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Anaesthetic Potential of Tobacco (*Nicotiana tobaccum*) on *Clarias gariepinus* (Burchell 1822) Fingerlings

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Abstract

The efficacy of *Nicotiana tobaccum* as anaesthetic agents on *Clarias gariepinus* was investigated in this study. There were dissimilarity ($P<0.05$) in the induction and recovery stages at varying concentrations of ethanol extract of *Nicotiana tobaccum* were identified for *Clarias gariepinus*. Induction time (in minutes) decreased significantly (T1)109, (T2) 101, (T3) 87, (T4) 79 and (T5) 63, with increasing concentrations of ethanol extract of *Nicotiana tobaccum*. On the other hand, there were upsurge in the recovery times with a rise concentrations of anaesthetic agent ($P<0.05$).

Fish in treatments T3, T4 and T5 started showing signs of uncomfortability on exposure to extracts of *Nicotiana tobaccum* at higher concentrations, like gasping for air at the air-water inter phase, trying to jump out of the tank, restlessness and eventually settling at the bottom of the tank lifeless (indicating that they have reached anaesthesia).

Keywords: anaesthetic, *Nicotiana tobaccum*, induction time, recovery time

1. Introduction

Clariid catfish are widely distributed in Africa (Shelton, 2001), they are Africa's main profitable food fish family (Adebayo & Fagbenro, 2004) and universally, Nigeria is the largest producer of farm raised *Clarias gariepinus* (FAO, 2013). The major attribute of the species are hardiness, high prolificacy and simplicity of culture, the existence of arborescent air breathing organ, omnivorous feeding habit, enhance/rapid growth rate and improve feed conversion (Britz & Pienaar, 1992; Hecht et al., 1996). *C. gariepinus* is of a great demand because of its striking attributes and enriched taste of its fleshy tissue (Sogbesan & Ugwumba, 2008).

Fish are usually traumatized when mal-handled during cropping, stocking, sorting, weighing, stripping, and transportation (Gabriel & Akinrotimi, 2011), consequently resulting to decreased fish performance, increased susceptibility to disease and mortality in extreme cases (Masa et al., 2000).

In order to minimize mortality induced by stress, anaesthetics are commonly dispensed to fish before handling to sedate and immobilize fish (King et al., 2005; L. G. Ross & B. Ross, 1999). Usually anaesthetics used for fish must have these characteristics: highly solvable in fresh and salt water, rapid induction and recovery time, not poisonous to fish and humans, physiological effects is for a while, rapidly wear off from the body, availability and cost effectiveness (Marking & Meyer, 1985). Common anaesthetics such as 2-phenoxyethanol, quinaldine, tricaine methane sulphonate (MS-222), eugenol, and benzocaine (Velisek et al., 2011) are highly priced and scarce in resource poor countries. Presently only MS-222 is authorized by law for use on food fish in the United States and in the European Union (Öğretmen & Gökçek, 2013).

Tobacco (*Nicotiana tobacum*) a natural biocide is native to tropics and subtropical America but it is now planted profitably globally (Knapp, 2004). Tobacco contains phytochemicals like, Glucosides (tabacinine, tabacine), Nicotianine, Nicotine, , Anabasine, 2-Methylquinone, Acrolein, Anthalin, 2-Napthylamine, Acrolein,, Anatalline, Anethole, Anatabine, Cembrene, Choline, Pyrene, Acrolein, Nicotelline and 2,3,6-Trimethyl-1,4-naphthoquinone in addition they are generally known as being narcotic/anaesthetic (Agbon et al., 2002).

Consequently in the quest for safer, more effective, readily available, affordable, eco-friendly and easily adaptable anaesthetic which is comparable to conventional chemical anaesthetics, tobacco, a popular narcotic, is hoped to be this suitable alternative.

Therefore the aim of this study is to determine the efficacy and optimum concentration of ethanol extract of tobacco *as anaesthetic on Clarias gariepinus* fingerlings.

2. Materials and Methods

2.1 Experimental Fish

Two hundred and fifty *C. gariepinus* fingerlings of multi -sex [of matching brood stock] superficially perceived to be healthy (5.63±0.42 g) were acquired from Afe Babalola University Fish Farm, Ado Ekiti, Ekiti State. They were taken live to the newly built Aquaculture and Fisheries Management laboratory of the Faculty of Agricultural Sciences, Ekiti State University, Ado Ekiti, in a 50 L capacity plastic container, half filled with pond water between 1700-1730h. They were later kept in rectangular plastic tanks 60 L capacity where they were set to adjust to laboratory conditions for 7 days.

