https://doi.org/10.33451/florafauna.v30i1pp122-126
FLORA AND FAUNA ISSN 2456 - 9364 (Online)
2024 Vol. 30 No.1 PP 122-126 ISSN 0971 - 6920 (Print)

Studies on pesticides induced changes in muscle biochemical composition in *Channa gachua*

Reshman Yasmin

P.G. Department of Zoology,
Gaya College, GAYA- 823001 (BIHAR), INDIA
E-mail : yasminreshman@gmail.com

Received **:** 28.03.2024; ***Revised*** **:** 04.04.2024; ***Accepted*** : 20.05.2024

ABSTRACT

In this work attempt has been made to assess the effect of few pesticides (namely Metacid-50 or M, Kelthane (or K) and Dithane M-45 (or D) and their mixture on changes in water, lipid and non-lipid fractions (major part protein, very less carbohydrate and minerals) in a fresh water teleostean fish, *Channa gachua* (HAM) in their body muscles at different concentrations during different exposure times. In control group the water, lipid content and non-lipid fractions were 76.559%, 0.774% and 22.667% respectively. Increased water content in muscles were obtained after 24hrs. and 48hrs. exposure of individual or mixed pesticides condition but the lipid content decreased in all the animals. Statistical relationship between concentration of pesticides *Vs* muscles, water and lipid have also been established.

Figure : 00 References : 20 Tables: 03
KEY WORDS : Body muscles, Fish, Lipid, Water.

Introduction

Culturally fish symbolize good luck, prosperity and long life. Fish was once called the poor man's protein because it was cheaper than beef, chicken and pork. Fishes are an essential food for people of developing countries. Fish is a valuable and easily accessible source of food, rich in protein. Its pursuit and capture constituting the fisheries are of great significance. In fishes muscles are important food constituent which are actually eaten but the quality of muscles get degraded due to pollution load in water bodies where they are cultured and thrive well. A perusal of literature indicates that our informations regarding the effect of pollutions on changes in bio-chemical constituents (main part being occupied by body muscles) in fishes are scanty or very limited[3-7,9,10,14,16,18,20] as such the present work is an endeavour to study the synergistic and antagonistic effect of different pesticides on water, lipid and non-lipid fraction in the body of a fresh water fish, *Channa gachua.*

Materials and Methods

Live specimens of *Channa gachua* (Ham.) were obtained from the local fish dealers. After proper acclimatization in the laboratory for about 10 days, the experiment started. Static acute bioassay test[1] was performed to determine the lethal concentrations of all the three pesticides (namely- Metacid 50 (M), an orgarophophate, 50% w/w methyl parathion = 0, 0 - (P - nitrophenol phosphothorate 2. Kelthane EC (K); an organochlorine; 18.5%; 1, 1-bis (chlorophenyl) 2, 2, 2-trichlorine (D1COFIL) and 3. Dithane M-45 (D); carbonate : 75%, Mancozeb or zinc ion and manganese ethylene bis dithio-carbamate) and their mixture (Table 1) were made at 30.0+1.0^{0}C water temperature. All together there were 8 groups (1 control + 7 experimental or pesticide treated groups). At the end of the experiment the fishes were sacrificed to take out known amount of muscle (in grams) and weighed for the estimation of water, lipid and non-lipid fractions (protein, carbohydrate, ash + minerals). Number of fishes (ranging 40-50g in weight) were 5 for each experiment. The details of the methods[18] were employed in the study to water, lipid and non-lipids.

