Journal of Advanced Laboratory Research in Biology
E-ISSN: 0976-7614
Volume 8, Issue 2, April 2017
PP 41-43
https://e-journal.sospublication.co.in

Research Article

Changes in total protein in Liver and Kidney of freshwater fish, *Channa punctatus* (Bloch.) after intoxication of Carbaryl

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Abstract: Pesticides are one group of toxic compounds linked to human use that have a profound effect on aquatic fauna. Fish may be good indicators of contamination by pollutants because their biochemical responses are quite similar to found in mammals. Studies on toxic effects of carbaryl (a carbamate pesticide) on liver and kidney of freshwater fish *Channa punctatus* have been made. The LC_{50} value of carbaryl was calculated 10.05mg/l for various time periods 24, 48, 72 and 96 hrs. The study was conducted to investigate the total protein changes in the liver and kidney of freshwater fish, *Channa punctatus* exposed to different sub-lethal concentrations of pesticide carbaryl for a period of 15, 30, 45, 60, 75 and up to 90 days. Carbaryl intoxication in *Channa punctatus* caused significant decrease in total protein in liver and kidney as compared to control. The reasons for such changes have been discussed in this paper.

Keywords: Pesticides, LC_{50}, Carbaryl, *Channa punctatus*, Protein.

1. Introduction

Fisheries and aquatic resources are exceptionally valuable natural assets enjoyed by millions of the people and play an important role in maintaining the economy of any country. Fish are known to be the richest source of high-quality protein. In India, where protein deficiency in wreak havoc on the health of millions of underprivileged and malnourished population, the pisciculture can prove to be a boon in overcoming this problem. But the pollution of the aquatic environment is a serious and growing problem for fisheries and aquatic resources. Discharge of untreated industrial water contaminated with harmful chemicals directly to the ecosystem increases the concentration of such chemicals into the aquatic environment, has led to metals, pesticides, and other pollutants, consequently various deleterious effects on the aquatic organisms (Oketola and Osibanjo, 2009). Such contaminants change the quality of water (Bhagat, 2008) directly and indirectly via the food chain (Sasaki *et al.*, 1997).

Pesticides are agents used to kill or control undesired pests, such as insects, weeds, rodents, fungi, bacteria or other organisms. The terms “pesticides” includes insecticides, herbicides, and rodenticides, as well as disinfectants, fumigants and wood preservatives. These have a vital role in controlling agricultural, industrial, home, garden and public health pests globally. The public has been tolerant of their use because they have the ability to reduce the level of vector born diseases and have offered lower cost, better quality goods, and services to society. However, these economic and health benefits are not achieved without potential risk and possible adverse health effects on human, animals and the environment. It has been estimated that 85-90% of the pesticides applied in agriculture never reach their target organisms, but instead are dispersed in the air, water, and soil. Based upon such estimates, pesticide exposure is likely for non-target organisms.

Carbaryl is the common name for the carbamic acid derivative of 1-naphthyl-n-methyl carbamate. It is sold in the market under many trade names like Sevin, Adios, Carbamec and Slam. The technical grade product is a white crystalline solid, with low volatility. It is soluble in water, which is stable to light and heat but easily hydrolysed in alkaline media. Carbaryl is toxic to a wide variety of living organisms not considered pests, including beneficial arthropods, birds,

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fish, earthworms, plants, and bacteria. In most cases, carbaryl is both acutely toxic and causes a variety of sublethal effects. Carbaryl is rapidly absorbed in the lungs and digestive tract. The principal metabolite in humans is 1-naphthol. Under normal exposure conditions, the accumulation of carbaryl in animals is unlikely.

The present study becomes more relevant since it takes into consideration the effect of carbaryl intoxication, which is common, used in agriculture. In the present study, significant decreases in total protein in the target organs, liver, and kidney have been recorded due to toxic effect of carbaryl.

2. Materials and Methods

Freshwater fish, *Channa punctatus* were collected from the local fish market and were acclimatized for 7 days in a large glass aquarium (80×80×50cms). The LC_{50} of aldicarb for the fish was determined by using linear regression method since 24, 48, 72 and 96 hrs. Then these fishes were exposed in four different sub-lethal concentrations 2mg/l, 4mg/l, 6mg/l and 8mg/l of carbaryl. The fish were sacrificed for control and treated over 90 days. On each of control and treated fish, the liver and kidney were dissected out, blotted of blood, rinsed in the phosphate buffer saline and immediately proceeded for biochemical estimation. Total protein was estimated by the method of Biuret and Dumas (1971). The data were analyzed using standard procedure and protocols for statistical calculations using SPSS 17 following Fischer and Yates (1950).

