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Piscicidal effect of *Luffa cylindrica* on tilapia (*Oreochromis mossambicus*) fingerlings

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Abstract- The purpose of this study was to determine the lethal concentration (LC_{50}) value of an extract of *Luffa cylindrica* fruit applied to *Oreochromis mossambicus* tilapia in the laboratory. After adding the extracts in proportion to the water in the aquarium, five distinct concentrations of the extract were produced: 8 g/l, 10 g/l, 12 g /l, 14 g /l, and 16 g /l. The lethal concentration (LC_{50}) of *Luffa cylindrica* on *Oreochromis mossambicus* was determined to be 10.54 g/l for exposure periods of 96 hours. The dose response of mortality as well as alterations in behavioural patterns were investigated in relation to the *Luffa cylindrica* fruit extract.

Key words: *Oreochromis mossambicus, Luffa cylindrical*, toxicity

INTRODUCTION

It has been suggested that the use of piscicides derived from plants could be the most effective alternative to the use of chemical piscicides in aquaculture for the elimination of fish fry predators and undesirable fish in aquaculture ponds. It is believed that plant extract is appealing owing to the fact that it is not harmful to the environment, that it is simple to acquire, that it is highly effective, that it poses a lower risk of toxicity to animals that are not the intended target, and that it biodegrades rapidly. It is possible to utilise it directly as an extract, either dissolved in water or in alcohol. Both of these methods are possible. There are a variety of applications for the several piscicidal components that may be extracted from this plant. Botanicals is the term that is used to refer to the extracts that are taken from plants, while piscicides is the term that is used to refer to compounds that are harmful to fish.[1] Producing plant pesticides using techniques derived from biotechnology has the potential to become a big industry in the long term. It is believed that plant extracts could prove to be useful agents because of their low toxicity to animals that are not the intended target, ease of availability, high efficiency, and rapid biodegradability.[2]

In addition to this, plant extracts do not negatively impact the environment. The catching of fish has been done by the utilisation of a wide array of plants sourced from all over the world. Because of the toxic characteristics that they possess, the roots, seeds, fruits, bark, and leaves of plants, as well as other plant parts, can all be used to poison fish. Both the *Luffa aegyptiaca* and the *Luffa cylindrica* species are capable of causing the death of fish, as stated by Neuwinger (1994). The *L. cylindrica* has a

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higher toxicity level. *L. cylindrica*, often called vegetable sponge gourd, is a member of the family Cucurbitaceae. This family also includes cucumbers. This plant is utilised on a large scale as a fish poison. The fruits of this plant are used by the indigenous farmers of Nigeria to entice fish out of bodies of water so that they might be consumed by people. Because of its hardy nature, the *Oreochromis mossambicus* fish, which is indigenous to southern Africa, is one of the most common species to be farmed for commercial purposes around the world. They are able to thrive despite the severe conditions of the aquatic environment as a result of their varied eating patterns, which allow them to consume a wide variety of foods. The species is able to withstand a wide array of issues pertaining to the quality of the water and has been deployed extensively as organisms to test various bioassays. There have been very few papers published on the topic of the piscicidal effect that *L. cylindrica* has on fishes under settings that are typical of India. The goal of the current inquiry, which is being carried out in order to observe the harmful effects of this plant on *O. mossambicus* in the laboratory circumstances, is in light of those indicated above.

MATERIALS & METHODS

The research was carried out in the laboratory of the Post Graduate Department of Zoology at B.N.M. University in Madhepura during the months of May and June of 2020. The fruits of the *Luffa cylindrica* plant were collected during those months. At a local market not far away, we were able to get our hands on some freshly picked Luffa cylindrica fruit. After being cut into smaller pieces, it was crushed into a more uniform form with an electric grinder. The uniformity of the final product was not affected.

After collecting the pure extract of this aqueous substance into a bottle, covering it, and storing it in a refrigerator at a temperature of 40 degrees Celsius in order to maintain its freshness until it was time to administer it, After making certain that the aqueous extract was well mixed, the experimental tanks were left empty for a period of half an hour before any fish were put inside. In the control condition, no extract was added, and the fish were maintained in water that did not contain any extract concentration. This was known as the "no extract" condition.

In order to carry out the phytochemical analysis of the aqueous extract fruits of *L. cylindrica*, the methodologies that were adopted[3] were applied.

The local fish market is where we purchased the *Oreochromis mossambicus* fingerlings, which are currently in excellent health. These fingerlings measured an average of 100.38 centimetres in length and weighed an average of 230.07 grammes each. Before beginning the experiment, they were held for a period of three weeks in a humid laboratory. The fish were fed pellets, and the water quality was maintained at its highest possible level during the experiment. The water in the fish tanks that measured 60 cm by 30 cm by 30 cm was changed out with fresh water on an as-needed basis and was provided with sufficient ventilation.

