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SHORT COMMUNICATION

EVALUATION OF THE TOXICITY OF THE OIL EXTRACT OF *Tetrapleura tetraptera* ON TADPOLES [AMPHIBIA: ANURA]

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ABSTRACT

The toxicity of oil extract of *Tetrapleura tetraptera* on tadpoles was investigated. Concentrations 0.4ml/L, 0.8ml/L, 1.2ml/L and 1.6ml/L of the oil extract were prepared using untreated water. The tadpoles were introduced into the various concentrations and observations were made at intervals over 24 hour period. The assay was conducted in three replicates. Results showed that *T. tetraptera* was highly toxic to tadpoles with LC_{50} of 0.189ml/L at 24 hours. From the result, there was clear indication that *T. tetraptera*, though a potential molluscicide, is also a potential poison to some other water fauna that make up the aquatic ecosystem.

Keywords: *Tetrapleura tetraptera*, molluscicide, oil extract, toxicity, tadpoles, ecology.

INTRODUCTION

Mollusciciding is one of the target measures available in the control of schistosomiasis (Editorial, Acta Tropica, 2010), a debilitating disease in the tropics, particularly in poverty-plagued developing countries. There are two categories of molluscicides i.e. synthetic chemical agents and vegetable molluscicides. Although the efficacy of Niclosamide, a chemical molluscicide, has been well documented (Yang *et al.*, 2010), biological control is a better alternative than chemical agents (El. Sherbini *et al.*, 2009). Several promising vegetable candidates have been identified (Ojewole, 2004; El. Sherbini *et al.*, 2009); perhaps one of the primary reasons why plant molluscicides have received increased attention is because they could be an appropriate and inexpensive technology for snail control in endemic poorer nations of the world. Following the discovery of endod (*Phytolacca dodecandra*) by Dr. Akilu Lemma (Ukoli, 1992), over 500 plants have been screened for molluscicidal activity. Of the 566 plants (54 monocots and 512 dicots) reported by Farnsworth *et al.* (1983) to have been tested for molluscicidal activity, only 113 (5 monocots and 108 dicots) tested very positive, 175 tested mildly positive while 276 tested negative. In Nigeria, 181 plants extract employed in herbal medicine have been screened for molluscicidal activity and 23 (12.7%) passed the WHO preliminary test for molluscicidal activity (Adewunmi and Sofowora, 1980). Further investigation into the 23 plant candidates revealed *Tetrapleura tetraptera* (Aridan) as a promising vegetable molluscicide (Adewunmi, 1984).

Tetrapleura tetraptera (Schum. and Thonn.) Taub. Mimosaceae, commonly known as Aridan, is a single stemmed, robust, perennial tree of about 30m tall. It is a Nigerian medicinal plant that is now considered promising for the local control of schistosomiasis. It has a grey/brown, smooth/rough bark with glabrous round branchlets. The flower is yellow/pink and the fruit has dark brown, four winged pods 12–25 x 3.5–6.5cm. It is generally found in the lowland forest of tropical Africa. The fruit consists of a fleshy pulp with small, brownish-black seeds. The fruit possesses a fragrant, characteristically pungent aromatic odour, which is attributed to its insect repellent property. It is also used as spice (Adewunmi, 1984).

Despite the potency of these plant molluscicides, there is a dearth of information on their effect on non-target organisms that share the same ecosystem with the snail vectors. Some selected chemical molluscicides were reported to be more toxic to fish than target mollusc (Waller *et al.,* 1993), while the effect of endod on mosquitoes is mild (Spielman and Lemma, 1973). Apart from serving as food in certain local dishes in different parts of the world, amphibians are considered as useful bioindicators in contaminated aquatic habitats and wetlands. A Bioindicator is an organism (plant/animal) that indicates pollution in a system. Their population in a particular habitat defines how healthy or polluted that environment may be. Anurans have been reported as useful indicators of contamination in aquatic systems (Degarady and Halbrook, 2006), and tadpoles have been suggested to be useful bioindicators in detecting differences in metal levels among wetlands (Burger and Snodgrass, 2001). These traits make them advantageous in an ecosystem quite apart from their role in the food chain. Since amphibians are recognised as good biological indicators, this research evaluates the toxicity of oil extract of *T. tetraptera* on tadpole as a way of assessing its effect on non-target organisms that live in aquatic habitats.

