Impact of Environmental Pollutants on Molluscans in an Urban Region

A Thesis

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Abstract

The freshwater gastropods *Lanistes carinatus* was used as a good bioindicator for water pollution in Kafr El-Zayat district Egypt, during the period from March 2014 to February 2015. The selected animal was stated as the common distributed in the region during all p eriods of study. The residue levels of heavy metals, persistent organic pollutants (POP_s) and pesticides in water, sediment and tissues of *investigated snails w*ere determined seasonally in five regions near the industrial and agriculture contaminated sources as well as non-contaminated one. The present study is focused on the changes in the innate immune defenses of investigated *L. carinatus* using flow cytometry and light microscope which are accomplished by haemocytes and haemolymph factors. The pollution effects on some biochemical components of the *Lanistes carinatus* snails were assessed as biomarkers such as acetylcholinestrase (AChE), catalase (CAT), glutathione peroxidase (GP_x), lipid peroxidase (LPO), lactic dehydrogenase (LDH) and carbonyl protein. As well as, their effect on the immunosystem and genomic DNA. Also, this study present good knowledge of their biomarker changes, as well as their cellular, genetic and biochemical level, which reinforces the role of fresh water snails as Bioindicators of the aquatic environment.

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LIST OF ABBREVIATIONS

Abbreviation	Nomenclature
%	Percent
ANOVA	Analysis of variance
bp	Base pair
b.p	Boiling point
BHC	Lindane (gama-hexachlorocyclohexane)
CAPL	Central Agricultural Pesticides Laboratory
$^{\circ}C$	Degree centigrade
cells/ml	Cells number per milliter
ROS	Reactive oxygen species
Chem.	Chemical
$Cl^{\bullet}$	Chlorine radical
cm	Centimetre
Co.	Company
DDD	Dichlorodiphenyl dichloroethane
DDE	Dichlorodiphenyl dichloroethylene
DDT	Dichlorodiphenyl trichloroethane
DNA	Deoxyribonucleic acid
DTNB	Dithionitrobenzoic acid
dS/m	Unit of electric conductivity
EDTA	Ethylenediaminetetra-acetic acid
EC	Electron capture
gm	Gram(s)
G/C content	Guanidine per cytosine percent
GC	Gas chromatography
GC-MS	Gas chromatographic mass spectroscopy
HCB	Hexachlorobenzene
HNO_3	Nitric acid
hr	Hour(s)
H_2O_2	Hydrogen peroxide
ICP	Inductive Coupled Plasma
L.	*Lanistis*
Lab.	Laboratory
Ltd	Limited
LSD (0.05)	Lethal significantly different at 0.05
N	Normality
No	Number

$MgSO_4$	Magnesium sulfate
M	Molarity
mM	mmole
mM/gm	mmole per gram
mmole/L	Millimole per litre
ml	Milliliter
ml/min	Mille per minute
mg/L	Milligram per Litre
mM	Milimole
min	minute(s)
meq/L	Milli equavilent per litre
m/e	Mass per charge (electrons)
m/z	Mass per hertz
nm	Nanometer
nmole/mg	Nanomole per milligram
PCR	polymerase chain reaction
RAPD-PCR	Random amplified polymorphic DNA-PCR
pH	Power of hydrogen
PSA	Primary secondary amine
PBS-BSA	Phosphate buffered saline- bovine serum albumine
ppb	Part per billion
POP_s	Persistent organic pollutant
PCB_s	Polychlorinated biphenyls
QuChERS	Quick, Easy, Cheap, Effective, Rugged and Safe technique
rpm	Rota per minute
SE	Standard error
TCA	Trichloroacetic acid
µl	Microliter
µm	micrometre
U/gm	Unit per gram
µg/L	Microgram per litre
µmole/mg/min	Micromole per milligram per minutes
U/L	Unit per litre
v/v	Volume per volume
Xg	Unit of centrifuge cycles
W:V	Weight per volume