Experiments were conducted in glass aquariums that were each 15 litres in size and filled with chlorine-free tap water. This was done in order to ascertain the median lethal concentration value, also known as the LC_{50}, over a period of 96 hours. One concentration served as a control, while the other four were subjected to varying degrees of change in order to create eight grammes per litre, ten grammes per litre, twelve grammes per litre, fourteen grammes per litre, and sixteen grammes per litre, respectively. Twenty fish were kept in each aquarium, and using replications, they were exposed to each of the different concentrations that were discussed in the previous section. The water of the control group did not have any extract added to it, and the fish that were maintained there were kept in water that did not contain any concentration of extract. In accordance with the standard operating protocol, the fish were exposed to an aqueous extract of the fruit of *Luffa cylindrica* for a period of ninety-six hours in order to perform a toxicity test.

During the course of the test, the fish were not given any food. The number of deaths that occurred in each tank was recorded at predetermined intervals. The dead fish were collected and put in storage so that they could be analysed in greater detail later.

Evaluation of the water's quality based on a number of parameters Some of the important physicochemical factors that were looked into were the amounts of dissolved oxygen (DO), free carbon dioxide (CO_2), total alkalinity, and ammonia content in the water. The protocols indicated in APHA were followed in order to carry out the analyses of the water quality parameters at the beginning and the end of the experiment. These analyses were carried out over the course of the median lethal test, which lasted for a total of 96 hours.

In order to establish the value of the LC_{50} for *L. cylindrical* in comparison to *O. mossambicus*, the Probit analysis method was applied.

RESULTS & DISCUSSION

The examination of the *Oreochromis mossambicus* fish for its potential to be harmful for *O. mossambicus* fingerlings, the median fatal concentration of *L. cylindrica*, also known as the 96-hour LC_{50} value, was found to be 10.54 g/l. This value is commonly referred to as the 96-hour LC_{50} value. The amount of fruit extract that was used and the amount of time that the fish were exposed to it both had an effect on the percentage of fish that perished after being exposed to the fruit extract. The findings of an analysis of variance (ANOVA) indicate that there is a statistically significant disparity between the concentration of the extract and the rate of mortality experienced by the fish. This conclusion was reached as a result of research that investigated how the amount of extract's concentration influenced the proportion of fish that were killed. The value of the correlation coefficient (R) between the concentration of the extract and the death rate of the fish was 0.950. This value was significant. In the group that served as a control, there was no sign of mortality. It was reported that the LC_{50} value of *Zanthoxylum rhetsa* in *Heteropneustes fossilis* was determined to be 70.1 mg/l during exposure periods of 96 hours. According to a report by, the LC50 value of the fruit extract of *Luffa cylindrica* on juvenile African catfish *Clarias gariepinus* (Buchell, 1822) was 14 g/l. This value was determined by testing the extract on the fish.[4] *Oreochromis mossambicus* had LC_{50} values of 14.40, 13.40, 12.34, and 11.68 mg/l for the synthetic drug mancozeb after 24, 48, 72, and 96 hours, respectively. These values were measured after 24, 48, 72, and 96 hours.[5] It was discovered that a dose of Mohua extract at 100 mg/l did not cause death in walking catfish *Clarias batrachus,* which is below the threshold that causes death.[6] Research and testing were conducted on Nile tilapia to investigate the effectiveness of piscicides produced from plants. In the Philippines, *Oreochromis niloticus* was tested with 10 different varieties of locally obtainable plants. The following was discovered to be the 96-hour lethal concentration (LC_{50}): adelfa (0.083 ml/l), makabuhai (0.44 ml/l), ampalaya (0.45 ml/l), neem (2.57 ml/l), and lagundi (2.93 ml/l (52 ml/l). The 96-hour LC_{50} value for dimethoate was reported to be 65 mg/l for *Clarias batrachus*[7], 47 mg l-1 (96 hr) for *Channa punctatus*, and 17.9 mg/l (24 hours) for *C. punctatus*. This information was obtained while dimethoate was being utilised as a fish toxicant.[8] Several different pisicidal herbs from Nepal against several species of catfish, including *Ophiocephalus punctatus, Clarias batrachus* and *Heteropneustes fossilis*, with LC_{50} values of 90 mg/l, 102.4 mg/l, and 109.1 mg/l, respectively.

