



Ain Shams University
Faculty of Women
for Arts, Science & Education
Department of Zoology

**THE CURATIVE PROSPECTIVE ROLE OF
"CLEOME DROSERIFOLIA" EXTRACT AND STEM
CELLS AGAINST TOXICITY OF CYHALOTHRIN ON
MALE ALBINO RATS**

A Thesis
Submitted for the Degree of Ph.D. in Zoology

By
NURA IBRAHIM AL-ZAIL IBRAHIM
(B.Sc. & M.Sc.)

Assistant lecturer in Zoology Department, Faculty of Science,
Omar AL-Moukhtar University, El-Beida, Libya

Board of Supervision

Assist. Prof. Magda Sayed Hasanin

Assist. Prof. of Physiology
Zoology Department
Faculty of Women
Ain Shams University

Prof. Dr. Hala Gabr Metwally

Prof. of Pathology
Clinical Pathology Department
Faculty of Medicine
Cairo University

Assist. Prof. Hala Fahmy Abd-Ellah

Assist. Prof. of Histology & Cytology
Zoology Department
Faculty of Women
Ain Shams University

Assist. Prof. Nora El-Hoseany Mohamed

Assist. Prof. of Physiology
Zoology Department
Faculty of Women
Ain Shams University

2016



Ain Shams University
Faculty of Women
for Arts, Science & Education
Department of Zoology

Approval Sheet

Name: Nura Ibrahim Al-Zail Ibrahim

Title: The Curative Prospective Role of "*Cleome Droserifolia*" Extract and Stem Cells against Toxicity of Cyhalothrin on Male Albino Rats.

Scientific Degree: Ph.D. Sc. in Zoology.

Board of Supervision

Assist. Prof. Magda Sayed Hasanin

Assist. Prof. of Physiology
Zoology Department
Faculty of Women
Ain Shams University

Prof. Dr. Hala Gabr Metwally

Prof. of Pathology
Clinical Pathology Department
Faculty of Medicine
Cairo University

Assist. Prof.

Hala Fahmy Abd-Ellah

Assist. Prof. of Histology & Cytology
Zoology Department
Faculty of Women
Ain Shams University

Assist. Prof.

Nora El-Hoseany Mohamed

Assist. Prof. of Physiology
Zoology Department
Faculty of Women
Ain Shams University



Ain Shams University
Faculty of Women
for Arts, Science & Education
Department of Zoology

Qualification

Name : Nura Ibrahim Al-Zail Ibrahim.

Scientific Degree : M. Sc. in Zoology.

Department : Zoology Department.

College : Faculty of Science.

University : Omar AL-Moukhtar University.

Graduation Year : 2007.

The studied courses

Courses studied by the candidate in partial fulfillment for the requirement of Ph.D. degree in Zoology (Physiology):

- 1- Physiology of nutrition.
- 2- Advanced topics in circulatory system.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
(وَأَنْزَلَ اللَّهُ عَلَيْكَ الْكِتَابَ
وَالْحِكْمَةَ وَعَلَّمَكَ مَا لَمْ
تَكُن تَعْلَمُ ۚ وَكَانَ فَضْلُ اللَّهِ
عَلَيْكَ عَظِيمًا)

صدق الله العظيم

سورة انشاء- الآية (١١٣)

Acknowledgments

First of all, grateful thanks are due to "ALLAH" as I feel his care and support in every step in my life and introduced me to the best people who helped in initiating and completing this work,

*I am deeply indebted and grateful to **Prof. Dr. Hala Gabr Metwally**, Prof. of Clinical Pathology, Faculty of Medicine, Cairo University for helpful suggestion for the point of research and the great role in the isolation and culture of bone marrow mesenchymal stem cells and for her supportive role in the writing of this part.*

*It is also a great pleasure to record my deep thanks to **Dr. Magda Sayed Hasanin**, Assist. Prof. of Physiology, Zoology Department, Faculty of Women for Arts, Science and Education, Ain Shams University for suggesting and planning the practical work as well as her supervising and illuminating criticism in reading the manuscript, helpful effort and meticulous guidance. Great thanks for her for reading the manuscript and revising my work,*

*All my deepest thanks and gratitude to **Dr. Hala Fahmy Abd-Allah**, Assist. Prof. of Histology and Cytology, Zoology Department, Faculty of Women for Arts, Science and Education, Ain Shams University for active supervision, valuable support, providing all the assistance in the histological and ultrastructural examination and her fruitful advices and guidance. To her I owe a special word of thanks.*

