Acute Effect of *Spondianthus Preussii leaf* Powder on *Clarias gariepinus* fry

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ABSTRACT
One thousand two hundred Clarias gariepinus fry (mean) were obtained from Aqualife consult, a reputable fish farm in Rivers State. These specimens were acclimated in 12 rectangular plastic containers (45cm - length x 30cm - width x 24cm - dept) filled with twenty liters of water each for 24 hours. After acclimation, the containers were thoroughly washed and refilled. Three graded concentrations - 1.00g/l, 1.10g/l, and 1.20g/l of Spondianthus preussii leaf powder were respectively added to each of the replicates that made up the three treatments. All treatments were exposed to the leaf powder for – 24hrs, 48hrs, 72 hrs and 96hrs. During the experimental period some physicochemical parameters such as temperature, pH, dissolved oxygen, total dissolved solids, ammonia and nitrite were monitored weekly. Temperature did not differ significantly (p>0.05) with increase in concentration. pH, DO, ammonia and nitrite slightly decreased while total dissolved solids increased with increase in concentration. Over time, some behavioral changes such as gasping for air, mucus secretion on the skin and erratic swimming prior to death were observed. The highest mean survival was observed at control (0.00g/l) which showed 100% survival followed by that of 1.00g/l where at: 24hrs - 120 (40%) of fry died; 48hrs – 80 (26.67%) died; 72hrs – 70 (23.33%) died and 96 hrs – 30 (10.00%) died. At 1.10g/l - 156 (52%); 70 (23.33%); 54 (18.00%) and 20 (6.66%) respectively died at 24, 48, 72 and 96 hrs. At 24hrs - 210 fry (70.0%) died; 70 fry (23.33%) died; 20 fry (6.66%) died at 1.20g/l.

KEYWORDS: *Spondianthus preussii, Clarias gariepinus, fry, physicochemical, treatment.*

1.0 INTRODUCTION

Fafioye, (2005) reported 40 plants with piscicidal effects being used in Southwest Nigeria for fish harvesting. However, it can be expected that the use of these plants for fishing in Nigeria freshwater bodies would have negative effects on aquatic biodiversity. Plants are the largest chemical industry in the whole universe as they possess the capacity to manufacture endless varieties of active substances. Generally, plants that produce chemicals having piscicidal activity are termed piscicidal plants (Banerjee *et al.*,1999; Buege, and Aust, 1978). Research interest in piscicidal plants is predicated by lack of information on their ecology, toxicological effects, insecticidal properties and an urgent need for effective and eco-friendly piscicides for aquaculture management (Carvalho *et al.*, 2012). Fafioye (2005), reported that biocides are believed to be more environmentally friendly because they are easily biodegradable, cheap and leave no residues in the environment and are easily reversed in fish subjected to chronic concentrations. The use of piscicides as a tool in pond management during pond preparation to get rid of predators before fish stocking is an important tool. Ideally, ponds should be sundried and the pond bottom cracked dried to help get rid of fish predators. However, this practice is not always possible particularly during the wet season. Moreover, farmers who are always in a hurry to prepare their ponds always resort to the use of synthetic fish toxicants.

Some producers battles with this problem by using cyanide (a poison) or any other poison of similar nature that can have serious impact on other organisms in food chain, including humans. Some use tea seed cake to control predators and trash fishes, while others drain ponds, which is usually not feasible and also ineffective in controlling and eradicating unwanted fishes at commercial scale.

Fish toxicants (piscicides) can be herbal or synthetic. Synthetic piscicides are not biodegradable, and hence, pose the problems of environmental resistance, pest resurgence and could have detrimental effects on non- target organisms (Fafioye and Adebisi, 2002). The use of plant piscicides for poisoning and stupefying fish is very common globally and is most preferred to synthetic piscides (Olufayo, 2009). Plants are virtually an inexhaustible source of structurally diverse and biologically active substances (Batabyal *et al., 2007*). Plant poisons called botanicals are extracted from flowers, bark, pulp, seeds, roots, leaves and even the entire plant (Sirivam *et al., 2004*). Some plants contain compounds of various classes that have insecticidal, piscicidal and molluscicidal properties (Wang and Huffman, *1991*). The *rotenones, saponins and cynanide* account for nearly all varieties of fish poisons; others are *ichthyoethereol, triterpene and other ichthyotoxins* (Béarez, 1998).

