CONTENTS

LIST OF TABLES vi – ix
LIST OF FIGURES x – xiii
ABBREVIATIONS xiv

I. INTRODUCTION 1 - 16

1. History
2. Classification of Diabetes mellitus
3. Diabetes in India
4. Causes of Diabetes
5. Symptoms of Diabetes
6. Diagnosis of Diabetes
7. Conventional Medical Treatments
8. Complications of Diabetes
   8.1. Acute complications
   8.2. Chronic complications
9. Therapeutic Considerations
   9.1. Diet
   9.2. Nutritional Supplements
   9.3. Exercise
10. 10. Alternative medicines/ Nutraceutical Therapy
    10.1. Herbs commonly used to treat diabetes
11. Objectives
12. Plan of Work

II. LITERATURE REVIEW 17 - 99

1. Diabetes Mellitus
   1.1. Common Symptoms Associated with Diabetes Mellitus
   1.2. Diagnosis of Diabetes
   1.3. Assessment of Control of Diabetes
   1.4. Types of Diabetes Mellitus
   1.5. The “Metabolic Syndrome" or Syndrome X
   1.6. Regulation of Blood Glucose
   1.7. Insulin
   1.8. Therapeutic Considerations for Hyperglycemia
   1.9. Complementary and Alternative Medicine (CAM)
2. Plant Tissue Culture
   2.1. Cytodifferentiation
   2.2. Production of Secondary Metabolites
   3.1. Botanical description
   3.2. Geographical distribution
   3.3. Cultivation of *Gymnema*
   3.4. Traditional uses
   3.5. Clinical Trials
   3.6. Toxicity studies
   3.7. Phytochemistry
   3.8. Dosage and administration
   3.9. *Gymnema*: Active Ingredients of Drugs

4. *Catharanthus roseus* Linn
   4.1. Description
   4.2. Geographic distribution
   4.3. Pharmacological studies

5. *Tabernaemontana divaricata* (L.) R.Br.exRoem. et Schult Botanical
   5.1. Botanical description
   5.2. Traditional uses
   5.3. Pharmacology
   5.4. Tissue Culture Studies

6. *Ocimum Basilicum* var Thai Queen
   6.1. Plant Description
   6.2. Nutritive value
   6.3. History & Folklores
   6.4. Chemical Compounds
   6.5. Medicinal and Ethnobotanical uses
   6.6. Pharmacology
   6.7. Toxicity
   6.8. Tissue Culture

III. MATERIALS AND METHODS 100 - 125

1. Animal Experimentations
   1.1. Experimental animals
   1.2. Induction of experimental Diabetes
   1.3. Determination of Blood Glucose Levels
   1.4. The Glucose Tolerance Test
   1.5. Biological assays

2. Phytochemistry
   2.1. Collection of Plant Material
   2.2. Preparation of Plant Powder for Qualitative Analysis
   2.3. Preliminary Phytochemical Tests
2.4. Thin Layer Chromatography
2.5. Phytochemical analysis of callus
2.6. Phytochemical analysis of Cell Suspension Cultures of *Gymnema sylvestre. R.Br.*

3. Tissue Culture
3.1. *Gymnema sylvestre* R. Br.
3.2. *Catharanthus roseus/Vinca roseus*
3.3. *Ocimum basilicum var. Thai queen*

IV. RESULTS & DISCUSSION

A. Animal Experiments 126 -164

1. *Gymnema sylvestre* R.Br.
   1.1. Effect of crude extract of fresh leaves and dried leaves of *Gymnema sylvestre R.Br.*
   1.2. Dose-dependent hypoglycemic activity of *Gymnema sylvestre R.Br.*
   1.3. Hypoglycemic effect of different extracts of *Gymnema sylvestre R.Br.* in diabetic models
   1.4. Dose-dependent hypoglycemic effect of alcoholic extracts of *Gymnema sylvestre R.Br.* on diabetic animals
   1.5. Hypoglycemic activity of *in vitro* cultures of *Gymnema sylvestre R.Br.* in diabetic rats