Results

The data showing the effect of different pesticides (M, K, D) and their combinations at different doses and exposure times on water, lipid and non-lipid of control and experimental fishes in body muscles of *Channa gachua* have been presented/summarized in Table - 1. The perusal of this Table indicates that in control group the water, lipid and non-lipid (protein, carbohydrate and ash content with minerals) were 76.55g%, 0.774% and 22.667% respectively. Increased water content in

TABLE-1 : Effect of 24 and 48 hours pesticides exposure on the muscles composition of *C. gachua* (+ Standard deviation; N = 5 animals in group) (Material = Muscles)

Condition	Dose (mg/l)	Water (g%)		Lipid (g%)		Non-Lipid (g%)	
		24 hr.	48 hr.	24 hr.	48 hr.	24 hr.	48 hr.
Control	-	76.559±3.262	76.232±3.262	0.774±0.042	0.774±0.042	22.667±1.358	22.667+1.358
Metacid	2.0	79.989±4.149	79.232±2.736	0.521±0.027	0.403±0.018	20.49±1.344	20.365±1.018
(M)	5.0	79.231±4.675	79.602±3.814	0.484±0.028	0.386±0.014	20.285±0.881	20.012±1.206
	8.0	79.649±3.892	80.451±3.481	0.359±0.011	0.353±0.023	19.956±1.227	19.196±0.985
Kelthane	2.22	78.296±3.311	78.425±4.031	0.607±0.038	0.614±0.042	21.097±1.088	20.961±1.357
(K)	5.18	78.641±5.254	78.837±3.841	0.442±0.024	0.401±0.021	22.917±1.245	20.762±1.257
	8.8	79.573±3.798	78.952±3.358	0.295±0.180	0.388±0.034	20.132±0.952	20.665±1.133
Dithane	10.0	78.988±3.519	79.211±5.044	0.439±0.019	0.402±0.024	20.573±0.861	20.387±1.092
(D)	15.0	79.491±3.902	79.82±3.392	0.413±0.025	0.362±0.017	20.096±1.157	19.818±1.089
	20.0	79.997±4.129	80.397±4.528	0.388±0.021	0.314±0.017	19.615±0.972	19.289±0.795
M+K+D	3.0	78.803±3.189	79.024±4.841	0.264±0.017	0.182±0.013	20.933±0.873	20.794±1.147
	4.48	79.222±3.691	79.472±3.793	0.161±0.011	0.123±0.009	20.617±1.23	20.405±1.528
	6.32	80.044±4.926	80.835±5.265	0.074±0.005	0.065±0.005	19.882±1.119	19.1±0.005
M+K	2.11	78.309±3.312	79.044±4.472	0.305±0.023	0.272±0.021	21.386±1.169	20.684+0.887
	4.22	78.766±5.153	79.468±4.793	0.215±0.12	0.182±0.013	21.019±1.305	20.35±1.262
	5.96	79.822±2.694	80.516±4.381	0.171±0.011	0.122±0.008	20.007±1.203	19.362±0.874
M+D	2.2	78.451±4.532	78.632±4.031	0.413±0.024	0.369±0.022	21.136±1.156	20.999±1.195
	4.1	78.941±5.255	79.264±3.952	0.348±0.02	0.314±0.021	20.711±1.182	20.422±0.846
	6.0	79.798±2.933	78.866±4.971	0.301±0.019	0.224±0.016	19.905±0.816	19.91±1.094
K+D	2.31	78.203±4.191	78.895±3.744	0.408±0.025	0.321±0.019	21.389±1.183	20.784+1.114
	4.32	78.842±3.513	79.477±4.376	0.381±0.021	0.286±0.018	20.777±1.124	20.237±1.214
	5.96	79.001±4.473	79.662±3.618	0.215±0.017	0.205±0.015	20.784±1.362	20.133±1.168

TABLE-2 : Equation and correlation coefficient to elucidate the relationship of Muscles water (Y) with the concentration of pesticides (X) for 24 and 48 hours exposure in *Channa gachua*

