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RESEARCH ARTICLE

TOXICITY OF KHAYA GRANDIFOLIOLA (AFRICAN MAHOGANY) BARK WATER EXTRACT AGANIST *BIOMOPHLARIA* SNAILS

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ABSTRACT

Background: Molluscicides are crucial for the control of schistosomiasis and other snail-borne infections. The need to use plant s has received increased interest as an inexpensive technology because of the high cost of synthetic compounds for snail control in the endemic areas of poor nations of the world. The aim of this study was to investigate the toxic effect of the aqueous extract of *Khaya grandifoliola* **"**Mahogany" bark against *Biomphalaria* snails under laboratory conditions.

Methods: A true experimental study was done to find out the toxic effect of the aqueous extract of Mahogany bark on *Biomphalaria* snails. An aqueous extract from bark was powdered and strained and was used as stock solution. Serial concentrations of 0.0005% up to 0.01% were tested on *Biomphalaria* snails. The snails were subjected to the extract for 24hrs. After that the Lc50 and Lc90 were obtained and the toxic index was compared to that of the classical molluscicide "Baylucide" was also obtained.

Results: The mortality rate was found to be ranging between 13% and 87%. Three trials were made and the average was taken. The LC50 and LC90 were found to be 0.015% and 0.039% consecutively. The toxic index compared to baylucide was found to be 75%)

Discussion: Niclosamide, the active ingredient of baylucide is the classical pesticide for snail control (12). Because of its impacts on other aquatic fauna and the environment, quest for safer pesticides has attracted researchers to look into plants with pesticidal properties. *Khaya grandifoliola* **"**Mahogany" proved to be one of those plants. The aqueous extract of this tree has been found to be potent in controlling Biomphalaria snails. It is recommended to do more research on the plant extracts in water and other solvents. Yet, since the chemical contents of plants depend mainly on soil composition, it is of paramount importance to test extracts of **"**Mahogany" from different geographical areas.

INTRODUCTION:

Schistosomiasis is one of the most widely spread parasitic infections transmitted by snails. It occurs in most countries of tropical Africa, Middle East, Central and South America, the Caribbean and the Far East. An estimated 200 million people in the world are infected from a total of 600 million at risk. Ten percent of the infected people develop severe clinical diseases (20 million). Of the remaining 180 million people, an estimated 50-60% also has symptoms -a public health problem of enormous proportions (1). Other flukes of public and veterinary importance are also transmitted by snails. Chemical, environmental and biological methods were used in snail control for decades.

The use of aqueous plant extracts with pesticidal properties for insect pest control in crops has been well documented. These include neem, lemon grass, mahogany, chili pepper, citrus peel, black pepper, garlic, and bougainvillea (2-3). *Khaya grandifoliola* (also called African mahogany, Benin mahogany, Large-leaved mahogany, or Senegal mahogany) is a species of trees in the Meliaceae family. It is found in Benin, the Democratic Republic of Congo, Ivory Coast, Ghana, Guinea, Nigeria, Sudan, Togo, and Uganda. It is threatened by habitat loss (4). The botanical molluscicides are of economic importance, especially in developing countries (5). Also, there is a continuous need to search for new plant species with ideal molluscicidal properities (8-6).

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Different plants have been reported as molluscicides (7). In Egypt, screening of local plants for molluscicidal activity has received increasing attention (9)

The number and types of the specific molluscicides used for controlling the snails are limited; they caused different environmental problems in addition to the toxic effects to non-target organisms (11).

In this study, it was intended to find out the toxicity of the Mahogany bark ***a***queous extract against *Biomphalaria* snails

MATERIALS AND METHODS:

Materials:

Plastic dishes 1000ML, strainers, beakers, Flasks, Measuring cylinders, wooden sticks.

Methodology:

Snail collection:

Snails were collected from different sites in Khartoum State (Selate Northern Canal 18&7, Selate Southern canal B, Aldoma area, Alfake Hashim, Algamoea, Alshagara, Alkalakla Albaiara & Jabil Awleia)

Mahogany bark preparation:

Mahogany bark was collected, dried in shaded place and was powdered using a clean electric blender (Moulinex).

Preparation of aqueous extract:

20% (W/V) stock solution of mahogany bark was prepared by adding 100 grams of the powder to 500 ml of distilled water followed by vigorous shaking then the aqueous extract was strained and was kept in a covered flask till use.

Different concentrations were prepared from the stock solutions using the dilution formula X/Y = Q/Z

Where:

X= Final volume

Y= volume taken from the stock solution.

Q= Concentration available

Z= Concentration needed.

Experimental methods:

Serial dilutions of Mahogany bark aqueous extract were made by adding certain amount of stock solution to the natural habitat water to bring the following concentration: (0.01, 0.008, 0.006, 0.005, 0.004, 0.003, 0.0025, 0.002, 0.0015, 0.001, and 0.0005). Approximately 20 snails were transferred to each plastic dishes (each one contains designated dilution of Mahogany bark aqueous extract).

