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Full Length Research Paper

Comparative evaluation of molluscicidal effects of *Securidaca longepedunculata* (Fres.) and *Tephrosia bracteolata* (Guilland Perr) on *Bulinus globosus*

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The molluscicidal activities of ethanoic and methanoic extracts of the leaf, stem bark and root of *Securidaca longepedunculata* (Polygalaceae) and *Tephrosia brateolata* (Fabaceae) against bred *Bulinus globosus* measured 0.50 - 0.90 mm in size, were investigated. The snails were exposed to a serial dilution of 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 5.0, 7.5 and 10.0 ppm of the ethanoic and methanoic extracts of the leaf, stem bark and root of *S. longepedunculata* and *T. bracteolata* for 24 h. All tested extracts showed varied snail mortality rates with the concentration of ethanoic and methanoic extracts of the plants parts from 0.0 - 100.0%. The lethal concentration LC50 values ranged from 0.15 - 0.60 ppm and LC90 values from 0.80 - 6.90 ppm for both ethanoic and methanoic extracts of *S. longepedunculata* for 24 h. The two plants showed significant difference ($p < 0.05$) in the mortality rates of the snails *(B. globosus).*

Key words: Plant extracts, mortality, juvenile, *Bulinus globosus, Securidata longepedunculata, Tephrosia brateolata.*

INTRODUCTION

The toxicity of active ingredients of certain plants to freshwater snails usually leads to death or low density of freshwater snails in such an environment (Adewumi and Marquis (1981); Olofintoye and Akinbile (2007)). The presence of *Bulinus globosus* in different freshwater habitats in Ekiti State as an important vector of human schistosomiasis has been reported (Olofintoye (2001); Odaibo et al. (2004); Olofintoye (2005)) . In addition, the endemicity of Schistosomiasis which may probably results to chronic and debilitating diseases that affects people who had contact with freshwater harbouring infected snails has been observed in the study area (Odaibo et al. (2004); Olofintoye (2005)).

The need for control measure of the freshwater snails is imperative and method with low cost and free of environmental pollution could be adopted. Therefore, the use of natural plant products with potential molluscicidal properties could be investigated. Earlier on, some of these medicinal plants have been used in the Laboratory to control freshwater snails. Some of these include the works of (Adewumi and Marquis, 1981; Olofintoye and Akinbile, 2007; Vasconcellos and Amorin, 2003; Jose et al., 1835; Azare et al., 2007; Albuquerque et al., 2006). This study is therefore aimed at evaluating the molluscicidal properties of *Securidaca longepedunculata* and *Tephrosia bracteolate* in the control of Schistosome snail vector *B. globosus.*

MATERIALS AND METHODS

Ethanoic and methanoic extracts were obtained form the leaf, stem bark and root parts of *S. longepedunculata* and *T. bracteolate* collected from forest regrowth and margins in Ado-Ekiti, Ekiti State, Nigeria. Different concentrations were prepared from vacuum dried methanolic extract of the leaves, stem bark and root of *S. longepedunculata* and *T. bracteolate* (the stock solution concentration) . The stock solution was diluted with distilled water. Nine different concentrations (0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 5.0, 7.5 and 10.0 ppm) were prepared following the method of (Sukumaran et al., 2002; Azare et al., 2007), for the toxicity test. *B. globosus* juveniles newly hatched in the laboratory culture from samples collected from Ofin stream in Ado-Ekiti in 2009 were use for the test.

Toxicity test

The test snail (juvenile) measured 0.50 - 0.90 mm in size. 10 snails were exposed to 9 different concentrations each of the extracts. The toxicity test was replicated thrice per concentration for 24 h.

Table 1. Mortality rates of leaf, stem bark and root of *S. longepedunculata* with ethanonic and methanoic extracts against 10 *B. globosus* per concentration.

