WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 12, 911-919. Research Article ISSN 2277– 7105

STUDY ON TISSUE LEVEL OF THE ANTIOXIDANT ENZYME VITAMIN E IN INDIAN MAJOR CARPS

Sudha Summarwar[1]*, Abhishek Singh[2] and Nirmal Singh[3]

[1]Department of Zoology, UGC-PDF, Research Associate, Sangam University, Bhilwara.
[2,3]Department of Engineering & Technology, (Ph.D. Scholar) Sangam University, Bhilwara.

Article Received on
08 August 2020,
Revised on 28 August 2020,
Accepted on 18 Sept. 2020
DOI: 10.20959/wjpr202012-18753

***Corresponding Author**
Sudha Summarwar
Department of Zoology,
UGC-PDF, Research
Associate, Sangam
University, Bhilwara.

ABSTRACT

To appraise the impact of pesticides on tissue level of the Vitamin E in Indian major carps from lakes of Rajasthan, 2 varieties of fish were collected from lakes of Rajasthan. For this purpose fish sort enclosed *Labeo rohita* and *Catla catla*. the gathering sites enclosed 2 lakes settled within the Ajmer town of Rajasthan. These lakes were Ana Sagar and Foy Sagar lakes. Fish from varied lake areas were collected, particularly Ana Sagar site one, Ana Sagar site two, Ana Sagar site three, Ana Sagar site four, Ana Sagar site five, and Foy Sagar. On the premise of accessible management values, it absolutely was finished that the mean values of Vitamin E altogether the tissues of each the categories of fish divulged oxidative stress. Observations of the current endeavor divulged that nerve-wracking conditions in water medium may well be the motive for lower fat-soluble vitamin contents resulting in large production of free radicals. This possibly resulted in oxidative stress and inequity between oxidizer and inhibitor systems.

KEYWORDS:- Oxidative stress, Vitamin A, *Labeo rohita, Catla catla.*

INTRODUCTION

In many ecosystems, human activity has led to changes of natural biogeochemical cycles, resulting in the accumulation of some substances. Chemical contaminants are found everywhere in nature, and ecologists are the ones who assess their impact on natural communities of organisms. Among these, pesticides are the most common type of aquatic ecosystem contaminant. The effects of pesticides on fish are various and varied: they directly and indirectly cause mortality, through starvation (destroying the species on which they feed), affect hatching, growth rate, It may lead to malformations, affect reproductive levels, alter enzyme function, and cause organ histopathological changes, genetic effects, etc.

In all fish species several types of antioxidant compounds are found to protect their lipids against damage caused by reactive oxygen species. Changes in environmental temperature and oxygen concentration may result in oxidative stress affecting the fishes (Sudha and Deepali, 2013). The present paper is on the Study on tissue level of the antioxidant enzyme Vitamin E in Indian major carps as a bioindicator species.

MATERIAL AND METHOD

Sample collection

Two types of fish were collected from Rajasthan lakes to assess the impact of pesticides on the tissue level of the antioxidant enzyme Vitamin E in Indian major carps from Rajasthan lakes. Form of fish included Labeo rohita and Catla catla for this reason. The collection sites comprised two lakes located in Rajasthan's Ajmer city. These lakes were Ana Sagar and Foy Sagar lakes.

Vitamin E

It was determined by the spectrophotometric method as described by Joshi (2012) with little modification (Anonymous, 2016). The method is highly sensitive and can detect the very small concentration of vitamin E in the blood. It is based upon the color reaction between phosphomolybdic acid and vitamin E.

RESULT AND DISCUSSION

Mean± SEM values of vitamin E of heart, kidney, liver, and gills of male and female fish i.e. Labeo rohita (Rohu, Lr) and Catla catla (Catla, Cc) collected from different areas of Ana Sagar lake (site 1, site 2, site 3, site 4 and site 5) and Foy Sagar lake is presented in table 1 & figure 1,2. In each gender, fish were further grouped as low-weight (LW) and high weight (HW). The data are based on 20 observations each as specified in the section of materials and methods.

Table 1: Mean values of vitamin E in tissues of fishes collected from different areas of ana Sagar and Foy sagar lakes.