2. *Catharanthus roseus* L.
   2.1. Effect of crude extract of fresh leaves of *C. roseus.*
   2.2. Hypoglycemic activity of different fractions of *C. roseus* var. white in diabetic rats.
   2.3. Dose-dependent hypoglycemic effect of chloroform extract of *C. roseus* var. white
   2.4. Hypoglycemic activity of *in vitro* cultures of *C. roseus* var. white
   2.5. Conclusion

3. *Tabernaemontana divaricata*
   3.1. Normal rats
   3.2. Diabetic rats

4. *Ocimum basilicum var. Thai queen*
   4.1. Normal rats
   4.2. Diabetic rats

5. Conclusions

6. Discussions

B. Phytochemical Studies 165 -175

1. *Gymnema sylvestre R.Br.*
2. *Catharanthus roseus*
3. *Tabernaemontana divaricata*

4. *Ocimum basilicum var* (Thai Siam Queen)

5. Discussions

**C. Tissue Culture Studies**

1. *Gymnema sylvestre* R.Br.
   
   1.1. Explant establishment in MS (modified) media fortified with NAA and BA individually and in combination.
   
   1.2. Explant establishment in MS (modified) media fortified with Kinetin and NAA
   
   1.3. Explant establishment in modified MS media fortified with 2,4-D and BA
   
   1.4. Explant establishment in modified MS media fortified with 2,4-D and Kinetin
   
   1.5. Initiation of cultures for somatic embryogenesis from nodal and leaf explants
   
   1.6. Induction of somatic embryogenesis in MS (modified) media fortified with 2,4-D and IAA
   
   1.7. Induction of shoot buds/somatic embryogenesis in modified MS fortified with NAA, IAA and BA
   
   1.8. Culture establishment in modified MS media with Kinetin, NAA and a high concentration of IAA
   
   1.9. Explant establishment in modified MS fortified with NAA, Kinetin and BA in combination
   
   1.10. Culture establishment in media containing MS salts and organic constituents of Gamborg’s (B5) media
   
   1.11. Preliminary studies investigating endogenous contamination in in vitro cultures of *Gymnema sylvestre* R.Br.
   
   1.12. Discussion

2. *Catharanthus roseus*
   
   2.1. Explant establishment in MS media fortified with 2,4-D
   
   2.2. Explant establishment in MS media fortified with BA
   
   2.3. Explant establishment in MS media fortified with 2,4-D and BA
   
   2.4. Explant establishment in media containing NAA and BA
   
   2.5. Explant establishment in MS media fortified with NAA and Kinetin
   
   2.6. Discussion

3. *Ocimum basilicum Var. Thai Queen.*
   
   3.1. Percentage establishment of explants
   
   3.2. Callus induction
   
   3.3. Shoot Induction and multiplication
   
   3.4. Hardening of the rooted plants
   
   3.5. Discussion
**D. Cell Suspension Studies** 255 - 287

1. Chemical factors
   1.1. Effect of different phytohormones different auxins and BA
   1.2. Effect of sucrose concentration
   1.3. Effect of a combination of auxins with BA in the initiation media
   1.4. Effect of modifications in the organic constituents of MS media
   1.5. Effect of increased nitrate content in the initiation media
   1.6. Effect of various additives in the initiation or subculture medium
   1.7. Effect of glutamine
   1.8. Effect of pH

2. Physical factors
   2.1. Effect of temperature
   2.2. Effect of time (age of cultures) on saponin production

3. Discussion

**E. Bioreactor Pilot Study** 288 - 291

1. Pilot study in a Bioreactor
2. Discussion

**V. SUMMARY & CONCLUSION** 292 - 306

**REFERENCES** 307 - 325

**APPENDIX - A** A1 - A11