Plant parts	Conc. (ppm)	Ethanol extracts mortality (%)	C.I*	Methanol extracts mortality (%)	C.I*
Leaf	0.1	1(10.0)	-0.09 - 0.29	0 (0.0)	0.0 - 0.0
	0.2	3(30.0)	0.02 – 0.58	1 (10.0)	- 0.09 - 0.29
	0.5	3(30.0)	0.02 – 0.58	1 (10.0)	- 0.09 - 0.29
	1.0	5(50.0)	0.19 – 0.81	2 (20.0)	-0.03 - 0.43
	2.0	5(50.0)	0.19 – 0.81	3 (30.0)	0.02 - 0.58
	3.0	5(50.0)	0.19 – 0.81	3 (30.0)	0.02 - 0.58
	5.0	6(60.0)	0.30 – 0.90	4 (40.0)	-0.10 - 0.70
	7.5	7(70.0)	0.42 – 0.98	6 (60.0)	0.30 - 0.90
	10.0	10(100.0)	0.0 – 0.0	9 (90.0)	0.71 – 1.09
Control	H_2O	0 (0.0)	0.0 – 0.0	0 (0.0)	0.0 - 0.0
	0.1	0 (0.0)	0.0 – 0.0	0 (0.0)	0.0 - 0.0
	0.2	0 (0.0)	0.0 – 0.0	0 (0.0)	0.0 - 0.0
	0.5	1 (10.0)	-0.09 – 0.29	0 (0.0)	0.0 - 0.0
	1.0	5 (50.0)	0.09 – 0.81	3 (30.0)	0.02 - 0.58
Stem bark	2.0	7 (70.0)	0.42 – 0.98	3 (30.0)	0.02 - 0.58
	3.0	7 (70.0)	0.42 – 0.90	6 (60.0)	0.30 - 0.90
	5.0	9 (90.0)	0.71 – 1.09	6 (60.0)	0.30 - 0.90
	7.5	10 (100.0)	0.0 – 0.0	7 (70.0)	0.42 - 0.90
	10.0	10 (100.0)	0.0 – 0.0	7 (70.0)	0.42 - 0.90
Control	H_2O	0 (0.0)	0.0 – 0.0	0 (0.0)	0.0 - 0.0
	0.1	2 (20.0)	-0.03 – 0.43	1 (10.0)	-0.09 - 0.29
	0.2	2 (20.0)	-0.03 – 0.43	2 (20.0)	-0.03 - 0.43
	0.5	6 (60.0)	0.30 – 0.90	3 (30.0)	0.02 - 0.58
	1.0	6 (60.0)	0.30 – 0.90	7 (70.0)	0.42 - 0.98
	2.0	7 (70.0)	0.42 – 0.98	7 (70.0)	0.42 - 0.98
Root	3.0	8 (80.0)	0.55 – 1.05	7 (70.0)	0.42 - 0.98
	5.0	8 (80.0)	0.55 – 1.05	8 (80.0)	0.55 – 1.05
	7.5	10 (100.0)	0.0 – 0.0	9 (90.0)	0.71 – 1.09
	10.0	10 (100.0)	0.0 – 0.0	9 (90.0)	0.71 – 1.09
Control	H_2O	0 (0.0)	0.0 – 0.0	0 (0.0)	0.0 - 0.0

C.I* = 95% Confidence interval.

Thereafter, the number of juvenile snail died was counted after 24 h recovery in distilled water. The lethal concentrations of LC50 and LC90 were calculated by plotting the log concentration against the percentage mortality occurred at 24 h.

Plants used

S. longepedunculata (Fres) – Polygalacease is known as violet tree. Its active constituents include saponinglycosides of Oleanolic acid, Tannins and Vateriannate methylsalicylate. *T. bracteolate* (Guill and Perr) – Fabaceae, contains active constituents such as Degudin, Tephrosin, Toxi-carol, Tephrasal, Quercetrin, Rutin and Rotenone Kloss (1987), Morais et al. (2005). The two plants are commonly available in the study area. The molluscicidal potency of the extracts of the plants used was tested statistically using chi-square analysis (X^2) and the 95% confidence interval (C.I) was derived for the percentage morality of the snails per concentration.

RESULTS AND DISCUSSION

The molluscicidal activities of the leaf stem bark and root of *S. longepedunculata* and *T. bracteolate* with ethanol extract and methanol extract at different concentrations (0.100 - 10.0 ppm) are shown in Tables 1 and 2. Table 1 shows the peak molluscicidal activity of leaves, stem bark

Table 2. Mortality rates of leaf, stem bark and root of *T. bracteolata* with ethanonic and methanoic extracts against 10 *B. globosus* per concentration.