*Spondianthus preussi i*is a plant of moderate elevation in the humid tropics, where it can be found at elevation up to 1800 metres. The leaves and stem bark contain extremely hazardous, very toxic and volatile monoflouro acetic acid, as well as saponins, flavonoid and tannins.

Fawole *et al*., 2007 and Sadiku, *et al*., 1991 reported that fish is one of the cheapest protein sources in Africa, and the importance of fish in developing countries increased greatly after the Sahelian drought of 1971 to 1974, which decimated the prices of beef. *Clarias gariepinus* belongs to the family Claridae. This fish species is the most cultured fresh water fish in Nigeria. They are characterized by their ability to grow on a wide range of artificial and natural feeds, ability to feed on a wider range of organisms including insects. *Clarias gariepinus* has a high potential hardness and tolerance to dissolved oxygen, can be cultured at high stocking density hence emphasis has been on how to increase productivity. Although, African catfish has been reported to tolerate estuarine conditions, it is considered to be a fresh water fish species which is accessible in land locked African countries.

In Nigeria today, there is no legally registered fish toxicant except for some organics such as tea seed cake and tobacco dust. In view of this, farmers resort to nonconventional and unregistered fish toxicants such as agro-pesticides and sodium cyanide because they are fast acting and readily available in the market in order to increase catch yields in traditional fishing. Different toxic plants that can stupefy fish have been exploited (Kamalkishor *et al.*, 2009). However, these chemicals may have negative effects on the environment and farmers' health.

Although, all fishing methods have a direct impact on the target resources and may also affect non target resources, but the use of fish poison plant is an example of destructive practices because the economic losses for the local and wider society resulting from such damage far outweigh the short-term individual gains made by the users of these destructive methods. The poisons also kill other non –targeted organisms in the ecosystem thereby altering the trophic system including the coral reef- building organisms (FAO, 2005). The use of poison also results in by- catch made up of wrong size of target species, other species that are not eaten or for which there is no market and banned or endangered species resulting into food shortages as they are thrown back into the water dead or wounded..

Spondianthus preussii (SP) is an important tropical tree species for producing poison and other wood products. It is a large water-loving tree native to Africa extending from Liberia to Gabon (Keay *et al.*, 1964). Ethnotoxicologically, SP is locally named and known as rat poison plant (Yoruba: Obo ekute, Benin: Orho, Ijaw: Opolata, Efik: Ibok-eku) in Nigeria (Keay *et al.,* 1964), and is one of the most used plant species in remedy developed for the control of rat. This information is accessible and the popularity of SP as pesticidal toxic agent is evident and widespread in Nigeria but data on its extracts suitability for controlling wood pests are not available. Sowemimo *et al.,* 2007 reported that SP stem bark successfully had 'knock down' effects on brine shrimps and rats, and then caused chromosomal damage in rats at lowest used concentration of 2.5 mg/kg. All parts of *Spondianthus preussii* are extremely poisonous, and medicinal uses are scarce. A strongly diluted leaf decoction is sometimes drunk to treat fever. A bark decoction is used as mouthwash to treat toothache. It is also taken to treat stomach-ache and pains during pregnancy. Bark maceration is applied to snakebites. Rice, meat or fish cooked with the bark, bark sap or pulverized seeds are widely used in baits to kill rodents and stray dogs. The plant is considered too poisonous to use as arrow poison as the poison spreads too easily through the meat; however, in Côte d'Ivoire it has sometimes been used in hunting elephants. Pulverized twig bark and seeds are added to drinks for criminal purposes. The bark sap is also used as fish poison. The poisonous leaves are particularly dangerous to cattle; the animals may die suddenly several hours later without any symptoms. In southern Nigeria the Yoruba people use the fruit in a ceremony to cure certain cough ailments. The heartwood is brownish, strongly speckled, hard and heavy. The wood is used for construction and implements. In Uganda the trunk is used to make dugout canoes. As the wood is dense and slow burning, the charcoal is popular with blacksmiths in southern Nigeria.

