https://doi.org/10.33451/florafauna.v28i2pp262-266
FLORA AND FAUNA ISSN 2456 - 9364 (Online)
2022 Vol. 28 No. 2 PP 262-266 ISSN 0971 - 6920 (Print)

Effect of molasses on protein content of fresh water fish, *Puntius chrysopterus*

***Dinkar S. Tambe[1] and Sandip D. Talole[2]**

[1]Padmashri Vikhe Patil College of Arts, Science and Commerce,
PRAVARANAGAR, LONI KHURD-413713, (M.S.) INDIA
[2]Arts, Science and Commerce College ,
RAHATA-423107, (M.S.) INDIA
*Corresponding Author
E-mail: dinkartambe5679@gmail.com

Received **:** 11.08.2022; ***Accepted*** : 08.09.2022

ABSTRACT

It was examined whether molasses was toxic to the freshwater fish, *Puntius chrysopterus*. There was a 5 percent LC_{50} value for Molasses. Rapid, jerky swimming with seemingly random motions; toxic convulsions; postural instability; an increase in surface activity and opercular movements; a loss of equilibrium; these are all symptoms of the Molasses poisoning. A layer of mucus formed over the gills, and the lamellae of the gills changed from red to brown. The fish were swimming in isolation from one another until they all perished. Protein was shown to be diminished throughout all fish tissues following exposure to a sub-lethal quantity of molasses.

Figures : 03 References : 08 Tables : 02
KEY WORDS : Acute toxicity, Molasses, Protein, *Puntius chrysopterus*

Introduction

Molasses comprises by product of sugar industry, which is generally discarded or used in distilleries for fermentation and alcohol production. If it randomly disposed, it may enter into water bodies, leading to water pollution. Attempts were made during present investigation to find out the effect of molasses on protein content of the fish.

Life depends on water as its primary nutrient. Fish are one of the most significant bio indicators of water contamination, while other aquatic creatures may serve this purpose. Pesticide usage in agricultural areas has expanded dramatically in recent years to meet rising demand for food, medicine, clothes, cosmetics, *etc.,* but this has led to a decline in the quality of aquatic ecosystems such as rivers, lakes, streams, and ponds. Aquatic life, especially fish, is influenced by this water pollution.

It is now well recognised that human activities have contributed significantly to the degradation of aquatic ecosystems due to water pollution from a wide variety of sources, most notably factories and agricultural chemicals. Rains, winds, rivers and floods may transport these industrial emissions to big water bodies, where they might alter the Physico-chemical characteristics of the water, potentially making it more harmful. Polluted water is harmful to marine life, particularly fish because of their extreme sensitivity to toxins[5].

Chemicals have varying effects on the body because of the way in which they work. Some toxins cause outward harm to the body by acting locally at the point of entrance.

Substances in fish products must sometimes be measured to ensure they are within regulatory limits or to fulfil special requirements. Take the fish in fish cakes as an example. Knowing the composition of fish is crucial for extracting its maximum nutritional value, since it is one of the most useful sources of high-quality protein accessible to man in today's food-starved world. Muscle protein content in fish typically ranges from 15% to 20%, but may be as low as 15% or as high as 28% in rare cases.

A wide variety of fish species actively absorb and accumulate several toxicants, including pesticides, heavy metals and molasses, from aquatic environments. Molasses is the most hazardous of all these agricultural poisons, wreaking havoc on aquatic environments and the species that call them home. Molasses' harmful effect on the body results in a change in the biochemical composition of the soft tissues.

Molasses is commonly known as sugar factory wastewater flood into the water bodies. It is broad-spectrum, noncumulative. *Puntius chrysopterus* is most of the prime cultured freshwater fish in poly-culture and has tremendous economic importance. Molasses is a typical byproduct of sugar factories that releases its sewage into nearby water sources. It has far-reaching effects and does not stack. In this work, we looked at the

TABLE-1: Mortality of *Puntius chrysopterus* in different concentrations of molasses at 96 hr exposure

S. No.	Conc. of molasses in Percentage X103		Log Conc. of Molasses	No. of fishes exposed	No. of fishes alive	No. of fishes dead	Percent mortality	Probit mortality
1	1	100	2.00	10	9	1	10	3.72
2	2	200	2.30	10	8	2	20	4.16
3	3	300	2.47	10	7	3	30	4.48
4	4	400	2.60	10	6	4	40	4.75
5	5	500	2.69	10	5	5	50	5.00
6	6	600	2.77	10	3	7	70	5.52
7	7	700	2.84	10	3	7	70	5.52
8	8	800	2.90	10	2	8	80	5.84
9	9	900	2.95	10	2	8	80	5.84
10	10	1000	3.00	10	1	9	90	6.28

effects of molasses on the protein content of the freshwater fish *Puntius chrysopterus* and attempted to calculate its LC_{50} value in the year 2021.