MATERIALS AND METHODS

Juvenile tadpoles were collected from stagnant water bodies within Akure metropolis. The tadpoles with mean weight 0.29g and mean length of 0.02m were collected using a plastic sieve and transferred immediately into a bowl containing the source water. In the laboratory the tadpoles were introduced into a 60cm×30cm×30cm rectangular glass tank. The tank contained untreated stream water. The tadpoles were fed with algae and their activity was monitored for 48 hours in order to ensure their adjustment to laboratory conditions.

Preparation of Plant Oil Extract for Toxicity Test

T. tetraptera fruits were collected, dried and pulverized. The extraction of the oil was done with ethanol using Soxhlet apparatus model 77-520 (Hospital Equipment Manufacturing. Co. Limited, India). 20g of the powder was weighed into sowed muslin cloth. The solvent (ethanol) was poured into a round bottom flask; the flask was placed on a heating mantle at 60^0C. The solvent was separated using Rotary Evaporator model at 80^0C. 0.4ml of *T. tetraptera* extracted oil was introduced into 100ml of untreated well water to form a stock solution at a dilution of 1:250. 0.4ml, 0.8ml, 1.2ml and 1.6ml were taken from the stock solution and introduced into 1000mls of untreated water. A control solution of untreated well water was also prepared.

1000ml beaker was used in carrying out the bioassay. 5 tadpoles were introduced into each of the beakers containing 0.4ml, 0.8ml, 1.2ml and 1.6ml of *T. tetraptera* oil. The beakers were labelled accordingly and experiment was conducted in three replicates for each concentration and control. The mortality of the tadpoles was recorded at 0, 4, 8, 16 and 24 hours after the commencement of the experiment. Statistical analysis was done using EPA Probit analysis program to calculate the LC_{50} and Statistical Package for Social Scientists [SPSS] Version 17.0 was used to show the graphical relationship between the percentage mortality and the treatment concentrations used.

RESULTS

Reaction of the Tadpoles

After the introduction of the tadpoles into the various beakers containing different concentrations of *Tetrapleura tetraptera,* observations were made at different time intervals. On introduction into the 1.2ml/l and 1.6ml/l. the tadpoles were observed to be dull and inactive compared with the ones in the 0.4ml/l and control set up where they were seen swimming about. At 8th and 16th hour most of the tadpoles had died in the concentrations of 1.2ml and 1.6ml (Table 1). However, before death, the tadpoles swam up to the surface of the water where they finally died and floated. By the 24th hour at concentrations of 0.8ml, 1.2ml, 1.6ml, almost but not all the tadpoles had died. At the end of the 24 hour bioassay the LC_{50} was determined as 0.189ml/l (Fig. 1) and mortality increased with increased concentration.

DISCUSSION AND CONCLUSION

The need for the eradication of parasitic diseases along with the problems therein has been reviewed by Ukoli (1987; 1991; 1992). The WHO special programme in Tropical Disease Research/Schistosomiasis Scientific Working Group had considered the feasibility of using plant molluscicides to control schistosomiasis (WHO, 1983). The aim of using molluscicides is to control those snails that serve as the intermediate hosts of schistosomes. In the course of controlling the snail host, other water fauna may be at risk. WHO (1983) recommends that there should be

Table 1: Mean mortality rate of tadpoles exposed to different concentrations of oil extract of *T. tetraptera* within 24 hours.

Conc. ml/l	Mean mortality (hours)			
	4	8	16	24
Control	0.00	0.00	0.00	0.00
0.4	0.00	0.00	2.81±0.8	2.67±0.5
0.8	0.00	1.00±0.0	2.00±0.0	3.67±0.5
1.2	1.00±0.0	2.00±0.0	3.00±0.0	4.00±0.8
1.6	2.00±0.0	2.67±0.5	3.33±0.5	4.33±0.5

