


## Certificate

I certify that the thesis entitled “**Optimization of *In vitro* Micropropagation, Characterization of Bioactive Compounds and Biological Activities of *Cynanchum tunicatum* (Retz.) Alston – A Rare Medicinal Plant**” submitted to Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore for the award of the Degree of Doctor of Philosophy (Ph.D.) in Botany, is a record of original work done by Mrs. Deepika K, during the period from June 2019 to December 2024 in Department of Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, under my guidance and supervision and the thesis has not formed on the basis for the award of any Degree, Diploma, Associateships, Fellowship, or similar Thesis to any candidate in this University or any other University or Institution of Higher Learning.

  
21/12/2024  
Signature of the Supervisor

  
21/12/24  
Signature of Head of Department

  
21/12/2024  
Signature of the Dean

## Declaration

I declare that the thesis entitled “**Optimization of *In vitro* Micropropagation, Characterization of Bioactive Compounds and Biological Activities of *Cynanchum tunicatum* (Retz.) Alston – A Rare Medicinal Plant**” submitted by me for the Degree of Doctor of Philosophy (Ph. D) by Mrs. Deepika K in Department of Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore is the record of research work carried out by her during the period from June 2019 to December 2024 under the guidance of **Dr. S. Amutha M.Sc., M.Phil., Ph.D.**, Assistance Professor and this work has not formed on the basis for the award of any Degree, Diploma, Associateships, Fellowship or other Thesis in this University or any other University or Institution of Higher Learning.



Signature of Candidate



Signature of the Supervisor

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## Abbreviations

(NH <sub>4</sub> ) NO <sub>3</sub>	- Ammonium nitrate
2,4-D	- 2,4-dichlorophenoxyacetic acid
2-iP	- 6-( $\gamma,\gamma$ -Dimethylallylamino)purine
AR	- Adventitious roots (AR)
ABTS	- 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)
ANOVA	- Analysis of variance
BAP	- Benzyl adenine
CaCl <sub>2</sub> .2H <sub>2</sub> O	- Calcium chloride
CCE	- Callus Chloroform Extract
CDK <sub>2</sub>	- Cyclin-dependent kinase 2
CEAE	- Callus Ethyl acetate Extract
CHE	- Callus Hexane Extract
CME	- Callus Methanolic Extract
CC	- Compact calli
CoCl <sub>2</sub> .6H <sub>2</sub> O	- Cobalt(II) chloride
CuSO <sub>4</sub> .5H <sub>2</sub> O	- Copper(II) sulphate pentahydrate
DMRT	- Duncan's Multiple Range Test
DMSO	- Dimethyl sulfoxide
DPPH	- 2,2-diphenyl-1-picrylhydrazyl
DPPH	- 1,1-Diphenyl-2-picrylhydrazyl
EB	- Ethidium bromide
FC reagent	- Folin Ciocalteu reagent
FC	- Friable calli

FeSo <sub>4</sub> .7H <sub>2</sub> O	- Ferrous sulphate heptahydrate
FRAP	- Ferric reducing antioxidant power
FRAP	- Ferric Reducing Antioxidant Power
FTIR	- Fourier-transform infrared spectroscopy
GCMS	- Gas Chromatography Mass Spectrometry
H <sub>2</sub> SO <sub>4</sub>	- Sulfuric acid
H <sub>3</sub> BO <sub>3</sub>	- Boric acid
HCl	- Hydrogen Chloride
HCT- 116	- Human colorectal carcinoma cell line
HgCl <sub>2</sub>	- Mercuric chloride
HPTLC	- High-performance thin-layer chromatography
IAA	- Indole -3- acetic acid
IBA	- Indole-3- butyric acid
KH <sub>2</sub> PO <sub>4</sub>	- Potassium dihydrogen phosphate
KI	- Potassium Iodide
KIN	- Kinetin
KNO <sub>3</sub>	- Potassium Nitrate
LAF	- Laminar airflow cabinet
MBC	- Minimum Bactericidal Concentration
MEM	- Minimum Essential Medium
MFC	- Minimum Fungicidal Concentration
MgSo <sub>4</sub> .7H <sub>2</sub> O	- Magnesium sulphate heptahydrate
MIC	- Minimum Inhibitory Concentration
MIC	- Minimum Inhibitory Concentration
MnSo <sub>4</sub> .4H <sub>2</sub> O	- Manganese(II) sulphate tetrahydrate

MS	- Murashige and Skoog
MS medium	- Murashige and Skoog medium
MTCC	- Microbial Type Culture Collection
MTT	- 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tertazolium bromide
Na <sub>2</sub> EDTA	- Ethylenediaminetetraacetic acid disodium salt dihydrate
Na <sub>2</sub> MoO <sub>4</sub> .4H <sub>2</sub> O	- Sodium molybdate tetrahydrate
NaOH	- Sodium hydroxide
NIST	- National Institute of Standards and Technology
NMR	- Nuclear magnetic resonance (NMR) spectroscopy
PBS	- Phosphate Buffered Saline
PCE	- Plant Chloroform Extract
PDA	- Potato Dextrose Agar
PDB	- Protein databank
PEAE	- Plant Ethyl acetate Extract
PGRs	- Plant growth regulators
PHE	- Plant Hexane Extract
PME	- Plant Methanolic Extract
PTC	- Plant Tissue Culture
R <sub>f</sub> values	- Retardation factors
ROS	- Reactive Oxygen Species
SE	- Somatic Embryogenesis
TAA	- Total Antioxidant activity
TLC	- Thin Layer Chromatography
TPVG	- Trypsin-Phosphate buffered saline- Versene- Glucose
ZnSo <sub>4</sub> .7H <sub>2</sub> O	- Zinc sulphate heptahydrate