Plant parts	Conc. (ppm)	Ethanol extract mortality (%)	C.I*	Methanol extract mortality (%)	C.I*
	0.1	1(10.0)	-0.09 - 0.29	0 (0.0)	0.0 - 0.0
	0.2	1(10.0)	-0.09 - 0.29	1 (10.0)	- 0.09 - 0.29
	0.5	3(30.0)	0.02 - 0.58	1 (10.0)	- 0.09 - 0.29
	1.0	3(30.0)	0.02 - 0.58	2 (20.0)	-0.03 - 0.43
Control	2.0	6(60.0)	0.30 - 0.90	4 (40.0)	-0.10 - 0.70
	3.0	6(60.0)	0.30 - 0.90	6 (60.0)	0.30 - 0.90
	5.0	8(80.0)	0.30 - 0.90	8 (80.0)	0.55 - 1.05
	7.5	9(70.0)	0.55 - 1.05	8 (80.0)	0.55 - 1.05
	10.0	10(100.0)	0.42 - 0.98	9 (90.0)	0.71- 1.09
	H_2O	0 (0.0)	0.0- 0.0	0 (0.0)	0.0 - 0.0
	0.1	0 (0.0)	0.0 - 0.0	0 (0.0)	0.0 - 0.0
	0.2	0 (0.0)	0.0 - 0.0	0 (0.0)	0.0 - 0.0
	0.5	0 (0.0)	0.0 - 0.0	1 (10.0)	-0.09 - 0.29
	1.0	1(10.0)	0.0 - 0.0	2 (20.0)	-0.03 - 0.43
Control	2.0	3 (30.0)	-0.09 - 0.29	2 (20.0)	-0.03 - 0.43
	3.0	3(30.0)	0.02 - 0.58	4 (40.0)	-0.10 - 0.70
	5.0	4 (40.0)	0.02 - 0.58	5 (50.0)	0.19 - 0.81
	7.5	7 (70.0)	-0.10 - 0.70	6 (60.0)	0.30 - 0.90
	10.0	7 (70.0)	0.42 - 0.98	8 (80.0)	0.55 - 1.05
	H_2O	0 (0.0)	0.42 - 0.98	0 (0.0)	0.0 - 0.0
	0.1	1 (10.0)	-0.09 - 0.29	2 (20.0)	-0.03 - 0.43
	0.2	1 (10.0)	-0.09 - 0.29	2 (20.0)	-0.03 - 0.43
	0.5	2 (20.0)	-0.30 - 0.43	4 (40.0)	-0.10 - 0.70
	1.0	2 (20.0)	-0.30 - 0.43	5 (50.0)	0.19 - 0.81
Control	2.0	4 (40.0)	-0.10 - 0.70	5 (50.0)	0.19 - 0.81
	3.0	4 (40.0)	-0.10 - 0.70	6 (60.0)	0.30 - 0.90
	5.0	5 (50.0)	0.19 - 0.81	6 (60.0)	0.30 - 0.90
	7.5	7(70.0)	0.42 - 0.98	8 (80.0)	0.55 - 1.05
	10.0	7(70.0)	0.42 - 0.98	9 (90.0)	0.71 - 1.09
	H_2O	0 (0.0)	0.0 - 0.0	0 (0.0)	0.0 - 0.0

C.I* = 95% Confidence interval.

and the roots of *S. longepedumculata* with ethanol and methanol extracts at 10.0 ppm concentration ranged from 70.0%, C.I = 0.42 - 0.98 - 100.0%, C.I = 0.0 - 0.0, morality rates of juveniles of *B. globosus* for 24 h exposure. However, the molluscicidal potency of ethanol extract with the leaf, stem bark and root of *S. longepedunculata* showed higher potency of mortality rates of 100.0%, C.I = 0.0 - 0.0 at 10 ppm for 24 h than the methanol extract.

On the other hand, the effect of the plant extract of *S. longepedunculata* particularly the stem bark recorded very low mortality rate of *B. globosus* 0.0%, C.I = 0.0 - 0.0 at 0.1 and 0.2 ppm to 10.0%, C.I = -0.09 - 0.29 at 0.5 ppm for 24 h. Even though at 0.1 - 0.5 ppm, the leaf extract recorded 10.0%, C.I = - 0.09 - 0.29 to 30.0%, C.I = 0.20 – 0.58 mortality rates of *B. globosus* at 24 hexposure. More so, the peak mortality rates at lower concentrations of 0.10 - 0.50 ppm of the root of *S. longepedunculata* with ethanol extract ranged from 20.0%, C.I = -0.30 - 0.43 to 60.0%, C.I = 0.30 - 0.90 at 24 h exposure (Table 1). These observations are similar to the findings of Sukumaran et al. (2002) and Olofintoye and Akinbile (2007).