Aims and Objective

Fish toxicity is an important study for fisheries development. Therefore, the current study attempted to determine the LC_{50} for molasses.

Materials and Methods

The freshwater fish, *Puntius chrysopterus* was captured in its natural habitat at Savlivihir near Shirdi in Taluka Rahata, Ahmednagar District Maharashtra, India. The fish ranged in length from 2.22 to 3.00 centimetres and in breadth from 0.50 to 1.0 centimetres.

After being rinsed with a 0.1 percent $KMnO_4$ solution to clear walls from microbial infection, the fishes were acclimatised to laboratory condition for two weeks in big chlorinated tap water. Fish in the tank underwent acclimation by having their water changed every day and being fed rice bran. During the current investigation, molasses was obtained from a sugar plant and employed as a toxicant.

TABLE-2 : Change in the protein content (mg/g wet wt. soft body tissue) and % change over the control of *Puntius chrysopterus* exposed to sublethal concentration of molasses for 96 hr.

S. No.	Tissue	Protein		% Decrease
		Control	Experimental	
1	Whole body tissue	15	5	66.66

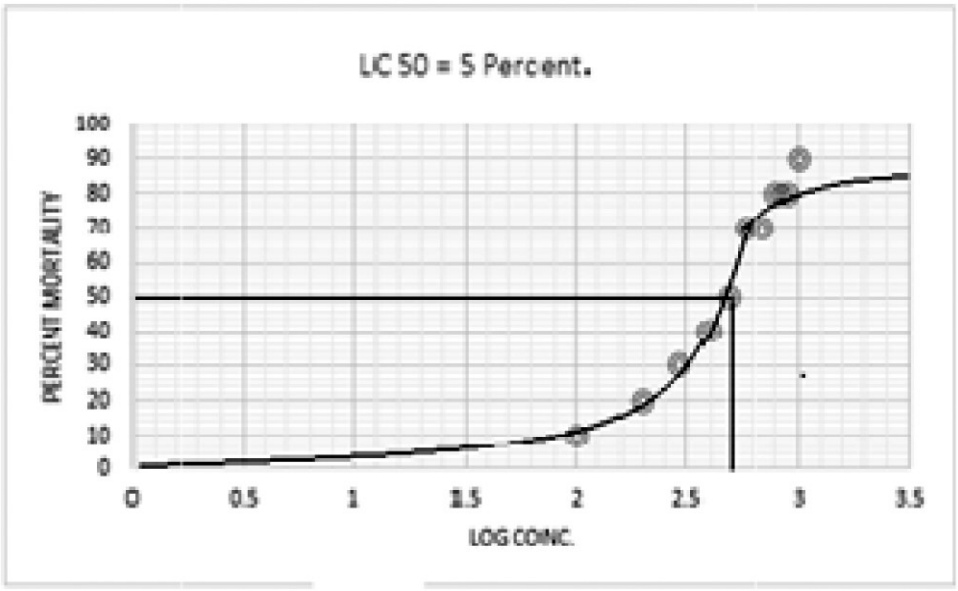

Fig. 1 : Percent mortality against Log concentration.

compliant protocols were used for all toxicity testing[1]. To test the effects of molasses on fish, we subjected them to various concentrations for 24, 48, 72, and 96 hours. It was decided to keep a separate group of fish as a control group. Mortality rates of fish were measured at 24, 48, 72, and 96 hours. The fatality rate was determined. Ten groups of fishes (10 fishes per group) were exposed to molasses at concentrations ranging from 1% to 10% for 24, 48, 72, and 96 hours to determine the median tolerance limit (LC_{50}).

The protein content estimated in whole body tissue samples following the method [7].