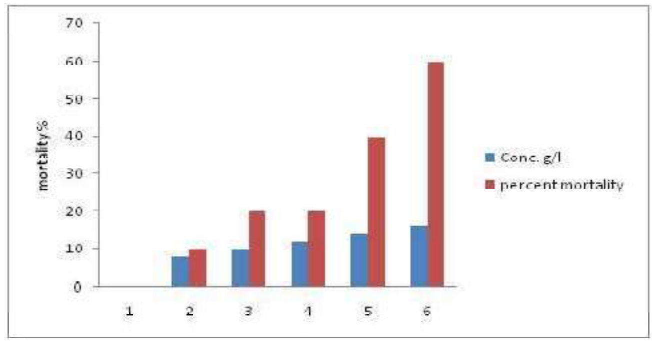

Fig. 1- Percentage mortality at different concentration

CONCLUSION

According to the findings of the current research, it is possible to draw the conclusion that the fingerlings of the tilapia species *Oreochromis mossambicus* should not be exposed to the fruit extract of *L. cylindrica*. In order to successfully engage in commercial aquaculture, it is required to exercise control over and eliminate undesirable fish species from bodies of water. The elimination of fish populations in a shorter amount of time can be accomplished with remarkable efficiency by using synthetic chemicals; however, these substances are not safe for the environment. It is feasible that plant piscicides, which are not damaging to the environment and have dual effects, such as the killing of fish and the generation of manure after a certain period of time has passed, could be utilised in some situations. The findings of this study suggest that plant materials that are easily accessible in the local area, such as *L. cylindrica*, have the capacity to eradicate undesired fishes and can be employed as piscicides on a broad scale. In addition, the plant materials in question are both environmentally friendly and capable of decomposing naturally. This study has the potential to make a substantial contribution to the development of a new plant-based piscicide that may be utilised in aquaculture management systems for the purpose of controlling fish populations.

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REFERENCES

1. **Fafioye O. O. 2005.** Plants with Piscicidal Activities in Southwestern Nigeria. *Turkish Journal of Fisheries and Aquatic Sciences*. **5:**91-97.
2. **Yunis A. J., Claudiano G. S., Marcusso P. F., Ikefuti C., Ortega G. G., Eto S. F. 2014.** Acute toxicity and determination of the active constituents of aqueous extract of *Uncaria tomentosa* bark in *Hyphessobrycon eques*. *Journal of toxicology*. 412-437.
3. **APHA, AWWA, WEF. 2012.** *Standard Methods for examination of water and wastewater*. Edn 22, American Public Health Association, Washington, 1360.
4. **Saha N. C., Giri S. N., Chatterjee N., Biswas S. J., Bej S. 2016.** Acute toxic effects of Mancozeb to fish *Oreochromis mossambicus* (W. K. H. Peters, 1852) and their behavior. *International Journal of Advanced Research in Biological Sciences.* **3(6):**40-44.
5. **Rajput V. & Gaur R. 2015.** Toxicological study on *Clarias batrachus* caused by Croton and Mahua extract. *Journal of Pharmacognosy and Phytochemistry.* **3(5):**32-34.
6. **Cagauan A. G., Galaites M. C., Fajardo L. J. 2004.** Evaluation of botanical piscicides on Nile Tilapia (*Oreochromis niloticus* L.) and mosquito fish (*Gambusia affinis* Baird and Girard). *Proceedings of 6th International Symposium on Tilapia in Aquaculture;* Manila, Philippines, 179-87.
7. **Begum G., Vijayaraghavan S. 1995.** *In vivo* toxicity of dimethoate on protein and transaminases in the liver tissue of fresh water fish *Clarias batrachus* (Linn.). *Bulletin of Environmental Contamination and Toxicology*. **54:**370-375.
8. **Srivastava V. K., Singh A. 2001.** Studies of seasonal variation in toxicity of frequently used commercial organophosphate, carbamate and synthetic pyrethroids pesticides against freshwater fish *Channa punctatus* and behavioural responses to treated fish. *Malaysian Applied Biology*. **30:**17-23.

ADDITIONAL REFERENCES

9. **Edafe O., Sikoki D. S. F., Vincent-Akpu I. J. and Ita U. D. 2016.** Acute Toxicity of Sponge Plant (*Luffa cylindrica*) Fruit Extract on African Catfish (*Clarias gariepinus*, Buchell 1822) Juveniles. *International Journal of Life Sciences Research*. **4(1):**148-159.
10. **Neuwinger H. D. 1994.** Fish Poisoning Plants in Africa. *Plant Biology*. **107(4):**263-270.
11. **Pandey A., Kumar G. K., Munshi J. S. D. 1990.** Integumentary chromatophores and mucous glands of fish as indicator of heavy metal pollution. *Journal of Freshwater Biology*. **2:**117-121.
12. **Stalin S. I., Kiruba S., Manohar S., Das S. 2008.** A comparative study on the toxicity of a synthetic pyrethroid, deltamethrin and a neem based pesticide, Azadirachtin to *Poecilia reticulata* Peters (Cyprinodontiformes: Poeciliidae). *Turkish Journal of Fisheries and Aquatic Sciences*. **8:**01-05.
13. **Yekeen T. A., Fawole O.O. 2011.** Toxic effects of endosulfan on haematological and biochemical indices of *Clarias gariepinus*. *African Journal of Biotechnology*. **10(64):**14090-14096.

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