2.0 MATERIAL AND METHODS

2.1 Experimental Area and Set up

This experiment was carried out at the University of Port Harcourt demonstration farm, aquaculture unit Choba Port Harcourt Rivers State. Rectangular plastic containers of (15 × 3 cm) with net covers were used to avoid or prevent fish from jumping from experimental tanks. Each container was filled with 20 liters of water and the pH of the water was checked and corrected.

2.2 Sample Collection and Preparation

The fresh sample of the piscicide (*Spondianthus preussii*) was collected from the forest between Choba and Emouha in Obio/Akpor Local Government Area of Rivers State, Nigeria. The samples were washed and oven- dried at $100^{o}c$, ground into fine powder and stored in a container.

2.3 Trial test

Series of trial test were conducted until a definitive test was reached.

2.4 Specimens for Experiment.

Fry (6 days old) used in this study was purchased from a reputable farm in Rivers state. Care was taken to avoid stress during the transportation. The fry were counted and stocked at 300/tank in each of the experimental tanks.

2.5 Acclimation

Fry were acclimated for 24 hours before the introduction of the toxicant and was fed with artemia, three times daily.

2.6 Experimental Design

Complete randomized design was used in this work

2.6 Physicochemical Parameter

Temperature, Dissolved oxygen (DO), pH, Ammonia, Nitrite, Total dissolved solid were determined using standard methods.

2.7 Statistical Analysis

Using SPSS version, data was pulled by treatment and presented by mean and standard deviation (SD) or standard error (SE). Data analysed for the treatment effect was determined and data obtained was subjected to one-way analysis of variance (ANOVA) using general linear model (GLM of SAS 9.2). Results was subjected to statistical analysis using Duncan's multiple range F-test to test for significant difference ($p< 0.05$) among various concentrations of the *Spondianthus Preussii* and the control.

3.0 RESULT

The mean values for water variables such as pH, temperature, total dissolved solids, dissolved oxygen, ammonia and nitrite obtained in the experimental tanks during the exposure of *C gariepinus* fry to *Spondianthus preussii* leaf powder are presented in table

1. pH, temperature, ammonia and nitrite were in the same range with no significant difference ($p > 0.05$). Total dissolved solids (Fig.3) increased with increase in concentration while dissolved oxygen decreased with increase in concentration (Table 1 and Fig. 4). pH decreased with increase in toxicant concentration. Temperature is within the same range (Fig. 2). Total dissolved solids increased with increase in the concentration of the toxicant (Fig. 3). Dissolved oxygen (Fig.4) dropped with increase concentration. Ammonia and Nitrite shows an upward movement with increase in concentration (Fig. 5 and 6) respectively. At 1.00g/l: 24hrs - 120 (40%), 48hs - 80 (26.67%), 72hrs - 70 (23.33%) and 96hrs - 30 (10.00%), at 1.10g/l: 24hrs - 156 (52.00%), 48hrs – 70 (23.33%), 72hrs – 54 (18.00%), 96hrs – 20 (6.66%); and at 1.20g/l: 24hrs – 210 (70.00%), 48hrs – 70 (23.33%) and 72hrs – 20 (6.66%) of *Clarias gariepinus* fry died on exposure to toxicant (Table 2). The mortality (%) increased as the concentration of the toxicant was raised with the highest mortality at 1.20g/l (24hrs) and none at 0.00 g/l (conrol).

