Ain Shams University
Women's College for Arts,
Science&Education.

Physiological, Biochemical and Histopathological changes in African catfish (*Clarias gariepinus)* Exposed to Atrazine Herbicide

Thesis
Submitted in partial Fulfillment for the requirements of the degree of ph.D. of Science in Zoology

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2012


DEDICATION
To my kind
Parents
To my
helpful Sisters
Rehab & Eman.
To my
faithful Brothers
Tamer, Ehab,
Mohamed & Yasser

Qualifications

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APPROVAL SHEET

This is to approve that the dissertation presented by

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Abstract

In recent years, there is wide spread use of atrazine and it is commonly monitored in groundwater and surface water. A study is needed to determine its effects on the aquatic organisms and its potential effects as an environmental contaminant. In this study, the half lethal concentration (LC_{50}) of atrazine for female catfish, ***Clarias gariepinus*** (***C. gariepinus***) was calculated. Atrazine toxicity was evaluated through acute and chronic exposures of fish to 1/2 and 1/10 the calculated LC_{50} for 4 days and 6 weeks respectively. As well as, the evaluation of role of vit. E in preventing or alleviating the induced defects. Results showed that the LC_{50}/96h was 13.75 mg/l. The effects of both acute and chronic exposures revealed clinical abnormalities which were manifested by loss of appetite, sluggish or restlessness swimming, rapid opercular movements and abnormal skin pigmentation in the form of faded skin. Moreover, the biometric parameters showed highly significant decrease in body weight and gonad weight but the liver weight of atrazine exposed fish was significantly increased. In addition, the results of absolute fecundity showed highly significant decrease in (T.R. Egg No.). The results also revealed a marked decrease in RBCs, Hb content, MCV, MCH, MCHC and WBCs. Where as, significant increase in AST and ALT activities, creatinine, uric acid, glucose and serum cortisol levels were recorded. Furthermore, atrazine exposures were associated with an inhibition of cholinesterase activity. Marked decrease in estradiol, testosterone levels and total protein concentration in serum with a reduction in both albumin and globulin were also recorded. Results also showed a significant induction of oxidative damage in liver tissue as evidenced by increased level of lipid peroxidation (LPO) and reduced glutathione content (GSH). In addition, significant increase in the activities of catalase (CAT) and superoxide dismutase (SOD). The histopathological alterations of different organs of the exposed fish were recorded. Additionally, the supplementation of vit.E can reduce the incidence of growth retardation and can improve the haematological, biochemical and histological abnormalities in female catfish, ***C. gariepinus*** exposed to atrazine in relation to fish exposed to atrazine only. This may be related to successive reduction of the oxidative stress, caused by atrazine toxicity.

Keywords: Atrazine, Freshwater fish, vit.E, LC_{50}, Clinical signs, Biometric parameters, Fish fecundity, Blood parameters, Biochemical parameters, Oxidative stress, and Histopathological changes.

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List of Abbreviations

%	**Percent**
˚C	**Degree selezius**
µ /l	**Micro per liter**
µg/dl	**Microgram per deciliter**
µg/kg	**Microgram per kilogram**
µg/l	**Microgram per liter**
µm	**Micrometer**
11-KT	**11-Ketotestosterone**
2,4- D	**2,4- Dichlorophenoxyacetic acid**
A/G ratio	**Albumin/globulin ratio**
AAP	**4-aminophenazone**
AchE	**Acetylcholinestrase**
ACTH	**Adrenocorticotropic hormone**
ALP	**Alkaline phosphatase**
ALT	**Alanine amino transferase**
AMT	**Aminotriazole**
ANTU	**A-Naphthyl thiourea**
ASDI	**Atrazine, simazine, diuron and isoproturon**
AST	**Aspartate amino transferase**
ATR	**Atrazine**
B.L.	**Body length**
B.Wt.	**Body weight**
CAMP	**Cyclic adenosine monophosphate**
CAT	**Catalase**
CBZ	**Carbamazepine**
CF	**Condition factor**
Cm	**centimeter**
CMS	**Carboxy methyl cellulose**
$COPEC_S$	**Chemicals of potential ecological concern**
CRF	**Corticotropin releasing factor**
DbcAMP	**Dibutyryl-Camp**
DCA	**3,4-Dichloroaniline**

List of Abbreviations (Cont.)

