

# Toxicity of *Piper guineense* berry to *Clarias gariepinus*

Frank N. I. Morah, Albert P. Ekanem, Victoria O. Edubio

## ABSTRACT

**Aims:** To evaluate the ichthyotoxic effect of *Piper guineense* that has been recommended for control of exoparasites of fish. **Methods:** Ten *Clarias gariepinus* finger lings were kept in each of the different aquaria containing different levels of aqueous extract of *Piper guineense* berry. The fishes were observed for a period of 96 hours. The behavior, external changes and mortality of the fishes were observed during the period. **Results:** Introduction of the plant extract into the aquarium water resulted in death of the fishes and has an  $LC_{50}$  of  $3.1 \text{ mgcm}^{-3}$  after 96 h. These fishes showed erratic swimming motions, loss of reflex, vertical swimming and discoloration before dying. **Conclusion:** *Piper guineense* berry is toxic to catfish. A therapeutic dose of this plant should be worked out in such a way that it will not exceed its safe level.

**Keywords:** *Piper guineense*, *Clarias gariepinus*, Ichthyotoxicity

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## INTRODUCTION

*Piper guineense* is an important African medicinal plant. The seeds are revulsive, anthelmintic, carminative, appetizer, stomachic, styptic, vulnerary, calefacient, bronchodilator, digestive and counterirritant [1]. It is used for preparation of soup and yam porridge for women after child birth in Nigeria. It imparts heat and a spicy pungent aroma to classic West African soups. It also has antioxidant properties for effective preservation of smoke-dried catfish [2]. *Piper guineense* berry and leaf have been reported to have strong insecticidal and antimicrobial activities [3–5]. Its extract has been successfully used for the control of monogenean parasite on goldfish [6]. Piperine isolated from this plant species has been shown to be active against *Argulus* species exoparasite on goldfish.

Different plants contain organic compounds which are toxic to fishes. Such compounds include saponins, coumarins, cyanogenic glycosides and rotenones [7]. The presence of these ichthyotoxic plants in water causes lowering of dissolved oxygen level, physiological changes in fish or damage to gill lamellae which eventually lead to death of aquatic life [8, 9].

*Clarias gariepinus* belongs to the family Clariidae. It is widely and naturally distributed in all parts of the

African continent. Ecologically, it requires calm waters like lakes, ponds and pools but may also occur in fast flowing streams and rivers [10]. It is an African fresh water air-breather capable of tolerating a wide fluctuation of dissolved oxygen and other extreme environmental conditions because of the possession of accessory breathing organs which enables it to breathe air when exposed to adverse environmental conditions like lack of dissolved oxygen [11]. It is regarded as one of the most important aquaculture candidates because of its ability to tolerate a wide range of environmental conditions, high stocking densities under culture conditions, fast growth rate, high yield potential, high fecundity, air breathing characteristics and high market value [12, 13].

### Aims

Since *Piper guineense* has been recommended for control of fish parasites, the present work is aimed at evaluation of its toxicity to *Clarias gariepinus*.

### MATERIALS AND METHODS

The fresh berries of *Piper guineense* were purchased from Akim Market, Calabar municipality, Cross River State, Nigeria. They were dried in an air circulating oven at 60°C for 9 h and powdered. The powdered berries (45 g) were extracted with distilled water for 5 h using a Soxhlet extractor. The resultant solution of the extract was distilled down in vacuo to give 35 g of the aqueous extract.

*Clarias gariepinus* fingerlings were harvested from the University of Calabar fish farm. They were kept in aquaria in the laboratory at room temperature for one week to acclimatize to the laboratory environment. Ten fingerlings were introduced into each of the six aquaria containing 0.000, 0.067, 0.125, 0.250, 0.500 and 1.000 mgcm<sup>-3</sup> of the extract in water. The experiment lasted for four days (96 h) and was monitored every 24 h. The

behavior, external changes and mortality of the fishes were observed during the period.

### RESULTS

Table 1 gives the effect of aqueous extract of *Piper guineense* berry on the survival rate of *Clarias gariepinus*. It shows the number of deaths after 24, 48, 72 and 96 hours. Mortality of the fish reached 100% after 96 hours at the level of 1.0 mgcm<sup>-3</sup> of the berry extract in water.

### DISCUSSION

When *Clarias gariepinus* fingerlings were exposed to different levels of the extract in water, there was no death in the control and at 0.063 mgcm<sup>-3</sup> level. Ten percent of the fishes died at 0.125 mgcm<sup>-3</sup> while 100% died at the 1.00 mgcm<sup>-3</sup> level of the plant extract in water after 96 hours. The LC<sub>50</sub> occurred at 3.1 mgcm<sup>-3</sup> level. These fishes showed erratic swimming motions, loss of reflex, vertical swimming and discoloration before dying. These are indications of physiological stress which must have lead to the observed mortality [14]. The abnormal behaviors are concentration dependent as they increased with an increase in concentration of the extract. The mortality rate which is directly proportional to the concentration of the berry extract is also time dependent. The abnormal behavior did not occur in the control. Hence the mortality is attributed to the introduced plant extract. *Piper guineense* crude extract or its constituent piperine have been successfully been employed for the control of exoparasites of fish and have been recommended for phototherapy of fish [6, 15]. With the observed ichthyotoxic effect of *Piper guineense* extract, the authors recommend that a therapeutic dose of this plant should be fashioned out in such a way as to avoid exceeding its safety limit when used for phytotherapy of fish.

Table 1: Effect of aqueous extract of *Piper guineense* berry on survival rate of *Clarias gariepinus*

Concentration	Mortality with time				Total	% mortality
	24 h	48 h	72 h	96 h		
0.000 mgcm <sup>-3</sup>	0	0	0	0	0	0%
0.063 mgcm <sup>-3</sup>	0	0	0	0	0	0%
0.125 mgcm <sup>-3</sup>	0	0	1	0	1	10%
0.250 mgcm <sup>-3</sup>	0	1.3	2.7	0	4	40%
0.500 mgcm <sup>-3</sup>	3.7	3.3	1.7	0.6	9.3	93%
1.000 mgcm <sup>-3</sup>	6.3	3.7	0	0	10	100%

## CONCLUSION

Although *Piper guineense* can be used for control of exoparasites and microbial infections of *Clarias gariepinus*, the present work shows that it is toxic to the catfish at higher doses. The authors, therefore, call for a control on the level to be employed for therapeutic purposes.

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## Author Contributions

Frank N. I. Morah – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Albert P. Ekanem – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Victoria O. Edubio – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

## Guarantor

The corresponding author is the guarantor of submission.

## Conflict of Interest

Authors declare no conflict of interest.

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