Name of area	Type of fish			Mean ± SEM (µg g^{-1}) Heart	Kidney	Liver	Gills
Ana Sagar Site 1	*Lr* Overall value (80)			21.00^{b} ± 0.11	23.00^{b} ± 0.08	29.00^{b} ± 0.11	27.00^{b} ± 0.10
Ana Sagar Site 1	*Lr* (80)	M (40)	LW (20)	20.00^{c} ± 0.03	22.00^{c} ± 0.02	28.00^{c} ± 0.02	27.00^{c} ± 0.03
Ana Sagar Site 1	*Lr* (80)	M (40)	HW (20)	24.00^{d} ± 0.01	26.00^{d} ± 0.03	32.20^{d} ± 0.03	27.00^{d} ± 0.02
Ana Sagar Site 1	*Lr* (80)	F (40)	LW (20)	18.00^{c} ± 0.03	20.00^{c} ± 0.02	26.00^{c} ± 0.02	24.00^{c} ± 0.03
Ana Sagar Site 1	*Lr* (80)	F (40)	HW (20)	22.00^{d} ± 0.01	24.00^{d} ± 0.03	30.20^{d} ± 0.03	28.00^{d} ± 0.02
Ana Sagar Site 1	*Cc* Overall value (80)			19.00^{b} ± 0.10	21.00^{b} ± 0.09	27.00^{b} ± 0.10	25.00^{b} ± 0.11
Ana Sagar Site 1	Cc(80)	M (40)	LW (20)	18.00^{c} ± 0.03	20.00^{c} ± 0.02	26.00^{c} ± 0.02	25.00^{c} ± 0.03
Ana Sagar Site 1	Cc(80)	M (40)	HW (20)	22.00^{d} ± 0.01	24.00^{d} ± 0.03	30.00^{d} ± 0.03	27.00^{d} ± 0.02
Ana Sagar Site 1	Cc(80)	F (40)	LW (20)	16.00^{c} ± 0.03	18.00^{c} ± 0.02	24.00^{c} ± 0.02	22.00^{c} ± 0.03
Ana Sagar Site 1	Cc(80)	F (40)	HW (20)	20.00^{d} ± 0.01	22.00^{d} ± 0.03	28.20^{d} ± 0.03	26.00^{d} ± 0.02
Ana Sagar Site 2	*Lr* Overall value (80)			17.00^{b} ± 0.10	19.00^{b} ± 0.09	25.00^{b} ± 0.10	23.00^{b} ± 0.11
Ana Sagar Site 2	*Lr* (80)	M (40)	LW (20)	16.00^{c} ± 0.03	18.00^{c} ± 0.02	24.00^{c} ± 0.02	23.00^{c} ± 0.03
Ana Sagar Site 2	*Lr* (80)	M (40)	HW (20)	20.00^{d} ± 0.01	22.00^{d} ± 0.03	28. 00^{d} ± 0.03	25.00^{d} ± 0.02
Ana Sagar Site 2	*Lr* (80)	F (40)	LW (20)	14.00^{c} ± 0.03	16.00^{c} ± 0.02	22.00^{c} ± 0.02	20.00^{c} ± 0.03
Ana Sagar Site 2	*Lr* (80)	F (40)	HW (20)	18.00^{d} ± 0.01	20.00^{d} ± 0.03	26.20^{d} ± 0.03	24.00^{d} ± 0.02
Ana Sagar Site 2	*Cc* Overall value (80)			15.00^{b} ± 0.10	17.00^{b} ± 0.09	23.00^{b} ± 0.10	21.00^{b} ± 0.11
Ana Sagar Site 2	*Cc* (80)	M (40)	LW (20)	14.00^{c} ± 0.03	16.00^{c} ± 0.02	22.00^{c} ± 0.02	21.00^{c} ± 0.03
Ana Sagar Site 2	*Cc* (80)	M (40)	HW (20)	18.00^{d} ± 0.01	20.00^{d} ± 0.03	26.00^{d} ± 0.03	23.00^{d} ± 0.02
Ana Sagar Site 2	*Cc* (80)	F (40)	LW (20)	12.00^{c} ± 0.03	14.00^{c} ± 0.02	20.00^{c} ± 0.02	18.00^{c} ± 0.03
Ana Sagar Site 2	*Cc* (80)	F (40)	HW (20)	16.00^{d} ± 0.01	18.00^{d} ± 0.03	24.20^{d} ± 0.03	22.00^{d} ± 0.02
Ana Sagar Site 3	*Lr* Overall value (80)			14.00^{b} ± 0.10	16.00^{b} ± 0.09	22.00^{b} ± 0.10	20.00^{b} ± 0.11
Ana Sagar Site 3	*Lr* (80)	M (40)	LW (20)	13.00^{c} ± 0.03	15.00^{c} ± 0.02	21.00^{c} ± 0.02	20.00^{c} ± 0.03