Result and Discussion

A higher molasses content in a water source is associated with a higher fish death rate (Table-1). As a percentage, the molasses concentration is plotted against the lethal concentration (LC_{50}) in a graph depicting the death rate. 5% was the LC_{50} value. Fish absorb molasses *via* their skin, gills, or mouth mucosa[4]. This study looked at the effects of a sublethal dose (5%) of molasses on the protein content of *Puntius chrysopterus* body tissues over the course of 96 hours. As a result of being immersed in molasses, the total amount of protein in their bodies fell dramatically. *Puntius chrysopterus* treated to sublethal

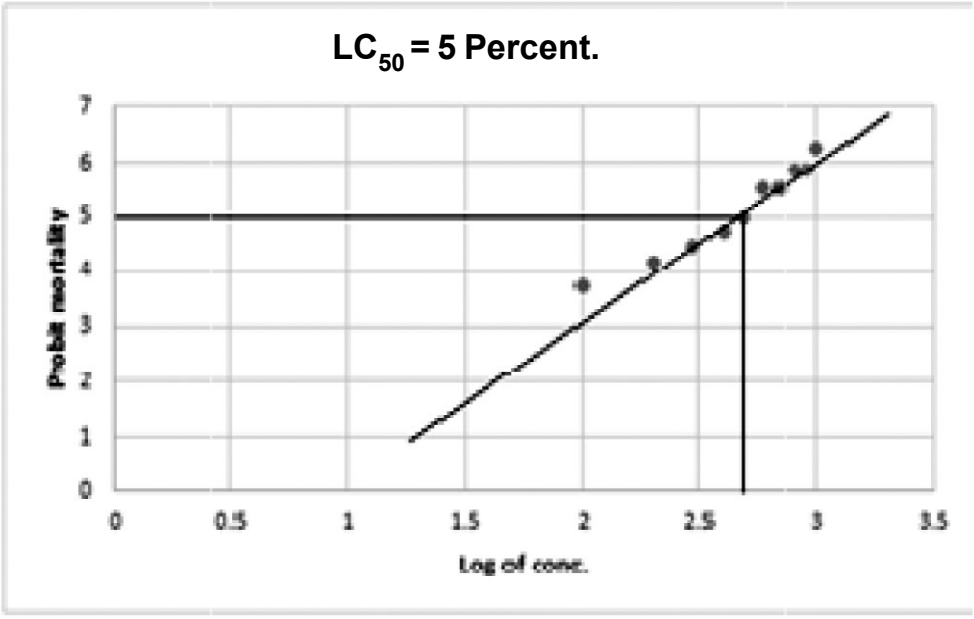

Fig. 2 : Probit mortality against Log concentration

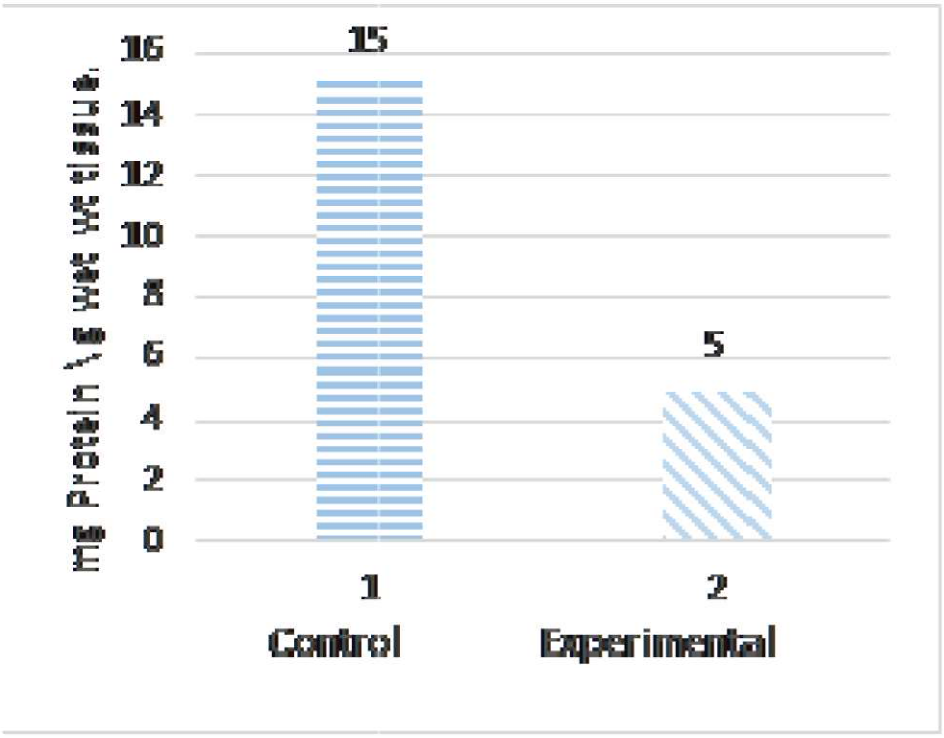

Fig. 3 : Change in the protein content (mg/g wet wt. of whole body tissue) over the control in *Puntius chrysopterus* exposed to sublethal concentration of molasses for 96.

