

**GENETIC EFFECT OF SOME MINERAL OILS
ON DROSOPHILA MELANOGASTER**

A THESIS

**Presented to the Faculty of Science
for the Award of the Ph. D. Degree**

By

LAILA SAYED ALI HAMOUDA

(B. Sc., M. Sc.)

595.774
L.S



Department of Entomology

Faculty of Science

Ain Shams University

49891



1993

THESIS	EXAMINATION	COMMITTEE
NAME	TITLE	SIGNATURE
-----	-----	-----
-----	-----	-----
-----	-----	-----

SUPERVISORS:

PROF. DR. A. Z. EL-ABIDIN SALAM	A.Z. El-Abidin Salam
PROF. DR. NAIMA A. ABDEL-RAZIK	Naima Abdel Razik
ASSIS. PROF. DR. A. A. M. AWAD	A.A.M. Awad
ASSIS. PROF. DR. NADIA M. ABOU GABAL	N. M. Abo Gabal

HEAD OF DEPARTMENT
Bahira El Sawaf
PROF. DR. BAHIRA M. EL-SAWAF



BIOGRAPHY

Date and place of birth : 22 nd August, 1959, Cairo

Date of Graduation : June, 1980

Degree Awarded : M.Sc. (Entomology)

Occupation : Assistant Lecturer in Entomology
Department, Faculty of Science,
Ain Shams University.

Date of Registration for
the Ph.D. degree : 9th July, 1990.

ACKNOWLEDGEMENT

The author is very much indebted and obliged to late Professor Dr. A. M. Guneidy, Professor of Entomology, Faculty of Science, Ain-Shams University for his valuable advice and faithful encouragement at the beginning of this work.

With great pleasure the author expresses her sincere thanks and appreciation to Professor Dr. A.Z. El-Abidin Salam, Professor and head of Genetics Department, Faculty of Agriculture, Ain Shams University for his valuable help and kind encouragement, for reading and correcting the manuscript.

Grateful appreciation is also due to professor Dr. Naima A. Abdel- Razik, Professor of Entomology, Faculty of Science, Ain Shams University for her faithful encouragement and help during the progress of this study.

I wish to express my greatest deep thank to Dr. A. A. M. Awad, Assistant Professor of Genetics, Faculty of Agriculture, Ain Shams University for his direct supervision of this work, for his valuable advice and kind encouragement and for reading and correcting the manuscript.

Thanks are also to Dr. Nadia M. Abou Gabal, Assistant Professor of Entomology, Faculty of Science, Ain Shams University for her help during the work of this study.

Special thanks to Professor Dr. M. S. Hamed, Professor of Entomology, Faculty of Science, Ain Shams University for his valuable help and kind encouragement throughout this work.

Thanks also to Dr. Thorayia F. K. El Nagar lecturer of Entomology, Faculty of Science, Ain Shams University for her valuable help during this work.

ABSTRACT

The present study was designed to study the genetic effect of two mineral oils: Kafr Zayat and super shoukrona on D. melanogaster using different protocols (sex-linked recessive lethals, dominant female sterility, dominant lethals and isozymes variations for the three enzymes: Mdh, Men and Esterases by starch gel electrophoresis).

It is clear from all the data gained by these protocols that both of the two used oils has a mutagenic effect. However, super shoukrona oil seemed more potential than KZ oil when adult *Drosophila* flies were treated.

Key Words: Drosophila melanogaster Sex-linked recessive lethals Dominant female sterility Dominant lethals Isozymes variations Malate dehydrogenase Mdh Malic enzyme Men Esterases Est.

List of abbreviations used in this thesis:

EDTA	:	Ethylene diamine tetra-acetic acid disodium salt.
MgCl ₂	:	Magnesium chloride.
NAD	:	Nicotinamide adenine dinucleotide.
NADP	:	Nicotinamide adenine dinucleotide phosphate.
NBT	:	Nitro blue tetrazolium.
PMS	:	Phenazine methosulphate.
KH ₂ PO ₄	:	Potassium dihydrogen phosphate.
Na ₂ HPO ₄	:	Sodium monohydrogen phosphate.
Tris	:	Tris-hydroxy-methyl aminomethane.
OAA	:	Oxaloacetate
A.S.T.M	:	American society for testing material.
α-Gpdh	:	α-glycerophosphate dehydrogenase
Adh	:	Alcohol dehydrogenase
Pgd	:	Phosphogluconate dehydrogenase
Idh	:	Isocitrate dehydrogenase
G-6-Pdh	:	Glucose-6-phosphate dehydrogenase
Aph	:	Alkaline phosphatase
ODH	:	Octanol dehydrogenase
Est-C	:	Esterase-C
XDH	:	Xanthine dehydrogenase
Ao	:	Aldehyde oxidase
Acph	:	Acid phosphatase
S.sh oil	:	Super shoukrona oil

III

LIST OF TABLES

	Page
ble (1): Results of tests with KZ oil on groups of adult males and females (O.R. strain) of <u>Drosophila melanogaster</u> .	29
ble (2): Results of tests with super shoukrona oil on groups of adult males and females (O.R. strain) of <u>Drosophila melanogaster</u> .	31
ble (3): Results of tests with KZ oil on groups of adult males and females (HES strain) of <u>Drosophila melanogaster</u> .	33
ble (4): Results of tests with super shoukrona oil on groups of adult males and females (HES strain) of <u>Drosophila melanogaster</u> .	35
ble (5): Frequencies of spontaneous and KZ oil induced sex-linked recessive lethals in different germ cell stages of wild type males of <u>D. melanogaster</u> .	46
ble (6): Frequencies of spontaneous and super shoukrona oil induced sex-linked recessive lethals in different germ cell stages of wild type males of <u>D. melanogaster</u> .	49
ble (7): Frequencies of spontaneous and KZ oil induced dominant female sterility in F ₁ heterozygous females in different germ cell stages of <u>D. melanogaster</u> males.	52