			HW (20)	17.00^{d} ± 0.01	19.00^{d} ± 0.03	25. 00^{d} ± 0.03	22.00^{d} ± 0.02
		F (40)	LW (20)	11.00^{c} ± 0.03	13.00^{c} ± 0.02	19.00^{c} ± 0.02	17.00^{c} ± 0.03
			HW (20)	15.00^{d} ± 0.01	17.00^{d} ± 0.03	23.20^{d} ± 0.03	21.00^{d} ± 0.02
	Cc Overall value (80)			12.00 ^{b} ± 0.11	14.00 ^{b} ± 0.08	20.00^{b} ± 0.10	18.00 ^{b} ± 0.10
	Cc (80)	M (40)	LW (20)	11.00^{c} ± 0.03	13.00^{c} ± 0.02	19.00^{c} ± 0.02	18.00^{c} ± 0.03
			HW (20)	15.00^{d} ± 0.01	17.00^{d} ± 0.03	23.00^{d} ± 0.03	20.00^{d} ± 0.02
		F (40)	LW (20)	09.00^{c} ± 0.03	11.00^{c} ± 0.02	17.00^{c} ± 0.02	15.00^{c} ± 0.01
			HW (20)	13.00^{d} ± 0.01	15.00^{d} ± 0.01	21.20^{d} ± 0.03	19.00^{d} ± 0.02
Ana Sagar Site 4	*Lr* Overall value (80)			13.00 ^{b} ± 0.10	15.00 ^{b} ± 0.09	21.00^{b} ± 0.10	19.00 ^{b} ± 0.11
	Lr (80)	M (40)	LW (20)	12.00^{c} ± 0.03	14.00^{c} ± 0.02	20.00^{c} ± 0.02	19.00^{c} ± 0.03
			HW (20)	16.00^{d} ± 0.01	18.00^{d} ± 0.01	24. 00^{d} ± 0.03	21.00^{d} ± 0.01
		F (40)	LW (20)	10.00^{c} ± 0.03	12.00^{c} ± 0.02	18.00^{c} ± 0.02	16.00^{c} ± 0.02
			HW (20)	14.00^{d} ± 0.01	16.00^{d} ± 0.03	22.20^{d} ± 0.03	20.00^{d} ± 0.02
	Cc Overall value (80)			11.00 ^{b} ± 0.10	13.00 ^{b} ± 0.08	19.00^{b} ± 0.10	17.00 ^{b} ± 0.11
	Cc (80)	M (40)	LW (20)	10.00^{c} ± 0.03	12.00^{c} ± 0.02	18.00^{c} ± 0.02	17.00^{c} ± 0.03
			HW (20)	14.00^{d} ± 0.01	16.00^{d} ± 0.03	22.00^{d} ± 0.03	19.00^{d} ± 0.02
		F (40)	LW (20)	08.00^{c} ± 0.01	10.00^{c} ± 0.02	16.00^{c} ± 0.01	14.00^{c} ± 0.02
			HW (20)	12.00^{d} ± 0.01	14.00^{d} ± 0.02	20.20^{d} ± 0.03	18.00^{d} ± 0.02
Ana Sagar Site 5	*Lr* Overall value (80)			20.00 ^{b} ± 0.10	22.00 ^{b} ± 0.10	28.00^{b} ± 0.10	26.00 ^{b} ± 0.10
	Lr (80)	M (40)	LW (20)	19.00^{c} ± 0.03	21.00^{c} ± 0.02	27.00^{c} ± 0.02	26.00^{c} ± 0.03
			HW (20)	23.00^{d} ± 0.01	25.00^{d} ± 0.03	31.20^{d} ± 0.03	28.00^{d} ± 0.02
		F (40)	LW (20)	17.00^{c} ± 0.03	19.00^{c} ± 0.01	25.00^{c} ± 0.02	23.00^{c} ± 0.01
			HW (20)	21.00^{d} ± 0.01	23.00^{d} ± 0.03	29.20^{d} ± 0.02	27.00^{d} ± 0.02
	Cc Overall value (80)			18.00 ^{b} ± 0.10	20.00 ^{b} ± 0.10	26.00^{b} ± 0.10	24.00 ^{b} ± 0.11
	Cc (80)	M (40)	LW (20)	17.00^{c}	19.00^{c}	25.00^{c}	24.00^{c}