concentrations of molasses for 96 hours: change in protein content (mg/g wet wt soft body tissue) and percent change from control (Table-2). Exposure to a sublethal quantity of molasses for 96 hours reduced the protein content of the fishes from the control group, which had a 15mg/g value, to a 5mg/g value. Investigators[6] documented a decrease in protein levels throughout the fish body as a whole. A lack of protein, as reported[6], may be due to the pesticide's interference with amino acid biosynthesis. Consumption of protein for its conversion into glucose is another probable cause.

Proteins seem to carry biological identity to different cell types, making them not only vital to cellular function but also to the survival of all forms of life[3]. When fish were given 5% molasses for 96 hours, a sub-lethal dose, the fish survived. After therapy, there was a notable drop in soft tissue protein levels. A catabolic process initiated by increased proteolysis led to rapid decline in protein concentration to meet the energy demand in an extremely stressful environment[2]. The early decline in muscle protein profile suggests stress in the metabolic process and impairment of protein synthesis machinery in fish. *Bengana elanga* whole-body tissues similarly showed a decreasing trend in total proteins. Fish in this research showed physiological flexibility in the face of toxicant stress, as seen by a drop in protein content. Fishes need a lot of energy to deal with stress. Due to the increased need for energy, protein catabolism may have been accelerated. Inhibition of metabolising enzymes by injection of toxicants may potentially account for the alterations and reduction in Protein level.

Multiple studies have shown that the use of toxic chemicals and fertilisers in farming reduces protein levels. These previous studies corroborate our current findings that molasses exposure reduces protein levels in *Puntius chrysopterus* tissues.

Conclusion

Protein metabolism of the fish, *Puntius chrysopterus* was altered as a result of exposure to molasses, as shown by a greater decrease in protein levels in treated fish tissues. The changed mobility and low content of Proteins represents a change in the rate of synthesis and degradation of Protein, reduced working capacity under the influence of accumulation of toxicant leading to a modification in function, and therefore increased susceptibility of the soft body tissue.

References

1. APHA. Standard Methods for the Examination of Water and Wastewater. 21st Edition, American Public Health Association/American Water Works Association/Water Environment Federation, Washington DC. 2005.

2. Baruah K, Sahu NP, Pal AK, Debnath D, Mukherjee SC. Dietary Microbial Phytase and Citric Acid Synergistically Enhances Nutrient Digestibility and Growth Performance of *Labeo rohita* (Hamilton) Juveniles at Sub-Optimal Protein Level. *Aquaculture Research.* 2007; **38**(2) : 109–120.

3. Brijender Bhushan, Sunita Pande, Nishi Saxena, Prabhu Narain Saxena. Serum biochemical responses under stress of cypermethrin in albino rat Toxicology Laboratory, Department of Zoology, School of Life Sciences, Dr. B.R. Ambedkar University, Khandari Campus, Agra 282002, India. 2002.

4. Dalela RC, Bhatnagar MC,Tyagi AK, Varma SR. Adenosinetriphosphatase activity in few tissues of fresh water teleost, *Channa gachua* following *in vivo* exposer to endosulfan. *Toxicology*. 1978 : 11361-368.

5. Herger W, Jung SJ, Peter H, Acute and prolonged toxicity to aquatic organisms of new and existing chemicals and pesticides. *Chemosphere.* 1995; **31**: 2707-2726.

6. Kale MD, Fvhanalkar SA, Waghmode SS, Muley DV, Sodium fluoride induced protein alteration in fresh water fish, *Cirrhina mrigala. J. aqua. Boil.* 2010; **25**(2) : 127-129.

7. Oliver H, Lowry Nira, J Rosebrough, A Lewis Farr, Rose J Randall. From the Department of Pharmacology, Washington University School of Medicine, St. Louis, Missouri, Received for publication. May 28, 1951.

8. Srivastava Rama, Srivastava Neera. Centre for Advanced Studies, Department of Zoology, Changes in nutritive value of fish, *Channa punctatus* after chronic exposure to zinc. University of Rajasthan, Jaipur-302 004, India. August 12, 2006.