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شبكة المعلومات الجامعية

بالرسالة صفحات لم ترد بالأصل

Cairo University
Faculty of Veterinary Medicine
Department of Cytology& Histology

Studies on the effect of glyphosate-based herbicide on some organs of albino rats with the possible ameliorative effect of N-acetylcysteine

A Thesis Presented by

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For the Degree of Master in Veterinary Medical Sciences

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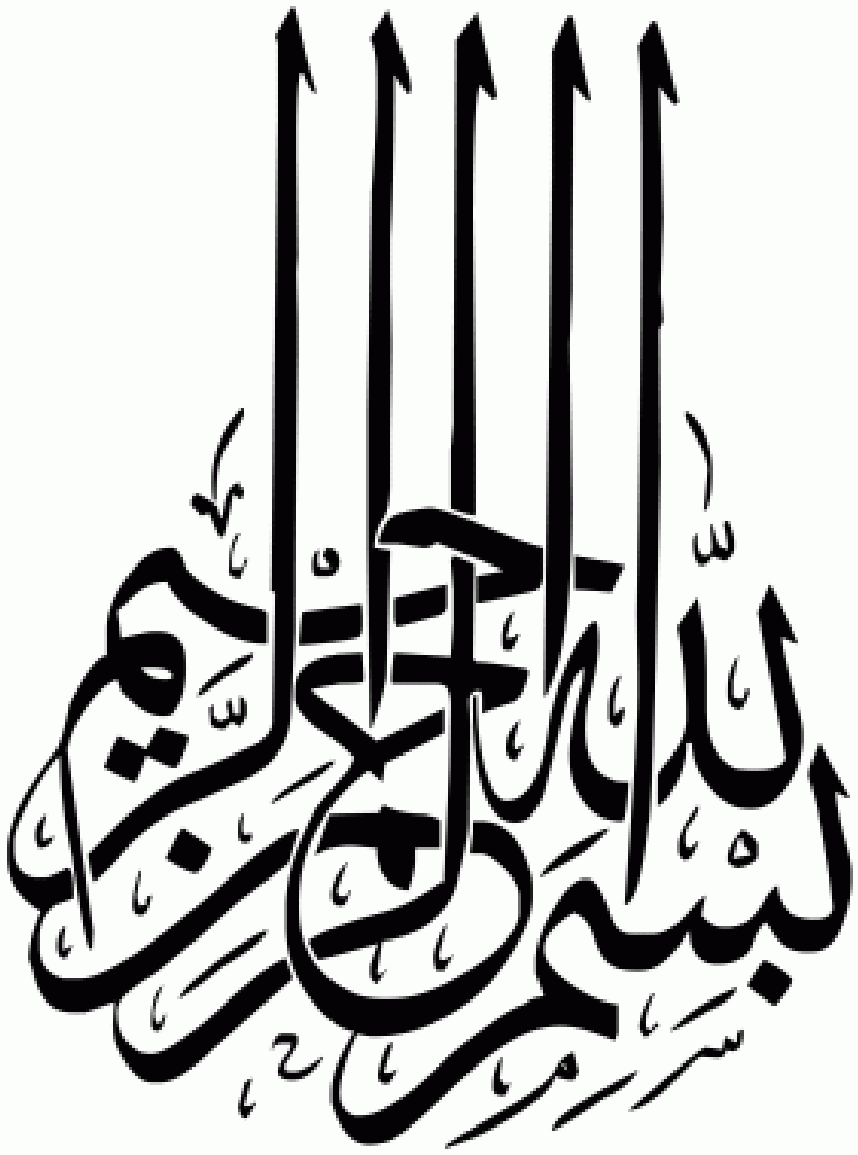
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ABSTRACT