Experimental condition	Equation for 24hr. Y = a+b.X	Correlation Coefficient r for 24hr	Equation for 48hr. Y = a+b.X	Correlation Coefficient r for 48hr
Muscles Vs Metacid	Y = 78.74+0.11.X	0.9886	Y = 78.746+0.203.X	0.9752
Muscles Vs Kelthane	Y = 77.773+0.194.X	0.9809	Y = 78.32+0.077.X	0.9293
Muscles Vs Dithane	Y = 77.978+0.101.X	0.9999	Y = 78.03+0.119.X	0.9999
Muscles Vs M+K+D	Y = 77.624+0.377.X	0.9924	Y = 77.232+0.553.X	0.9756
Muscles Vs M+K	Y = 77.381+0.387.X	0.961	Y = 78.136+0.376.X	0.9567
Muscles Vs M+D	Y = 77.613+0.353.X	0.988	Y = 77.922+0.325.X	0.9999
Muscles Vs K+D	Y = 77.747+0.223.X	0.9621	Y = 78.449+0.213.X	0.9732

muscles was obtained after 24 and 48hrs exposure of individual and or mixed pesticides condition but lipid content decreased in all the treated animals. Equations and Correlation coefficients to elucidate the relationship of muscle, water and lipid (Y) *Vs* concentration of pesticides (X) in this fish have been presented in Tables- 2 and 3 respectively..

Discussion

Water is the principal component of the fish amounting up to 80% of the edible flesh. The body moisture (water) in fish tissue is held tightly by colloidal as well as chemical forms so that fish subjected to high pressure does not release much of the water. This is unique water retention capacity[7]. It was reported[12] that survival of the fish is endangered even it looses 10% of its water, but can live if it looses all of the fat and half of its protein. It was also reported the highest value for tissue water is 96.18% in starving *Hippoglossoides*

TABLE-3 : Equation and correlation coefficient to elucidate the relationship of Muscles Lipid (Y) with the concentration of pesticides (X) for 24 and 48 hours exposure in *Channa gachua* (Ham.)

Experimental condition	Equation for 24hr. Y = a+b.X	Correlation Coefficient r for 24hr	Equation for 48hr. Y = a+b.X	Correlation Coefficient r for 48hr
Muscles Vs Metacid	Y = 0.572-0.021.X	-0.978	Y = 0.339-0.008.X	-0.9836
Muscles Vs Kelthane	Y = 0.7-0.046.X	-0.9955	Y = 0.644-0.033.X	-0.8293
Muscles Vs Dithane	Y = 0.49-0.005.X	-0.9626	Y = 0.491-0.009.X	-0.9986
Muscles Vs M+K+D	Y = 0.428-0.057.X	-0.9962	Y = 0.285-0.035.X	-0.987
Muscles Vs M+K	Y = 0.37-0.035.X	-0.9915	Y = 0.352-0.039.X	-0.9982
Muscles Vs M+D	Y = 0.475-0.029.X	-0.9977	Y = 0.459-0.038.X	-0.9911
Muscles Vs K+D	Y = 0.551-0.051.X	-0.9001	Y = 0.402-0.031.X	-0.9653

platessoides[11]. The water content or moisture in fishes seem to vary from 70 to 82%. Investigators[19] while working on rainbow trout, *Salmo gairdneri* (Richardson) reported that percent water content decreases with increasing body weights. In *Heteropneustes fossilis* (Bloch) after the treatment of Malathion (OP)[2], after the treatment of several pesticides in *Channa punctatus* (Bloch)[18]; after the treatment of Decil and Coraban in *Cyprinus Carpio*[14] and in *Channa gachua*[8] after the treatment of Bromacil and Bromophenax have reported the increased water content in various body tissues after a varieties of pesticides noted above and thus this finding is consistent with the above.

There is wide disparity in lipid content in different species of fishes. Lipid content of fishes is a matter of great economic and industrial importance as body lipid constitutes the body oil and is markedly influenced by diet. Fat is the main source of energy for the maintenance of the normal vital activity of the fish starving under experimental conditions and in the watering grounds[13]. The lipid content in fishes seems to vary from 0.6 to 19.4%, It was reported that the fat deposition in the body is determined by calorific content of the diet[15] and the fishes accumulate fat in muscle and liver during growth and migration[11]. In the present work on *Channa gachua* (Ham.) the treatment of different pesticides (M, K & D) and their combinations caused decrease in lipid content, which is consistent with the previous findings[2,6,8,14]. The non-lipid gave lower values in treated fishes which is also consistent with the earlier findings.

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