4.0 DISCUSSION

The result of the physicochemical parameters in this experiment shows that pH, temperature, dissolved oxygen, ammonia and nitrite decreased with increase in concentration while total dissolved solid, ammonia and nitrite increased with a rise in concentration and this corroborate with the report of other researcher that water quality is often affected by toxicants, thus bringing about physiological and behavioral changes in swimming activity of fish (Heath 1991, Ayotunde *et al.*, 2011 and Ojutiku *et al.*,2012). Dissolved oxygen decreases as the concentration of the *S. preussii* increases and this can be explained with the gasping of air. Toxicity level is informed by the size of the fish i.e. if smaller fishes are exposed to higher concentrations, the damage per unit weight is much higher when compared with larger fishes. The water parameters considered in this work were above tolerance ranges of warm water fish species as reported by Boyd and Lick 1997 and disagree with the notion that optimal requirement for African catfishes does not vary significantly ($P< 0.05$) in the respective treatment levels. The mortality rate (%) increased with concentration and survival rate decreased with a rise in the concentration of the toxicant which agrees with the findings of Fafioye 2001; Fafioye *et al.*,2004, Omotoyin 2006 and Uedeme-Naa and George (2019) who reported that fish exposed to higher concentrations exhibited toxic reactions that later resulted in death. Mortality was dose-dependent.

5.0 CONCLUSION

It is clear from the results that *Spondianthus preusii* leaf powder is very toxic to *C. gariepinus* fry and as such fishers should be monitored and educated on the danger of fishes going into extinction if fish seeds are ignorantly destroyed. Necessary laws should also be made by the authorities concerned with every available tool for implementation. Also, this plant extract or powder will be useful in aquaculture to eradicate predators and competing wild fish from nursery, rearing and stocking ponds prior to the stocking of commercially grown fry and fingerlings of desired species.

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Table 1: PHYSICOCHEMICAL PARAMETERS

Conc.(g/l)	Ph	Temp.	TDS	DO	NH_3	N_2
0.00	7.0± 0.11[a]	30.6 ± 1.27[c]	15± 1.15[b]	7.0 ± 0.011[a]	0.18± 0.011[b]	0.04± 0.011[a]
1.00	6.9 ± 0.11[a]	29.9 ± 1.27[c]	24± 1.15[b]	6.9 ± 0.011[a]	0.21± 0.011[a]	0.05 ± 0.011[a]
1.10	6.8 ± 0.11[a]	29.3 ± 1.27[c]	30± 1.15[b]	6.7 ± 0.011[a]	0.24± 0.011[a]	0.07 ± 0.011[a]
1.20	6.7 ± 0.011[a]	29.4 ± 1.27[c]	40± 1.15[b]	6.6 ± 0.011[a]	0.30± 0.011[a]	0.10 ± 0.011[a]

Mean±SE with same superscript across column values are not significantly different ($p>0.05$.)

Keys: Temp. = Temperature (0^C); TDS = Total dissolved solid; DO = Dissolved oxygen; NH_3= Ammonia; N_2= Nitrite

Table 2: Mortality table (%)

Conc. (g/l)	Fry	24 hrs	Morta-lity(%)	48 hrs	Morta-lity(%)	72 Hrs	Morta-lity(%)	96 hrs	Morta-lity(%)
0.00	300	00	Nil	00	Nil	00	Nil	00	Nil
1.00	300	120	40.00	80	26. 67	70	23.33	30	10.00
1.10	300	156	52.00	70	23.33	54	18.00	20	6.66
1.20	300	210	70.00	70	23.33	20	6.66	00	00.00