Glyphosate (GLP) is the most commonly used, broad spectrum non-selective herbicide in worldwide markets. It considered the active ingredient of several commercial formulations including Roundup®. The present study was carried out to study the potential toxic effects of (GLP) on both hepatic and testicular tissues and the ability of N-acetylcysteine (NAC) to ameliorate such toxic effects. A total 30 adult male albino rats were alienated into three groups 10 rats each: control group only received distilled water, GLP-exposed group orally received 375 mg/kg and NAC co-treated group orally received GLP(375mg/kg) plus NAC (160mg/kg orally, 1hr before GLP) daily for 6weeks. At the end of the experiment, blood samples were collected from each rat, serum was separated for determination of liver function tests (Aspartate aminotransferase (AST), Alanine aminotransferase (ALT). Sperms were collected from cauda of epididymis of each rat for semen analysis. Some liver and testis samples were collected for estimation of oxidative stress markers and quantitative RT-PCR analysis for apoptotic gene expression (Bax, c-Myc). While other samples were used for histo-pathological, immune-histochemical, and ultra-structural examination. GLP-exposed group revealed a significant increase in ALT, AST, Malondialdehyde (MDA) levels, abnormal sperms, apoptotic gene expression, and a significant decrease in sperm concentration, viability, and motility. Moreover, several histo-pathological alterations were observed in the form of hyalinization, vacuolation, and sever congestion of blood vessels for both testis and liver. Bile stagnation, ballooning of hepatocytes, desquamation of spermatogenic cells, decrease at epithelial height, thickening of tunica albugenia, edema, and vacuolation of interstitial tissue. Ultra-structurally, there was loss of most of cytoplasmic organelles in hepatocytes, nuclear condensation and mitochondrial degeneration in both hepatocytes and testicular cells. Increased inter-cellular spaces, and deformed spermatozoal heads, and degenerated tail with excess residual bodies were also noticed. There was an increase in immune-reactivity for both proliferating cell nuclear antigen (PCNA) and caspase-3. On the other hand, NAC co-treated group exhibited significant improvement at all levels in both hepatic and testicular tissues. It could be concluded that, the adverse effects induced by GLP were markedly ameliorated by co-treatment with NAC.

Keywords: GLP, NAC, Liver, Testis, Histopathology, Ultrastructure, apoptosis, MDA

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Acknowledgement

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Dedication

To my family (Dad, Mum and my brothers), My husband ***(Sayed)*** *and my lovely son (Ahmed) to say thanks seems so small but, thanks for everything... their continuous support, encouragement and helping me.*

Contents

LIST OF ABBREVIATION

Abbreviation	Complete words
AChE	acetyl cholinesterase
ALP	Alkaline phosphatase
ALT	Alanine aminotransferase
AMPA	Amino methyl phosphonic acid
ANOVA	Analysis of variance
ARE	Antioxidant response element
ARFD	Acute reference dose
AST	Aspartate aminotransferase
ATP	Adenosine Tri Phosphate
BAX	Bcl-2 Associated X-protein
Bcl-2	B-cell lymphoma 2
bwt	Body weight
CAPL	Central Agricultural Pesticide Laboratory
CAT	Catalase
CCl4	Carbone tetrachloride
cDNA	Complemintary deoxyribonucleic acid
c-Myc	Cellular myelocytomatosis
CO	carbone monoxide
CO_2	carbone dioxide

CPF	Chlorpyrifos
Ct	threshold cycle
CYP	cytochrome P
DAB	diaminobenzidine
DNA	Deoxyribonucleic acid
EPSPS	Enolpyruvylshikimate-3-phosphate synthase
Fig	Figure
G6PD	glucose-6-phosphate dehydrogenase
GBH	glyphosate based herbicide
GLP	Glyphosate
GM	genetically modified
GP	Group
GPx	Glutathione peroxidase
GSH	Glutathione
GST	Glutathione-S-transferase
H&E	haematoxylin and eosin
H_2O_2	Hydrogen peroxide
HIV	human immune-deficiency virus
I/P	Intra-peritoneal
IACUC	Institutional Animal Care and Use Committee
IP3	Inositol triphosphate

Kg	Kilogram
L.M	Light microscope
LH	Luteinizing hormone
LPO	Lipid peroxidation
MAP	mitogen activated protein
MCV	mean corpuscular volume
MDA	Malondialdehyde
mg	Milligram
Min	Minute
mRNA	Messenger Riboxyribonucleic acid
N	Number
NAC	N-Acetylcysteine
NADPH	Nicotinamide Adenine Dinucleotide Phosphate
NAPQI	N-acetyl-p-benzoquinone imine
NBF	Neutral Buffered Formalin
NF-κB	Nuclear factor Kappa-B
NO_2	nitrogen dioxide
NOAEL	No Observed Adverse Effect Level
NRF2	Nuclear factor erythroid 2
OH	Hydroxyl radical
PAS	periodic acid schiff