## 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

21/12/2024

Signature of the Supervisor

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**Deepika K**

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## Abbreviations

| | |
|---|---|
| $(NH_4)\ No_3$ | - Ammonium nitrate |
| 2,4-D | - 2,4-dichlorophenoxyacetic acid |
| 2-iP | - 6-(γ,γ-Dimethylallylamino)purine |
| AR | - Adventitious roots (AR) |
| ABTS | - 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) |
| ANOVA | - Analysis of variance |
| BAP | - Benzyl adenine |
| $CaCl_2.2H_2O$ | - Calcium chloride |
| CCE | - Callus Chloroform Extract |
| $CDK_2$ | - Cyclin-dependent kinase 2 |
| CEAE | - Callus Ethyl acetate Extract |
| CHE | - Callus Hexane Extract |
| CME | - Callus Methanolic Extract |
| CC | - Compact calli |
| $CoCl_2.6H_2O$ | - Cobalt(II) chloride |
| $CuSo_4.5H_2O$ | - 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 Ciocalteau reagent |
| FC | - Friable calli |

| | |
|---|---|
| $FeSo_4.7H_2O$ | - Ferrous sulphate heptahydrate |
| FRAP | - Ferric reducing antioxidant power |
| FRAP | - Ferric Reducing Antioxidant Power |
| FTIR | - Fourier-transform infrared spectroscopy |
| GCMS | - Gas Chromatography Mass Spectrometry |
| $H_2SO_4$ | - Sulfuric acid |
| $H_3Bo_3$ | - Boric acid |
| HCl | - Hydrogen Chloride |
| HCT- 116 | - Human colorectal carcinoma cell line |
| $HgCl_2$ | - Mercuric chloride |
| HPTLC | - High-performance thin-layer chromatography |
| IAA | - Indole -3- acetic acid |
| IBA | - Indole-3- butyric acid |
| $KH_2PO_4$ | - Potassium dihydrogen phosphate |
| KI | - Potassium Iodide |
| KIN | - Kinetin |
| $KNo_3$ | - Potassium Nitrate |
| LAF | - Laminar airflow cabinet |
| MBC | - Minimum Bactericidal Concentration |
| MEM | - Minimum Essential Medium |
| MFC | - Minimum Fungicidal Concentration |
| $MgSo_4.7H_2O$ | - Magnesium sulphate heptahydrate |
| MIC | - Minimum Inhibitory Concentration |
| MIC | - Minimum Inhibitory Concentration |
| $MnSo_4.4H_2O$ | - Manganese(II) sulphate tetrahydrate |

| | |
|---|---|
| MS | - Murashige and Skoog |
| MS medium | - Murashige and Skoog medium |
| MTCC | - Microbial Type Culture Collection |
| MTT | - 3-(4,5-dimethythiazol-2-yl)-2,5-diphenyl tertazolium bromide |
| $Na_2$ EDTA | - Ethylenediaminetetraacetic acid disodium salt dihydrate |
| $Na_2$ $MoO_4.4H_2O$ | - 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 |
| $R_f$ 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 |
| $ZnSo_4.7H_2O$ | - Zinc sulphate heptahydrate |