*There are no words sufficient to express my deepest gratitude to **Dr. Nora El-Hoseany Mohamed** Assist. Prof of Physiology, Zoology Department, Faculty of Women for Arts, Science and Education, Ain Shams University for suggesting and planning the point of research, close supervision of this work and helping in the practical part. I will never forget her unlimited help, continuous support, kind encouragement and constructive criticism. Great thanks for her reading and revision of all the parts of this thesis. To her I owe a great deal of her valuable advice.*

*My deep thanks to all the staff members of Department of Zoology, Faculty of Women, Ain Shams University and specially to the Head of department, **Prof. Dr. Shadia Mohamed Kadry** for her help and support.*

Dedicated

To

My Father and Mother

My Husband

My Children Pisha, Balsam

and Kaitham

My Brothers and Sisters

For Their Continuous

Care and Support

CONTENTS

Subject	Page
LIST OF TABLES.....	i
LIST OF FIGURES.....	iv
LIST OF ABBREVIATIONS.....	viii
ABSTRACT.....	xii
INTRODUCTION.....	1
AIM OF THE WORK.....	7
REVIEW OF LITERATURE.....	8
A- Pyrethroids (cyhalothrin)	8
1- Morphological studies.....	9
1.1- Effect of LCT and pyrethroids on body and organs weight.....	9
1.2- Effect of LCT and pyrethroids on sperm indices and fertility...	10
2- Biochemical studies	13
2.1- Effect of LCT and pyrethroids on hormones.....	13
2.2- Effect of LCT and pyrethroids on protein and lipid profile.....	15
2.3- Effect of LCT and pyrethroids on cytokines and immunity.....	15
2.4- Effect of LCT and pyrethroids on antioxidants and oxidative stress.....	16
3- Microscopical studies	18
- Effect of LCT and pyrethroids on testicular tissue.....	18
B- Cleome droserifolia (Samwah)	21
1- Morphological studies.....	22
1.1- Effect of <i>Cleome</i> species on body and organs weight.....	22
1.2- Effect of <i>Cleome</i> species on sperm indices and fertility.....	23
2- Biochemical studies.....	24
2.1- Effect of <i>Cleome</i> species on hormones.....	24
2.2- Effect of <i>Cleome</i> species on protein and lipid profile.....	25
2.3- Effect of <i>Cleome</i> species on cytokines and immunity.....	27
2.4- Effect of <i>Cleome</i> species on antioxidants and oxidative stress....	29

Subject	Page
3- Microscopical studies.....	32
- Effect of <i>Cleome</i> species on testicular tissue.....	32
C- Stem cells	34
1- Definitions and properties of stem cells.....	34
2- Types of stem cell.....	36
3- Mesenchymal stem cells (MSCs).....	38
3.1-Mesenchymal stem cells therapy	40
3.2-Mesenchymal stem cells for fertility and testicular regeneration.....	44
MATERIALS AND METHODS	46
A- Experimental animals	46
B- Chemical substance	46
C- Natural antioxidant	47
D- Stem cells	48
E- Experimental design	54
1- Morphological studies	55
1.1- Determination of total body weight, testis weight and relative testis weight.....	55
1.2- Sperm indices.....	55
2- Biochemical studies.....	57
2.1- Sexual hormones tests.....	57
2.2- Protein profile tests.....	64
2.3- Lipid profile tests.....	66
2.4- Cytokines measurement.....	69
2.5- Antioxidant and oxidative stress parameters.....	81
3- Microscopic studies.....	86
3.1- Light microscopic study	86
3.2- Electron microscopic study	89
4- Statistical analysis	93
RESULTS	94
1- Morphological studies	94
1.1- Characterization and identification of mesenchymal stem cells (MSCs).....	94