2.2 Experimental Plant

Nicotiana tobaccum leaves were collected along Iworoko- Ifaki town settlements, Ekiti State, Nigeria, this was followed by drying under shade at ambient temperature and pulverized into fine particle size (< 250 μm); and stored in a clean, dry, air-tight plastic vessel.

2.3 Ethanol Extract

Pulverized *Nicotiana tobaccum* (500 g) was packaged into soxhlet extractor, using ethanol as solvent for the extraction, after which distillation of the solvent takes place. One hundred (100) g ml of the ethanol extract *Nicotiana tobaccum was* obtained using soxhlet method (AOAC, 1999).

2.4 Induction and Recovery Stages of Anaesthesia

The efficacy of *Nicotiana tobacum* on *C. gariepinus* fingerlings was assessed by testing varying concentrations of ethanol extracts of *Nicotiana tobacum*. The concentrations at which *C. gariepinus* reached anaesthesia were determined by first conducting a range finding test.

Shortly before the initiation of the research, the fish were allowed to go hungry for 2 days to minimize waste in the test media and to prevent organic decay and depletion of oxygen. This research was conducted under standard static bioassay specification. Dissolved oxygen, Temperature, pH and conductivity level were measured using standard methods and readings were taken at 24 h interval for 96 h.

Ten *Clarias gariepinus* fingerlings (5.63±0.42 g) were kept in each rectangular tank (75 x 40 x 40) cm, 2/3 filled with clean and aerated water with three replicates per treatment.

The treatments are: (T1)1.25, (T2)2.50, (T3)3.75, (T4)5.00 and (T5)6.25 g/Litre of water. The induction and recovery time of each concentration was measured and monitored using chronological watch.

Clarias gariepinus fingerlings were introduced into each treatment and the behaviour(s) of the fingerlings monitored and recorded. Temperature, Dissolved oxygen and pH were measured and recorded using standard methods and readings were taken at interval of 24 h for 96 h.

The recovery process was actually done in a recovery tanks (75 x 40 x 40) cm, 2/3 filled with clean and aerated water having no *Nicotiana tobaccum* extract. The recovery time were monitored using chronometer.

2.5 Statistical Analysis

Data obtained from this research were made to undergo one-way Analysis of Variance (ANOVA) test using the Statistical Package for Social Science (SPSS) Version 11. Fisher's pairwise comparison was used in comparing variations between anaesthetic doses, recovery and induction times.

3. Results

There were significant differences ($P<0.05$) in the induction and recovery stages of *Clarias gariepinus* subjected to different concentrations of ethanol extract *Nicotiana tobaccum*. Induction time (in minutes) decreased significantly (T1)109, (T2) 101, (T3) 87, (T4) 79 and (T5) 63, with increasing concentrations of ethanol extract of *Nicotiana tobaccum*. On the other hand, increase in the concentration of anaesthetic agent ($P<0.05$) (Table 1) (Fig.1) leads to an upsurge in recovery times.

The induction time was recorded immediately the fish was noticed to be lossing of equilibrium and the fish began to swim vertically. Recovery time was recorded when equilibrium was regained.

Fish in treatments T3, T4 and T5 started showing signs of uncomfortability few minutes after exposure to extract of *Nicotiana tobaccum* at higher concentrations, like gasping for air at the air-water inter phase, restlessness and settling at the bottom of the tanks lifeless(indicating that they have reached anaesthesia).

Also, there were no mortality recorded in Treatments 1 and 2, however mortality were recorded in Treatments 3, 4 and 5 respectively (20, 45 and 60%). Mortality increases with increase in concentrations of the extract of *Nicotiana tobaccum* (Table 1).

