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Using Some Fruits Rich in Polyphenolic Compounds for Managing Dry Eye in Experimental Animal Model

Thesis
Submitted to Faculty of Women, Ain Shams University in Partial Fulfillment for Master of Science Degree (M.Sc) in Biochemistry and Nutrition

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2018

Acknowledgment

*First of all and foremost, thanks to **Allah** almighty for giving me the strength to continue this work.*

*I would like to express my sincere gratitude to **Prof. Dr. Fatma Hassan Abd El-Razek**, Professor of Nutrition, Biochemistry and Nutrition Department, Faculty of women for Arts, Science and Education, Ain Shams University, for her support, helps guidance, planning the frame of the work and her stimulating view.*

*Many thanks are extended to **Prof. Dr. Anhar Mohamed Gomaa Shehab,** Professor of Biochemistry, Biochemistry Department, and Research Institute of Ophthalmology, for her meticulous supervision and continuous encouragement, my words stand to express how much I'm obliged to her for helping me to complete this study, she never denied me her valuable time and effort.*

*I would like to thank **Dr. Bakinam Ali Mohamed** lecture of Biochemistry and Nutrition, Biochemistry and Nutrition Department, Faculty of women Faculty of women for Arts, Science and Education, Ain Shams University, for her effort, guidance and valuable advice.*

*I wish to express my deepest thanks to **Prof. Dr. Mohamed Saad Al-Balkini,** Professor of Ophthalmology, Ophthalmology Department, and Research Institute of Ophthalmology.*

*I would like to thank **Prof. Dr. Laila Kamal** Professor of Histopathology, Histopathology Department, and Research Institute of Ophthalmology.*

*With a great pleasure, I would like to express my sincere gratitude to my **Mother**, **Father**, **Husband**, **Daughter**, **Sister** and **Brother** for their continuous encouragement, support and love.*

Ethar Ahmed Mohamed


بسم الله الرحمن الرحيم


وقل رب زدني علما


صدق الله العظيم

سوره طه ـ ١١٤

Dedication

I would like to dedication this thesis to my family especially to my father and my mother for their constant, unconditional love and support throughout my entire life. There are not enough words I can say to describe just how important my mother and my father are to me, and what a powerful influence they continue to be…

Also this work is lovingly dedicated to my husband, daughter, sister and brother. I will never forget their effort towards me and also for their encouragement, support and love.

Abstract

Objective: The present study was performed to investigate the protective effect of blackberry and pomegranate as polyphenolic compounds for managing dry eye in experimental animal model.

Materials and Methods: The blackberry and pomegranate were dried in air oven. Forty eight male rabbits (1000-1300g) were divided into six groups: G1: normal control, G2: dry eye, G3: normal fed on blackberry, G4: normal fed on pomegranate, G5: dry eye feed on blackberry and G6: dry eye feed on pomegranate. Dry eye induced by atropine sulphate 1% drops (2 drops in each eye twice daily) for 2 months, blackberry or pomegranate was taken as 20% of the main diet. Polyphenolic compounds of blackberry and pomegranate were analyzed by using high performance liquid chromatography (HPLC). Tear production measured using Schirmer test and tear break up time (TBUT). Tears were collected from all groups using 5-µL silanated microcapillary pipettes. At the end of experiments, rabbits were fasted overnight and blood was withdrawn. The levels of reduced glutathione (GSH), malondialdehyde (MDA), nitric oxide (NO) and interlukin-1beta (IL-1β) were estimated in the tears and blood. In addition catalase (CAT) and superoxide dismutase (SOD) activity were determined in the blood. Cornea excised and examined by light microscope. Evaluation of tears protein fractions by sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) was also identified.

Results: Significant improvements were noticed in Schirmer I score and TBUT of dry eye rabbits fed on 20% dried blackberry or 20% dried pomegranate compared to dry eye group. There was a significant ($p < 0.05$) decrease in serum and tears IL-1β, NO

and a statistically increase in the blood GSH, plasma CAT in dry eye rabbits fed on 20% dried blackberry or 20% dried pomegranate compared to dry eye rabbit group.

In conclusion: Supplementation with dried blackberry or pomegranate is effective against the dry eye syndrome by decreasing ocular inflammation and increasing antioxidant contents in tears of experimental animal model.

Key words: dry eye, polyphenolic compounds, atropine sulphate, blackberry, pomegranate oxidative stress, antioxidant

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List of Abbreviations

AAP	4-aminophenazone
ALP	alkaline phosphatase
ARVO	The Association for Research in Vision and Ophthalmology
CAT	Catalase
DE	Dry eye
DED	Dry eye disease
DHBS	3,5- Dichloro -2- hydroxybenzene sulfonic acid
DTNB	5, 5’ dithio-bis-2-nitrobenzoic acid
ELISA	Enzyme linked immune sorbent assay
EP	Epithelial cells
GSH	Reduced Glutathione
GSSG	Oxidized Glutathione
GSHPx	Glutathione peroxidase
HCEP	Human corneal epithelium
HNE	4-hydroxynonenal
HPLC	High performance liquid chromatography
HRP	Horeseradish peroxidase
IL-1 α	Interleukin 1α
IL-1β	Interleukin 1β
iNOS	Isoform nitric oxide synthase

KCS	Kerato-conjunctiviti ssicca
LASIK	Laser-assisted insitu kertomileusis
LDL	Low density lipoprotein
LOO•	Peroxyl radical
MAD	Malondialdehyde
MAPK	Mitogen-activted protein kinase
MGD	Meibomian gland dysfunction
MMPs	Metalloproteinases
mtROS	Mitochondrial reactive oxygen species
N3•	azide
NADP	Nicotinamide adenine dinucleotide
Na_2 EDTA	Disodium ethylene diamine tetra acetic acid
NFkB	Nucler factor-kB
NO	Nitric oxide
•OH	hydroxyl
ONOO-	Peroxynitrite
OS	Oxidative stress
PHS	Physicians ‘Health Study
ROO•	peroxyl
ROS	Reactive oxygen species
SDS-PAGE	Sodium dodecyl sulfate polyacrylamide gel electrophoresis
sIgA	Secretory immunoglobin A

SOD	Superoxide dismutase
SS	Sjögren’s syndrome
TBA	Thiobarbituric acid
TBUT	Tear break up time
TMP	3, 3',5 ,5'-tetramethylbenzidine
TNF-α	Tumor necrosis factor-α
UV	Ultraviolet
Vit	Vitamin
WHS	Women’s Health Study

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