Subject	Page
1.2- Total body weight, testis weight and relative testis weight.....	110
1.3- Sperm indices.....	116
2- Biochemical studies.....	124
2.1- Sexual hormones.....	124
2.2- Protein profile.....	130
2.3- Lipid profile.....	134
2.4- Cytokines	144
2.5- Antioxidants and oxidative stress.....	150
3- Microscopic studies	156
3.1- Light microscopic study.....	156
3.2- Electron microscopic study	183
DESCUSSION	215
1- Morphological studies	217
1.1-Effect of CDE or MSCs on LCT-induced alteration in total body weight and testis weight.....	217
1.2-Effect of CDE or MSCs on LCT-induced alteration in sperm indices.....	220
2- Biochemical studies	224
2.1-Effect of CDE or MSCs on LCT-induced alteration in sexual hormones.....	224
2.2-Effect of CDE or MSCs on LCT-induced alteration in protein profile.....	228
2.3-Effect of CDE or MSCs on LCT-induced alteration in lipid profile.....	231
2.4-Effect of CDE or MSCs on LCT-induced alteration in cytokines.....	234
2.5-Effect of CDE or MSCs on LCT-induced alteration in antioxidants and oxidative stress.....	236
3- Microscopical studies	241

Subject	Page
SUMMARY	249
CONCLUSIONS AND RECOMMENDATIONS	258
REFERENCES	260
ARABIC SUMMARY	

LIST OF TABLES

Title of Table	Page
Table 1: Mean cell count and passage length.	98
Table 2: Results of flow cytometric analysis.	101
Table 3: The protective and therapeutic role of CDE or MSCs on total body weight level (g) of groups treated with LCT.	111
Table 4: The protective and therapeutic role of CDE or MSCs on total testis weight level (g) of groups treated with LCT.	113
Table 5: The protective and therapeutic role of CDE or MSCs on relative testis weight level (%) of groups treated with LCT.	115
Table 6: The protective and therapeutic role of CDE or MSCs on sperm count ($\times 10^6/\text{ml}$) of groups treated with LCT.	117
Table 7: The protective and therapeutic role of CDE or MSCs on sperm viability level (%) of groups treated with LCT.	119
Table 8: The protective and therapeutic role of CDE or MSCs on sperm motility level (%) of groups treated with LCT.	121
Table 9: The protective and therapeutic role of CDE or MSCs on sperm abnormality level (%) of groups treated with LCT.	123
Table 10: The protective and therapeutic role of CDE or MSCs on serum testosterone level (ng/ml) of groups treated with LCT.	125
Table 11: The protective and therapeutic role of CDE or MSCs on serum follicle stimulating hormone (FSH) level (ng/ml) of groups treated with LCT.	127

Title of Table	Page
Table 12: The protective and therapeutic role of CDE or MSCs on serum luteinizing hormone (LH) level (ng/ml) of groups treated with LCT.	129
Table 13: The protective and therapeutic role of CDE or MSCs on serum total protein level (g/dl) of groups treated with LCT.	131
Table 14: The protective and therapeutic role of CDE or MSCs on serum albumin level (g/dl) of groups treated with LCT.	133
Table 15: The protective and therapeutic role of CDE or MSCs on total cholesterol level (mg/dl) of groups treated with LCT.	135
Table 16: The protective and therapeutic role of CDE or MSCs on triglyceride (TG) level (mg/dl) of groups treated with LCT.	137
Table 17: The protective and therapeutic role of CDE or MSCs on high density lipoprotein (HDL) level (mg/dl) of groups treated with LCT.	139
Table 18: The protective and therapeutic role of CDE or MSCs on serum low density lipoprotein (LDL) level (mg/dl) of groups treated with LCT.	141
Table 19: The protective and therapeutic role of CDE or MSCs on serum very low density lipoprotein (VLDL) level (mg/dl) of groups treated with LCT.	143
Table 20: The protective and therapeutic role of CDE or MSCs on serum tumor necrosis factor (TNF- α) level (pg/ml) of groups treated with LCT.	145
Table 21: The protective and therapeutic role of CDE or MSCs on interleukin-10 (IL-10) level (pg/ml) of groups treated with LCT.	147

Title of Table	Page
Table 22: The protective and therapeutic role of CDE or MSCs on interleukin-12 (IL-12) level (pg/ml) of groups treated with LCT.	149
Table 23: The protective and therapeutic role of CDE or MSCs on reduced glutathione (GSH) level (µg/g) of groups treated with LCT.	151
Table 24: The protective and therapeutic role of CDE or MSCs on superoxide dismutase (SOD) level (µg/g) of groups treated with LCT.	153
Table 25: The protective and therapeutic role of CDE or MSCs on lipid peroxidation malondialdehyde (MDA) level (µg/100g proteins) of groups treated with LCT.	155