				± 0.03	± 0.02	± 0.02	± 0.03
			HW (20)	21.00^{d} ± 0.01	23.00^{d} ± 0.02	29.00^{d} ± 0.02	26.00^{d} ± 0.02
		F (40)	LW (20)	15.00^{c} ± 0.03	17.00^{c} ± 0.02	23.00^{c} ± 0.02	21.00^{c} ± 0.03
			HW (20)	19.00^{d} ± 0.01	21.00^{d} ± 0.03	27.20^{d} ± 0.03	25.00^{d} ± 0.02
Foy Sagar	*Lr* Overall value (80)			19.00 ^{b} ± 0.11	21.00 ^{b} ± 0.09	27.00^{b} ± 0.10	25.00 ^{b} ± 0.10
	Lr (80)	M (40)	LW (20)	18.00^{c} ± 0.03	20.00^{c} ± 0.02	26.00^{c} ± 0.01	25.00^{c} ± 0.03
			HW (20)	22.00^{d} ± 0.01	24.00^{d} ± 0.01	30. 0^{d} ± 0.03	27.00^{d} ± 0.02
		F (40)	LW (20)	16.00^{c} ± 0.03	18.00^{c} ± 0.02	24.00^{c} ± 0.01	22.00^{c} ± 0.03
			HW (20)	20.00^{d} ± 0.01	22.00^{d} ± 0.01	28.20^{d} ± 0.01	26.00^{d} ± 0.02
	Cc Overall value (80)			17.00 ^{b} ± 0.10	19.00 ^{b} ± 0.09	25.00^{b} ± 0.10	23.00 ^{b} ± 0.11
	Cc (80)	M (40)	LW (20)	16.00^{c} ± 0.03	18.00^{c} ± 0.02	24.00^{c} ± 0.02	23.00^{c} ± 0.03
			HW (20)	20.00^{d} ± 0.01	22.00^{d} ± 0.03	28.00^{d} ± 0.03	25.00^{d} ± 0.02
		F(40)	LW (20)	14.00^{c} ± 0.03	16.00^{c} ± 0.02	22.00^{c} ± 0.02	20.00^{c} ± 0.03
			HW (20)	18.00^{d} ± 0.01	20.00^{d} ± 0.03	26.20^{d} ± 0.03	24.00^{d} ± 0.02

Figures in the parentheses indicate number of observations in each case

Lr = *Labeo rohita*

Cc = *Catla catla*

M = Male

F = Female

b = Significant ($p \leq 0.05$) difference in overall mean values of *Lr* and *Cc*