3. Result and Discussion

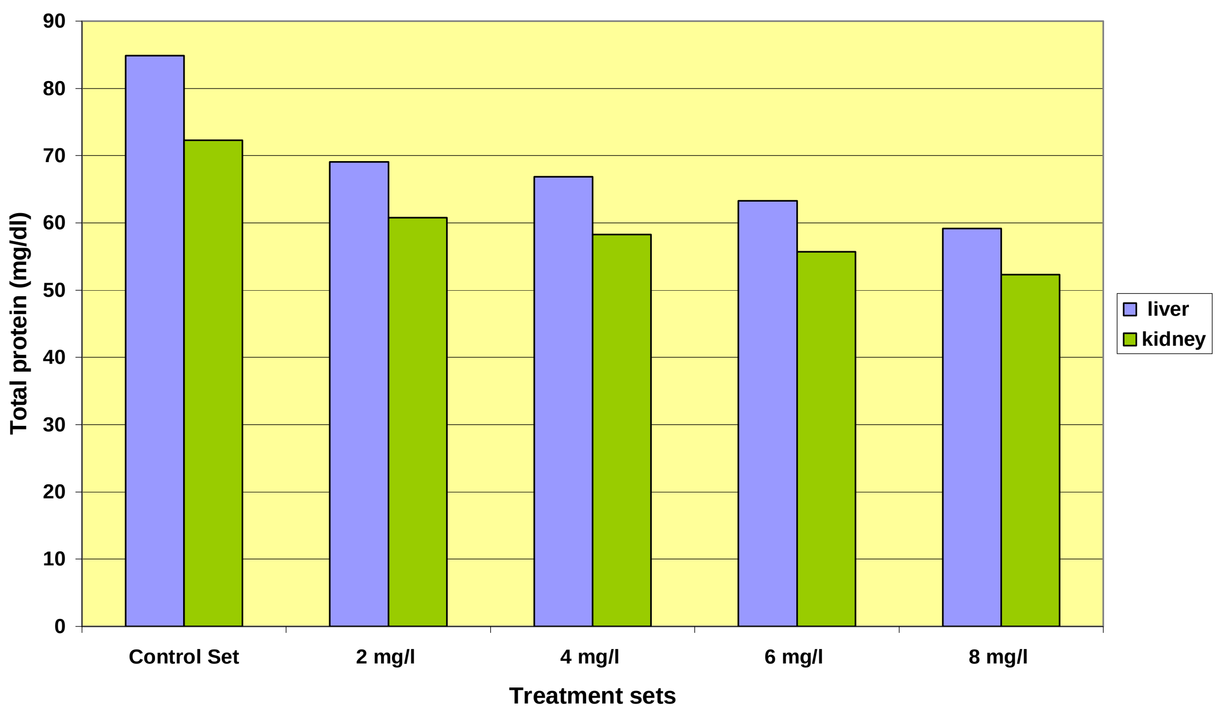
Total protein content was selected in the present study for evaluating the effect of carbaryl in liver and kidney of *Channa punctatus* for 90 days. The results are obtained by measuring total protein in liver and kidney of *Channa punctatus* exposed to different sub-lethal concentrations of carbaryl for 90 days is summarized in Table-1.

Table 1. Total protein in liver and kidney of *Channa punctatus* after different sub-lethal concentration of carbaryl.

Treatment sets	Total Protein (After 90 Days of Treatment)	
	In Liver	In Kidney
Control Set	84.85 ± 1.00	72.26 ± 1.10
2mg/l Treated	69.05 ± 0.60**	60.75 ± 1.05**
4mg/l Treated	66.85 ± 0.50**	58.26 ± 0.92**
6mg/l Treated	63.28 ± 0.99**	55.73 ± 0.88**
8mg/l Treated	59.15 ± 0.98***	52.32 ± 0.28***

(Mean ± S.Em) all values in mg/gm
* Non-Significant;
** Significant;
*** Highly Significant

The total protein content of the liver is maximum in control set, i.e. 84.85mg/gm, but in carbaryl treated groups at 2, 4, 6 and 8mg/l total protein value decreased significantly up to 59.15mg/gm. This depletion of protein from liver tissues may have been due to their degradation and possible utilization of degraded products for metabolic purposes. The similar decrease in protein content was also recorded by Stepanowska *et al.*, (2006), Kumar *et al.*, (2007), Srivastava and Verma (2009) and Tilak *et al.*, (2009). Decrease in liver protein causes acute burns, dehydration, nephritic syndromes, chronic liver diseases and other side effects.



In kidney, the total protein content was 72.26mg/gm in control set, while this value decreased significantly up to 52.32mg/gm with a treated set of 8mg/l concentration of carbaryl. This decrease in protein value due to the loss of total protein in tissues that are associated with intensive proteolysis and inhibition of protein degradation the similar findings were also found by Mustafa (1983), Tripathi *et al*., (2003), Begum (2003), Jaroli and Sharma (2005) and Koul *et al.*, (2007).

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