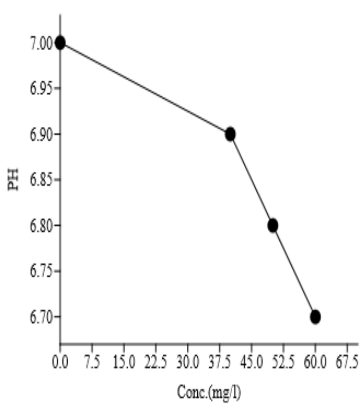

Fig. 1. Graph showing the P^H

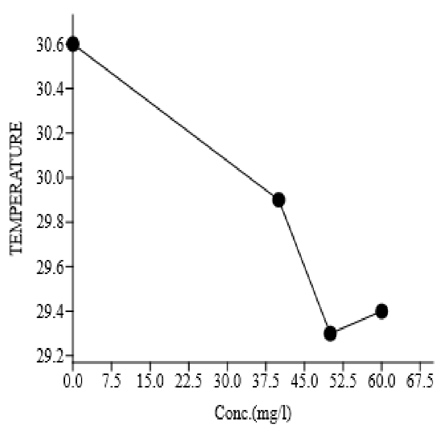

Fig. 2. Graph showing the Temperatur

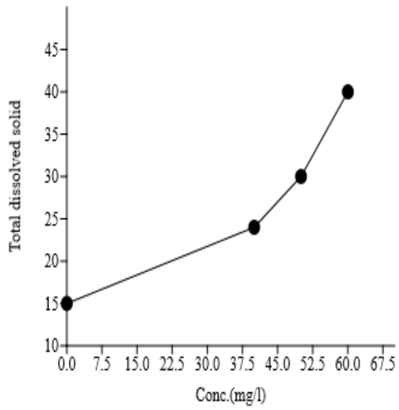

Fig.3: Graph showing the total dissolved solids

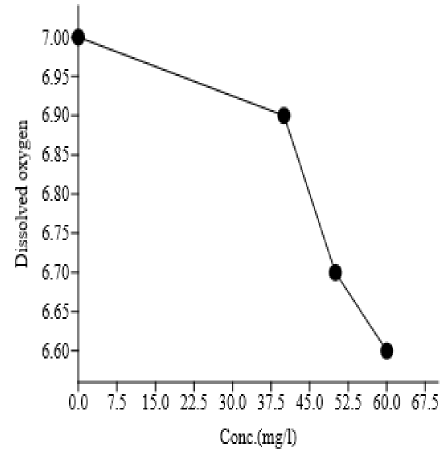

Fig. 4. Graph showing dissolved oxygen

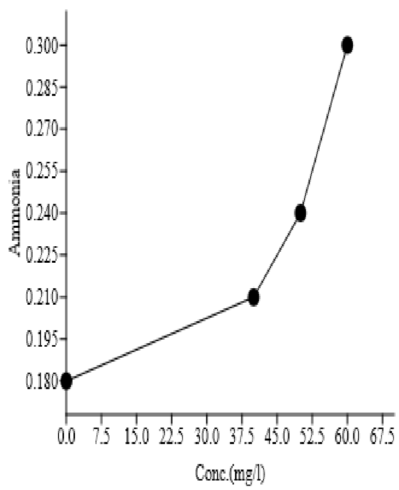

Fig. 5: Graph showing the level of ammonia

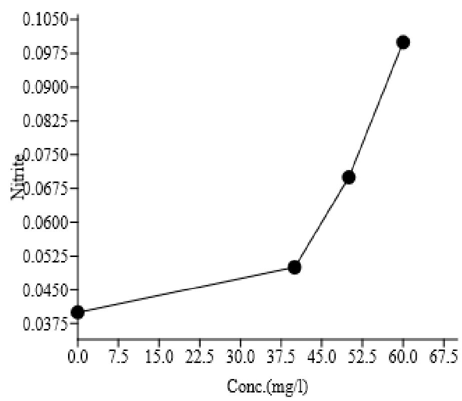

Fig 6 Graph showing the nitrite level

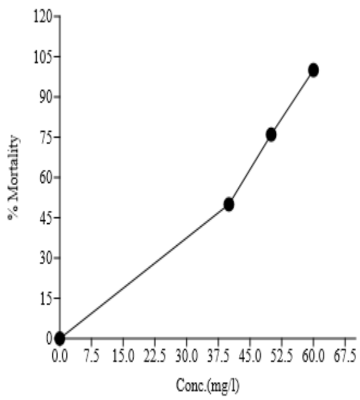

Fig. 7Mortality Graph