IV

Page

LIST OF TABLES (Cont'd)

able (8):	Frequencies of spontaneous and super shoukrona oil induced dominant female sterility in F_1 heterozygous females in different germ cell stages of <u>D. melanogaster</u> males.	55
able (9):	Dominant female sterility as a complementary assay for sex-linked recessive lethals test induced by KZ and super shoukrona oils.	58
able (10):	Induction of embryonic lethality after treatment with KZ oil compared with control.	61
able (11):	Induction of embryonic lethality after treatment with super shoukrona oil compared with control.	64
able (12):	Mutagenic potentiality of both KZ and super shoukrona oils as evaluated by the pooled data of SLRL, DFS and DL.	67
able (13):	Number of genes tested, allelic frequencies and observed proportion of heterozygotes for three loci in the F_1 's of the treated flies <u>D. melanogaster</u> by the two oils KZ and super shoukrona.	75

LIST OF FIGURES

	Page
ig.(1): Concentration/mortality regression lines for adult males and females (O.R. strain) of <u>Drosophila melanogaster</u> treated by KZ oil.	30
ig.(2): Concentration/mortality regression lines for adult males and females (O.R. strain) of <u>Drosophila melanogaster</u> treated by super shoukrona oil.	32
ig.(3): Concentration/mortality regression lines for adult males and females (HES strain) of <u>Drosophila melanogaster</u> treated by KZ oil.	34
ig.(4): Concentration/mortality regression lines for adult males and females (HES strain) of <u>Drosophila melanogaster</u> treated by super shoukrona oil.	36
g.(5): Histogram represents the percentage of spontaneous and induced sexlinked recessive lethals in three broods and their total of wild type males of <u>Drosophila melanogaster</u> following KZ oil feeding.	47
g.(6): Histogram represents the percentage of spontaneous and induced sex-linked recessive lethals in three broods and their total of wild type males of <u>Drosophila melanogaster</u> following super shoukrona oil feeding.	50

VI

LIST OF FIGURES (Cont'd)

		Page
ig.(7):	Histogram represents the percentage of spontaneous and KZ oil induced dominant female sterility in F ₁ heterozygous females in different germ cell stages of <u>Drosophila melanogaster</u> males.	53
ig.(8):	Histogram represents the percentage of spontaneous and super shoukrona oil induced dominant female sterility in F ₁ heterozygous females in different germ male cell stages of <u>Drosophila melanogaster</u> .	56
ig.(9):	Histogram represents the percentage of total spontaneous and induced dominant embryonic lethality as unhatched white and brown eggs in three treatments with KZ oil compared with control.	62
g.(10):	Histogram represents the percentage of total spontaneous and induced dominant embryonic lethality as unhatched white and brown eggs in three treatments with super shoukrona oil compared with control.	65
g. (11):	Zymogram represents electrophoretic variations of Mdh in <u>Drosophila melanogaster</u> showing one band pattern only.	70

VII

LIST OF FIGURES (Cont'd)

	Page
g. (12): Zymogram represents electrophoretic variations of Men in <u>Drosophila melanogaster</u> showing one band pattern only.	72
g. (13): Zymogram of esterase variations in <u>Drosophila melanogaster</u> showing one band pattern only.	74

CONTENTS

	Page
Abstract	I
List of abbreviations	II
List of tables	III
List of figures	V
1- Introduction	1
2- Review of literature	3
2.1. The use of mineral oils in pest control	3
2.2. Mutagenic potentiality of mineral oils and other chemicals	6
2.2.1. Induction of sex-linked recessive lethals (SLRL) in <u>D. melanogaster</u>	7
2.2.2. Induction of dominant female sterility (DFS)	12
2.2.3. Dominant female sterility as a complementary assay for sex- linked recessive lethals.	13
2.2.4. Induction of dominant lethals (DL)	14
2.2.5. Biochemical studies	16
2.2.5.1. Detection of mutagenicity by isozyme variations	16
2.2.5.1.a Malate dehydrogenase isozyme (Mdh)	16
2.2.5.1.b Malic enzyme (Men)	21
2.2.5.1.c Esterases (Est.)	22

CONTENTS (Cont'd)

	Page
3- Materials and Methods	25
3.1. Materials	25
3.1.1. Stocks	25
3.1.1.1 Oregon-R (O-R)	25
3.1.1.2 Muller-5 (M-5)	25
3.1.1.3 Homozygous enzyme strain (HEs)	26
3.1.2. Oils	26
3.2. Methods	27
3.2.1. Determination of LC_{50}	27
3.2.2. Detection of sex-linked recessive lethals (SLRL)	37
3.2.3. Detection of dominant female sterility	38
3.2.4. Detection of dominant lethals as a test for chromosomal aberrations	38
3.2.5. Electrophoretic analysis	38
3.2.5.1. Gel preparation	39
3.2.5.2. Gel and Electrode buffers	39
3.2.5.3. Electrode bridge (Wicks)	40
3.2.5.4. Sample preparation	40
3.2.5.5. Enzymes assays:	41