Dep. Eq.	**Dependence equation**
DFB	**Diflubenzuron**
DHBS	**3,5 Dichloro-2-hydroxy benzene sulfonic acid**
DNA	**Deoxyribonucleic acid**
DTNB	**5,5; dithiobis(2-nitrobenzoic acid)**
E.P.N.	**Ethyl-p- nitrophenyl-thionobenzene, phosphonate**
E_2	**17-ß estradiol**
EDCS	**Endocrine disrupting chemicals**
EPA	**Environment protection Agency**
FBL	**Fecundityrelated to body length**
FBW	**Fecundity related to body weight**
fl	**Femoliter**
FOW	**Fecundity related to gonadal weight**
g	**Gram**
G.F.R.	**Glomerular filtration rate**
g/ dl	**Gram per deciliter**
g/l	**Gram per liter**
Goal	**2,4-D-oxyfluorfen**
GSH	**Glutathione content**
GSI	**Gonadosomatic index**
GSSG	**Oxidized glutathione**
GW	**Gonad weight**
H	**Hour**
H and E	**Hematoxylin and Eosin**
H_2O_2	**Hydrogen per oxide**
H_2O	**Water**
Hb	**Haemoglobin**
HRP	**Peroxidase**
HSI	**Hepatosomatic index**
Ht	**Haematocrite**
I_G	**Gonadosomatic index**
I_H	**Hepatosomatic index**
K	**Condition factor**
LC_{50}	**Half lethal concentration**

List of Abbreviations (Cont.)

LPO	**Lipid peroxidation**
LSI	**Liver somatic index**
LW	**Liver weight**
MCH	**Mean corpuscular haemoglobin**
MCHC	**Mean corpuscular haemoglobin concentration**
MCV	**Mean corpuscular volume**
MDA	**Medical Devices Agency**
MDA	**Malondialdhyde**
mg	**Milligramper liter**
mg / Kg bw	**Milligram per kilogram body weight**
mg /dl	**Milligram per deciliter**
Mg Hg/l	**Milligram mercury per liter**
mg/g tissue	**Milligram per gram tissue**
mg/gww	**Milligram per gram weight**
mg/l	**Milligram per liter**
Min.	**Minute**
Ml	**Milliliter**
Ml /l	**Milliliter per liter**
Ml/min	**Milli per minute**
n mol/g tissue	**Nano mol per gram tissue**
Nacl	**Sodium chloride**
ng /l	**Nanogram per liter**
ng /ml	**Nanogram per milli**
nm	**Nanometer**
O.W.	**Ovarian weight**
O_2	**Oxygen**
O_2^-	**Superoxide anions**
$O_2^{\cdot}$	**Oxygen free radical**
$O_2^{-\cdot}$	**Oxygen free radical**
PCV	**Packed cell volume**
Pg/cell	**Pico gram/cell**
PIP	**Pesticide Information Profiles**

List of Abbreviations (Cont.)

PM	**Postmortem**
PPb	**Part per billion**
PPm	**Part per million**
PQ	**Gramoxone herbicide**
RBCs	**Red blood cells**
R.Egg	**Ripened egg**
ROS	**Reactive oxygen species**
rpm	**Revolution per minute**
RUP	**Restricted Use Pesticide**
SOD	**Superoxide dismutase**
Sol.	**Solution**
ß-carotene	**Beta carotene**
SW	**Spleen weight**
T	**Testosterone hormone**
T.R.Egg No.	**Total ripened egg number**
TBA	**Thiobarbituric acid**
TBARS	**Thiobarbituric acid reactive substance**
U/g tissue	**Micro per gram tissue**
Vit. E	**Vitamin E**
VTG	**Vitellogenin**
WBCs	**White blood cells**
W.	**Week**
W_G	**Gonadal weight**
W_H	**Hepatic weight**
WHO	**World Health Organization**
α- tocopherol	**Alpha tocopherol**

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