Table 1. Induction, Recovery and Mortality of *Clarias gariepinus* fingerlings exposed to ethanol extract of *Nicotiana tobaccum* leaf dust as anaesthetic agent

Concentration (g/10L)	Induction Time (mins.)	Recovery Time (mins.)	Mortality (%)
0 (Control)			
1.25	109	44	-
2.50	106	53-65	-
3.75	87	70	20
5.00	79	85	45
6.25	63	Never recovered	60

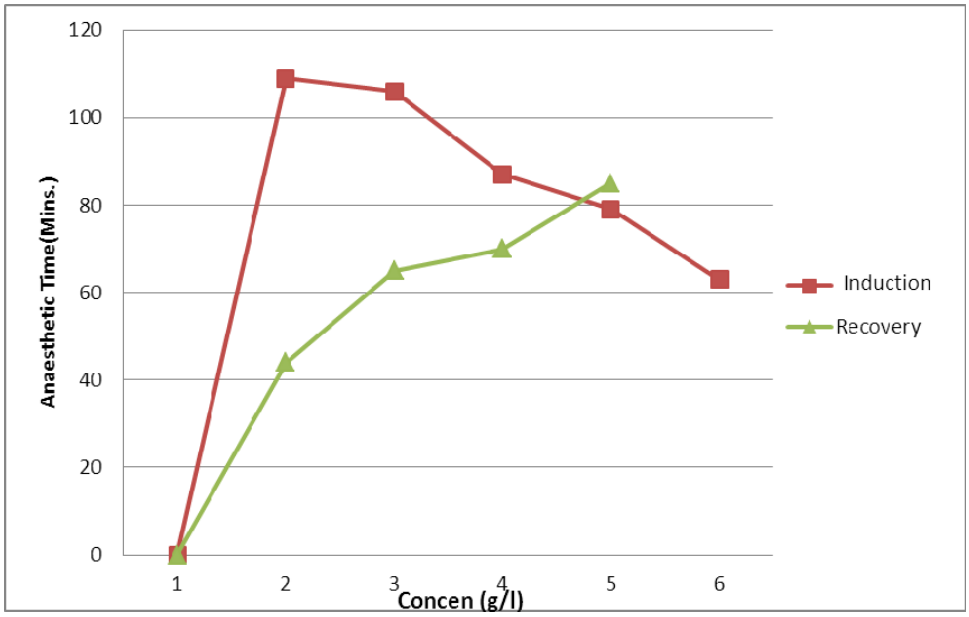

Figure 1. Induction and recovery times of *Clarias gariepinus* fingerlings anaesthetized with ethanol extract of *Nicotianna tobaccum*

4. Discussion

In this present study, induction time decrease significantly ($p<0.05$) with increase in concentrations of ethanol extract *Nicotiana tobaccum*. This result corroborates a previous research by Agokei and Adebisi (2010) where aqueous extract of tobacco (*Nicotiana tobaccum*) was tested on *Oreochromis niloticus* fingerlings. It was reported that as the concentrations of aqueous extract of tobacco increases anaesthetic time also decreases. Also a similar study by Öğretmen and Gökçek (2013) showed that as the concentrations of clove oil, 2-phenoxyethanol and eugenol (anaesthetic agents) increases, the induction and recovery time for *Clarias gariepinus* also decreases. Even though the time to reach induction and recovery in this study is on the high side, higher than that reported Agokei and Adebisi (2010) and by Öğretmen and Gökçek (2013) this study corroborate the study by Akinbulumo (2005) on the anestethic effect of ethanolic extract and aqueous extract of dried root powder of *Derris elliptica* on *Oreochromis niloticus*, The induction and recovery time reported for both aqueous and ethanolic extracts of *Derris elliptica* on *Oreochromis niloticus was* 48min and 45-60min as well as 30mins and 50- 65mins respectively at 1.5 g/10L concentration.

Also in this study, fish in treatments T3, T4 and T5 started showing signs of un-comfortability immediately after exposure to extracts of *Nicotiana tobaccum* at higher concentrations, like gasping for air at the air-water inter

phase, restlessness and eventually settling at the bottom of the tank lifeless. This corroborate a akin research by Jegede and Olanrewaju (2012) where *Clarias gariepinus* exposed to *Nicotiana tobaccum* leaf dust toxicity showed abnormal behaviours like erratic swimming, hyperventilation, vertical/spiral swimming positions, weakened swimming motions and settling at the bottom.

5. Conclusion

The ethanol extract of *Nicotianna tobaccum* at 2.5 g/10L may be used as anaesthetic agent on *Clarias gariepinus* fingerlings up to 53-65 minutes. Consequently, tobacco (which is readily available, cheaper and even eco-friendly) plant anaesthetic could be a better alternative to costly synthetic anaesthetics.

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