandey)

Signature of the HOD

(Prof. Paramjit Khurana)

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Comparative Analysis of Different Promoters under various Abiotic Stress**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in the planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: May 21, 2019

Signature of the Candidate

SHIVAM CHAUDHARY

Signature of the Supervisor

Prof. Paramjit Khurana

Signature of the HOD

Prof. Paramjit Khurana

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Date: May 21, 2019

Signature of the Candidate

Shruti Saini

Signature of the Supervisor

Prof. Sanjay Kapoor

Signature of the HOD

Prof. Paramjit Khurana

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Monica Biswas

Date: 6th June, 2020

Signature of the Candidate

(Monica Biswas)

Indranil Dasgupta

Signature of the Supervisor

(Prof. Indranil Dasgupta)

Signature of the HOD

(Prof. Anil Grover)

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Date: 06-06-2020

Haneet

Signature of the Candidate

(HANEET PAPREJA)

Signature of the Supervisor

(PROF. ANIL GROVER)

Signature of the HOD

(PROF. ANIL GROVER)

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University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Characterization of *OsPLC3* in *Arabidopsis thaliana* and rice**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 06.06.2020

Signature of the Candidate

(AASTHA)

Signature of the Supervisor

(PROF. GIRDHAR K. PANDEY)

Signature of the HOD

(PROF. ANIL GROVER)

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**An insight into the Class C of Heat Stress Transcription Factor (HSF) protein family in plants**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Ritesh.

Date: June 6, 2020

Signature of the Candidate
(RITESH)

Surekha

Signature of the Supervisor
(Dr. Surekha Katiyar Agarwal)

Signature of the HOD
(Prof. Anil Grover)

University of Delhi South Campus
DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Overexpression of rice stress associated protein gene *OsiSAP15* in *Arabidopsis thaliana* confers tolerance to drought stress**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus by **Anurag Panchal** and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Anurag

Date: 6th June 2020

(Anurag Panchal)

(Prof. Akhilesh K. Tyagi)

(Prof. Anil Grover)

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University of Delhi South Campus

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**A COMPENDIUM OF THE TRANSCRIPTION FACTORS ASSOCIATED WITH PLANT SENESCENCE AND AN INSIGHT INTO THE GENETIC VARIABILITY IN PROMOTER AND PROTEIN SEQUENCE OF HSFC1 IN NATURAL ACCESSIONS OF *ARABIDOPSIS THALIANA***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Apurva Singh

Date: 28-06-21

Signature of the Candidate

(APURVA SINGH)

Surekha

Signature of the Supervisor

(Prof. SUREKHA KATIYAR-AGARWAL)

Indranil Dasgupta

Signature of the HOD

(Prof. INDRANIL DASGUPTA)

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Date: 28/06/2021

Signature of the Candidate

(Atul Bahukhandi)

Signature of the Supervisor

(Prof. Girdhar K. Pandey)

For

Signature of the HOD

(Prof. Anil Grover)

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Date: June 28, 2021

Signature of the Candidate

(**Gopika Unni P J**)

Signature of the Supervisor

(**Prof. Paramjit Khurana**)

Signature of the HOD

for (**Prof. Anil Grover**)

अध्यक्ष, पादप आणविक जीव विज्ञान विभाग
Head, Department of Plant Molecular Biology
दिल्ली विश्वविद्यालय दक्षिणी परिसर
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Date: 28th June 2021

K. Thanduanlung

Signature of the Candidate

(K. THANDUANLUNG)

Signature of the Supervisor

(PROF. AKHILESH K. TYAGI)

Indranil Dasgupta

Signature of the HOD

(PROF. INDRANIL DASGUPTA)

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University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

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Karishma Sahu

Date: 28 JUNE 2021

Signature of the Candidate

(**KARISHMA SAHU**)

Paramjit Khurana

Signature of the Supervisor

(**Prof. Paramjit Khurana**)

Indrid Dasgupta

Signature of the HOD

for (**Prof Anil Grover**)

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University of Delhi South Campus

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Nidhi

Date: 28 June 2021

(Signature of the Candidate)

NIDHI MAURYA

Indrani Dasgupta

Signature of the Supervisor

For (PROF. SAURABH RAGHUVANSHI)

Indrani Dasgupta

Signature of the HOD

(PROF. INDRANIL DASGUPTA)

University of Delhi South Campus

DEPARTMENT OF PLANT MOLECULAR BIOLOGY

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Nitika Gupta

Date: 28.06.2021

Signature of the Candidate
(NITIKA GUPTA)

Arun K Sharma

Signature of the Supervisor
(Prof. Arun Kumar Sharma)

Indrid Dasgupta

for Signature of the HOD
(Prof. Anil Grover)

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DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Expression analysis of heat stress regulated genes at diverse developmental stages by *in silico* tools and role of Hsp101 in metal stress response by wet laboratory experiments in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 28th June 2021

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Regulation of Translation in Plants: Its Impact on Developmental Transitions**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**A comparative study of differentially expressed mRNAs in *Oryza sativa* and *Nicotiana benthamiana* upon viral infection**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Determination of the Role of Epigenetic Regulation in MADS -Box Genes during Reproductive Development in Rice**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**RNAi and genome editing techniques for generating plant virus resistance and testing resistance against Tomato Leaf Curl New Delhi Virus in *Nicotiana benthamiana* by a CRISPR construct**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Developing Strategies to Predict Calmodulin Binding Sites in Rice Mads-Box Family of Proteins**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarising research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as the presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"Transactivation of the CP promoter of Sri Lankan Cassava Mosaic Virus with AC2"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as the presentation.