The lethal concentrations LC50 of *S. longepedunculata* with ethanol were 0.15 ppm of the leaf, 0.19 ppm of the stem bark and 0.18 ppm of the root. And the lethal concentrations LC90 of *S. longepedunculata* with ethanol extract were 0.80 ppm of the leaf, 1.80 ppm of the stem bark and 6.70 ppm of the root at 24 h exposure (Table 1). The molluscicidal effect of methanol extract with leaf, stem bark and root of *S. longepedunculata* showed peak mortality rates of 90.0%, C.I = 0.71 - 1.09 at 10.0 ppm at 24 h but less than what was observed with ethanol

extract in Table 1. Similarly, very low mortality rate of 0.0%, C.I = 0.0 - 0.0 at 0.10 ppm was recorded with stem bark extract for 24 h (Table 1).

The lethal concentration LC50 of *S*. *longepedunculata* with methanol extract were 0.55 ppm of the leaf, 0.60 ppm of the stem bark and 0.21 ppm of the root. And the Lethal concentration LC90 of *S*. *longepedunculata* with methanol extract was 3.10 ppm of the leaf, 2.50 ppm of the stem bark and 2.90 ppm of the root for 24 h exposure. These LC50 and LC90 values were compared well with the findings of Ebenso (1992) and Tripaths and Singh (2000). Statistically, the molluscicidal potency of the leaf, stem bark and the root of *S. longepedunculata* with ethanol and methanol extracts showed significant difference in the mortality rates of juvenile *B. globosus* ($p < 0.05$) at different concentrations for 24 h exposure.

The molluscicidal activities of *S*. *longepedunculata* on juvenile *B. globosus* may probably due to the active ingredients of saponin – glycosides of Oleanolic acid, Tannins and Vateriannate methylsaliciate Kloss (1987); Morais et al. (2005) . Table 2 shows that the peak molluscicidal activities of the leaf, stem bark and the root of *T*. *bracteolata* with ethanol and methanol extracts at 10.0 ppm ranged from 90.0%, C.I = 0.71 - 1.04 to 100.0%, C.I = 0.0 - 0.0 and 80.0%, C.I = 0.55 - 1.05 to 90.0%, C.I = 0.71 - 1.04 for 24 h exposure respectively on juvenile *B*. *globosus*. However, the low mortality rates of 0.0%, C.I = 0.0 - 0.0 to 10.0%, C.I = -0.09 - 0.29 at 0.10 - 10.0 ppm concentrations with ethanol extract of the stem bark and 0.09, C.I 0.0 - 0.0 to 10.0%, C.I = -0.09 - 0.29 mortality rates at 0.10 - 0.5 ppm concentrations with methanol extract of the stem bark on *B. globosus* for 24 h exposure (Table 2), and these were similar to what was observed with stem bark of *S. longepedunculata* in Table1.

The lethal concentrations LC50 of *T*. *bracteolate* with ethanol extract were 0.19 ppm of the leaf, 0.45 ppm of the stem bark and 0.35 ppm of the root for 24 h and the lethal concentrations LC90 of *T. bracteolate* with ethanol extract were 1.60 ppm of the leaf, 1.80 ppm of the stem bark and 1.90 ppm of the root for 24 h. With methanol extract, the concentrations LC50 of *T. bracteolate* were 0.18 ppm of the leaf, 0.30 ppm of the stem bark and 0.44 ppm for 24 h. And LC90 recorded 0.90 ppm of the leaf, 1.20 ppm of the stem bark and 2.40 ppm of the root for 24 h. The lethal concentrations of LC50 and LC90 values observed in this plant were lower than the findings of Hashem and Fetyani (2007).

Chi Square (X^2) analysis shows that moluscicidal potency of the leaf, stem bark and the root of the *T. bracteolate* with ethanol and methanol extracts revealed significant difference in the mortality rate of juvenile *B. globosus* ($p < 0.05$) at different concentrations for 24 h. It then suggests that the molluscicidal potency of the *T. bracteolata*on juvenile of *B. globosus* may probably be due to active ingredients of Degcidin, Tephrosin, Toxicarol, Temphrasal, Quoscentrin, Rutin and Rotenone (Tahraoui et al., 2007; Agra et al., 2007). In conclusion, the use of *S. longepedunculata* and *T. bracteolate* products as moluscicides in the control of schistosome vector *B. globosus* may play a vital role, since their plants are commonly available all year round in the study area.

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