c = Significant ($p \leq 0.05$) difference for LW in a fish type

d = Significant ($p \leq 0.05$) difference for HW in a fish type

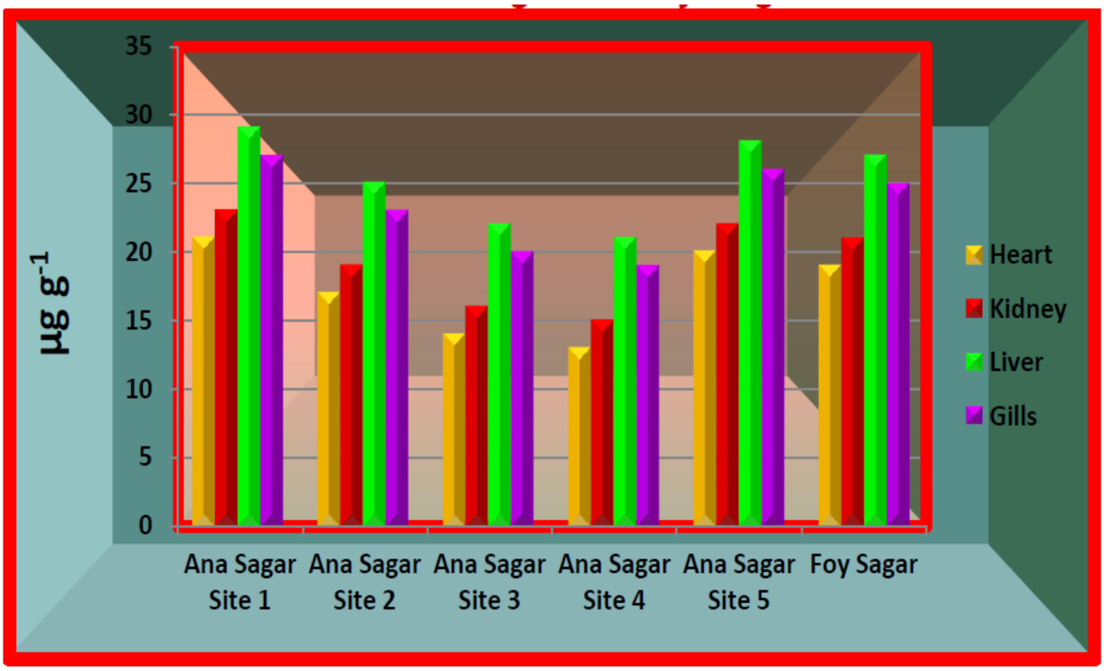

Fig. 1: Illustration of mean changes in values of vitamin E. in tissues of *Labeo rohita* fish from different areas of Ana Sagar and Foy Sagar lakes.

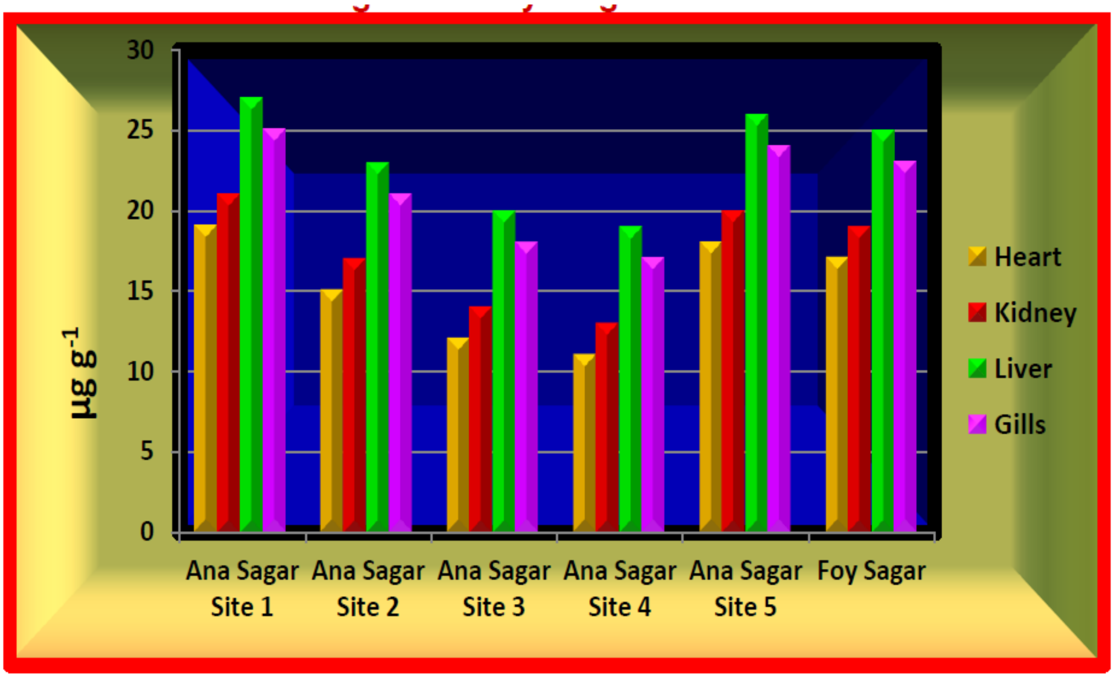

Fig. 2: Illustration of mean changes in values of vitamin E in tissues of *Catla catla* fish from different areas Ana Sagar and Foy Sagar lake.