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CERTIFICATE

This is to certify that the research **work embodied in this M.Sc. dissertation entitled, "Virus Induced Gene Silencing in Crops"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M. Sc. dissertation entitled **"Unravelling roles of TET3 and TET13 in abiotic stress response in *Arabidopsis thaliana*"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"Analysis of the expression of *Arabidopsis thaliana* HSP101 gene in heat and fungal stresses"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as the presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Studies on the role of Hsp101 in heat and fungal stresses in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 20th May 2022

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "STUDY OF THE EFFECT OF VIGS OF *VIM1* GENE ON PHENOTYPE OF TOMATO PLANTS" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Functional characterization of calcium and potassium transporters under abiotic stress conditions in plants**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Characterization of the function of novel miRNA M00107 which targets the *ERF72* mRNA *in silico* during tomato fruit ripening using Virus-Induced Gene Silencing technology**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution, and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as the presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, ***"In silico* expression analysis of Arabidopsis clade B type 2C protein phosphatases and identification of interacting proteins of AtPP2C5 by yeast-two-hybrid method"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M. Sc. dissertation entitled "**Towards functional characterization of TruB and Pus10 Pseudouridine Synthase family in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Vaishali Gupta

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Study on the roles of Ethylene Responsive Factors(ERFs) of tomato against salt stress.** " was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"*In silico* expression analysis of rice calcium signaling associated kinases, *OsCIPK9* & *OsCIPK23* and identification of interacting partners of OsCIPK23 by yeast-two-hybrid library screening"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Role of COP9 signalosome in meiosis and plant reproduction during heat stress**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**RNAi and genome editing techniques for generating plant virus resistance and testing resistance against Tomato Leaf Curl New Delhi Virus in *Nicotiana benthamiana* by a CRISPR construct**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 20-05-22

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(Aditi Soni)

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Exploring the Impact of Single Amino Acid Substitutions on BIG SIZE and NINJA Protein Interaction in Legumes**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 24.5.23

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Vitamin C supplementation serves as an antidote to the heat stress damages in Arabidopsis thaliana**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Deepshikha Sharma

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"INVESTIGATION OF ACTIVE CHROMATIN MARKS FUNCTION IN MEIOSIS AND PLANT REPRODUCTION DURING HEAT STRESS"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M. Sc. dissertation entitled, "**Unravelling the Role of PUS9 (Pseudouridine Synthase 9) in Regulation of Development and Abiotic Stress Responses in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution, and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M. Sc. dissertation entitled, "**Unraveling the Role of Tetraspanins (TET2 and TET3) in Modulating Abiotic Stress Responses in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Development of Molecular Markers for Mapping Race-Specific Fusarium Wilt Resistance Loci in Chickpea**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M. Sc. dissertation entitled, **"Study on the roles of Ethylene Responsive Factors (ERFs) of tomato in tolerance against oxidative stress"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"ESTABLISHMENT OF CYTOKININ AND AUXIN SENSORS, TCSv2 AND DR5 IN ARABIDOPSIS FOR SPATIO-TEMPORAL ANALYSIS OF THESE HORMONES IN PLANTA"**was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfilment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Date: 24th May 2023

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**ESTABLISHMENT AND CHARACTERISATION OF FLUORESCENCE-BASED REPORTER SYSTEMS FOR SPATIO-TEMPORAL ANALYSIS OF CYTOKININ ACCUMULATION AND CELL DIVISION IN ARABIDOPSIS**" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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This is to certify that the research work embodied in this M.Sc. dissertation entitled, "**Glutathione, the major ROS scavenger, supplementation serves as an antidote against heat stress damages in *Arabidopsis thaliana***" was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

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DEPARTMENT OF PLANT MOLECULAR BIOLOGY

CERTIFICATE

This is to certify that the research work embodied in this M.Sc. dissertation entitled, **"Comparative *in silico* investigation of putative interactors of *AtCIPK9* and their interaction analysis in Arabidopsis"** was carried out during semester IV in the Department of Plant Molecular Biology, University of Delhi South Campus and is in partial fulfillment for the degree of Master of Science in Plant Molecular Biology and Biotechnology. The work presented here demonstrates that the candidate has been trained in critical reading and summarizing research articles as well as planning, execution and presentation aspects of the experiments included in this dissertation. The candidate ensures the originality of the work as well as presentation.

Sneha Pathak

Date: 24.05.2023

Signature of the candidate

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Signature of the Supervisor

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