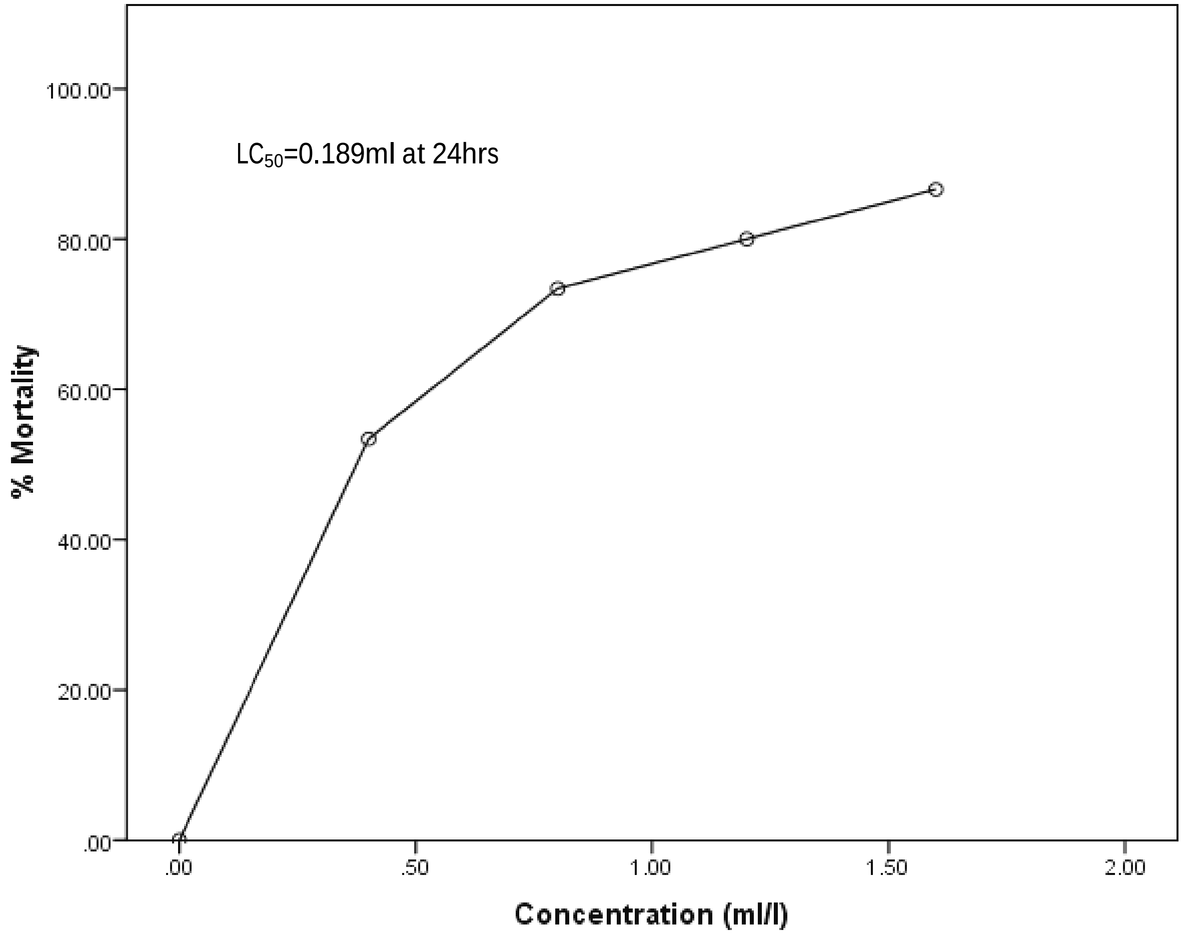

Figure 1: Determination of the LC_{50} of oil extract of *T. tetraptera* to tadpoles

considerable interest in determining the effect of molluscicides on fauna from the fact that the benthic and planktonic fauna form an important link in the ecological food chain leading to larger animals (Andrews *et al.*, 1983; Adewunmi *et al.*, 1982). It has been reported that the methanolic extract of *T. tetraptera* is toxic to fish (*Tilapia niloticus* and *T. galilae*) in laboratory experiments (Adewunmi *et al.*, 1982) but in the field only smaller *Tilapia* spp were killed (Adewunmi, 1984). However, the results in the study showed that the oil from *T. tetraptera* fruit is highly toxic to tadpole. The toxicity of *T. tetraptera* extract was most evident in the three higher concentrations, almost 100% mortality was observed in the two highest concentrations at the 16th and 24th hour. Other mortalities observed were less than 100% in the 0.4ml and 0,8ml concentrations.

These results indicate that the tolerance of tadpoles to the oil extract of *T. tetraptera* is relatively very low with LC_{50} of 0.189ml/l. Low mortality rates observed in the lower concentrations of 0.4ml and 0.8ml may be due to the exposure time, perhaps if they had been exposed much longer, 100% mortality may also have been recorded. *T. tetraptera* is a potent molluscicide. However, other non-target organisms are at risk of being killed if exposed, thus disrupting the ecological food chain in the freshwater aquatic ecosystem. Moreover, since preliminary results showed that the oil is toxic to tadpoles, it may also reduce their populations in the wild and thus inhibit their role as bioindicators of pollution. A field trial may therefore be necessary to assess its toxicity on tadpole under field conditions.

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