The mean values of vitamin E from each site revealed significant differences ($p \leq 0.05$) among themselves. Fish collected from Ana Sagar site 4 revealed significantly ($p \leq 0.05$) lowest values of vitamin E in all the tissues, respectively as compared to the rest of the other sites.

This revealed that maximum oxidative stress was developed in the fish collected from Ana Sagar site 4. At each collection site, Catla catla fish revealed lower vitamin E contents. This exhibited that Catla catla fish built up a greater degree of oxidative stress than labeo rohita fish. In both the category of fish, females revealed lower contents of vitamin E than males. This pointed up that females of both the type of fish had developed a higher scale of oxidative stress. Furthermore, it was found that low-weight male and female fish had a larger amount of oxidative stress than high-weight male and female fish. Vitamin E was significantly ($p \leq 0.05$) lower in low-weight fish than high-weight fish.

It divulged that pollution of the water altered the antioxidant status of fish of both the types i.e. Labeo rohita and Catla catla. The mean values of vitamin E in various tissues obtained in the present investigation showed more or less similar precedent of distribution in body tissues and values obtained from Ana Sagar site 1 were taken as control values. On the basis of available control values, it was concluded that the mean values of vitamin E in all the tissues of both the types of fish divulged oxidative stress. Alterations in antioxidant status are connected with the development of oxidative stress (Kataria et al., 2016). Oxidative stress is considered to play a major role in affecting the rejoinders of fish to variation in environments (Gauvin et al., 2017).

Lower concentration of vitamin E in fish indicated the presence of oxidative stress. In animals also, lower vitamin E content is a reflection of the development of oxidative stress (Kataria and Kataria, 2013). In each area, the vitamin E contents significantly differed among all the tissues collected i.e. heart, kidney, liver, and gills. In each area, the contents of vitamin E were highest in the liver for both the fish i.e. Lr and Cc. The activity was lowest in the heart of both the types fish i.e. Lr and Cc, collected from all six areas.

In each area, in each tissue, the vitamin E content was significantly lower in Catla catla than in Labeo rohita. In mammals, the lowered vitamin E contents signified the depletion of antioxidants due to oxidative stress (Kataria et al., 2010a).

Observations of the present endeavor divulged that stressful conditions in water medium could be the motive for lower vitamin E contents leading to the vast production of free radicals. This most likely resulted in oxidative stress and inequity between oxidant and antioxidant systems. Oxidative stress can be incited by any sort of stress (Kataria et al., 2010b). The consequence of variations in the environment can lead to the development of oxidative stress in animals (Kataria et al., 2010b).

It can be conjectured that lower vitamin E contents exhibited depletion of the antioxidant system of fish to fight against the ensuing oxidative stress. Therefore, Cc developed greater oxidative stress than Lr. Females of each species developed greater oxidative stress than males. Low-weight fish developed greater oxidative stress than high-weight fish in each gender and species. Normally, the liver had greater contents of vitamin E followed by gills, kidney, and heart. An increase in pH of water or extremely low pH of water resulted in the development of oxidative stress in tissues of fish and the enormity of oxidative stress was as heart, kidney, gills, and liver. Vitamin E is a well-established biomarker of oxidative stress in animals (Joshi, 2012). Lower concentration of vitamin E in fish marked the presence of oxidative stress.

The mean values of vitamin E in fish tissues collected from Ana Sagar site 1 was more or less similar to the available control values (Qing-song et al., 2007). However, the values obtained from other areas showed lower concentrations. Lower concentration of vitamin E in fish indicated the presence of oxidative stress.

Kataria et al. (2010a) also attributed a decrease in serum vitamin E to its depletion to combat oxidative stress. Vitamin E is considered as a very potent endogenous antioxidant and helps the body to fight with excessive free radicals. Depletion in the body is a crucial factor in rendering the fish to the threat of oxidative stress.

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