Mortality count was made after 24 hours. The snails were considered dead when settling on the bottom without moving. Four replicates were done and the average was tabulated.

Statistical Analysis:

Abbott's formula was used to correct mortality when needed. Morality was then transferred into probit transformation units and tabulated against log concentrations.

Concentrations were transformed into logarithms. Negative logarithms were made positive by adding (+2) to each (table.1 to 5). The added (+2) was subtracted again after the log of LC50 and LC90 was inferred from the graph

RESULTS:

The results of the experiments were analyzed using the analysis of variance and log probit analysis.

Normal graph was used instead of the logarithmic graph because of unavailability of the logarithmic scale graph papers. Table 1 to 4 shows the data for each replicate. Table 5 shows that the average mortality of *Biomphalaria* snails subjected to aqueous extract of Mahogany bark for the four trials ranged between 4% and 90% (probit units 3.26 – 6.28). It has also been shown that there was no mortality in the control of each trial; hence no correction for mortality was needed.

The graphical presentation of data revealed that the LC50 was found to be 0.015

Table 1: Mortality of *Biomphalaria* snails subjected to water extract of Mahogany bark (trial 1), Khartoum, 2014

Concentration	PPM	Log Concentration on	Log Concentration +5	% Mortality	Corrected mortality	Probit unit
0.01	0.0005	-3.3010	1.6990	90 %	90 %	6.28
0.008	0.0004	-3.3979	1.6021	90 %	90 %	6.28
0.006	0.0003	-3.5228	1.4772	50 %	50 %	5.00
0.004	0.0002	-3.6989	1.3011	0 %	0 %	2.67
0.002	0.0001	-4.0000	1.0000	0 %	0 %	2.67
0.001	0.00005	-4.3010	0.6990	0 %	0 %	2.67
0.0005	0.000025	-4.6020	0.3980	22 %	22 %	4.23

Table 2: Mortality of *Biomphalaria* snails subjected to water extract of Mahogany bark water extract (trial 2), Khartoum, 2014

Concentration	PPM	Log Concentration	Log Concentration +5	% Mortality	Corrected mortality	Probit unit
0.008	0.0004	-3.3979	1.6021	100 %	100 %	7.33
0.006	0.0003	-3.5228	1.4772	100 %	100 %	7.33
0.004	0.0002	-3.6989	1.3011	29 %	29 %	4.45
0.002	0.0001	-4.0000	1.0000	0 %	0 %	2.67
0.001	0.00005	-4.3010	0.6990	0 %	0 %	2.67
0.0005	0.000025	-4.6020	0.3980	0 %	0 %	2.67

Table 3: Mortality of *Biomphalaria* snails subjected to water extract of Mahogany bark water extract (trial 3), Khartoum, 2014

Concentration	PPM	Log Concentration	Log Concention+5	% Mortality	Corrected mortality	Probit unit
0.006	0.0003	-3.5228	1.4772	86 %	86 %	6.08
0.005	0.00025	-3.6020	1.3980	71 %	71 %	5.55
0.004	0.0002	-3.6989	1.3011	0 %	0 %	2.67
0.003	0.00015	-3.8239	1.1761	0 %	0 %	2.67
0.002	0.0001	-4.0000	1.0000	0 %	0 %	2.67

Table 4: Mortality of *Biomphalaria* snails subjected with water extract of Mahogany Bark water extract (trial 4), Khartoum, 2014

Concentration	Concentration (PPM)	Log Concentration	Log Concentration +5	% Mortality	Corrected mortality	Probit unit
0.006	0.0003	-3.5228	1.4772	71 %	71 %	5.55
0.005	0.00025	-3.6020	1.3980	83 %	83 %	5.95
0.004	0.0002	-3.6989	1.3011	14 %	14 %	3.92
0.003	0.00015	-3.8239	1.1761	0 %	0 %	2.67
0.002	0.0001	-4.0000	1.0000	14 %	14 %	3.92

Table 5: Mortality of the of *Biomphalaria* snails subjected to water extract of Mahogany bark water extract (Average of the four trials), Khartoum, 2014

Concentration	Concentration (PPM)	Log Concentration	Log Concentration +5	% Mortality					Probit unit
				1	2	3	4	mean	
0.01	0.0005	-3.3010	1.6990	90	-	-	-	90	6.28
0.008	0.0004	-3.3979	1.6021	90	100	-	-	95	6.64
0.006	0.0003	-3.5228	1.4772	50	100	86	71	77	5.74
0.005	0.00025	-3.6020	1.3011	-	-	71	83	77	5.74
0.004	0.0002	-3.6989	1.3011	0	29	0	14	11	3.77
0.003	0.00015	-3.8239	1.1761	-	-	0	0	0	2.67
0.002	0.0001	-4.0000	1.0000	0	0	0	14	04	3.26
0.001	0.00005	-4.3010	0.6990	0	0	-	-	0	2.67
0.0005	0.000025	-4.6020	0.3980.	22	0	-	-	11	3.77

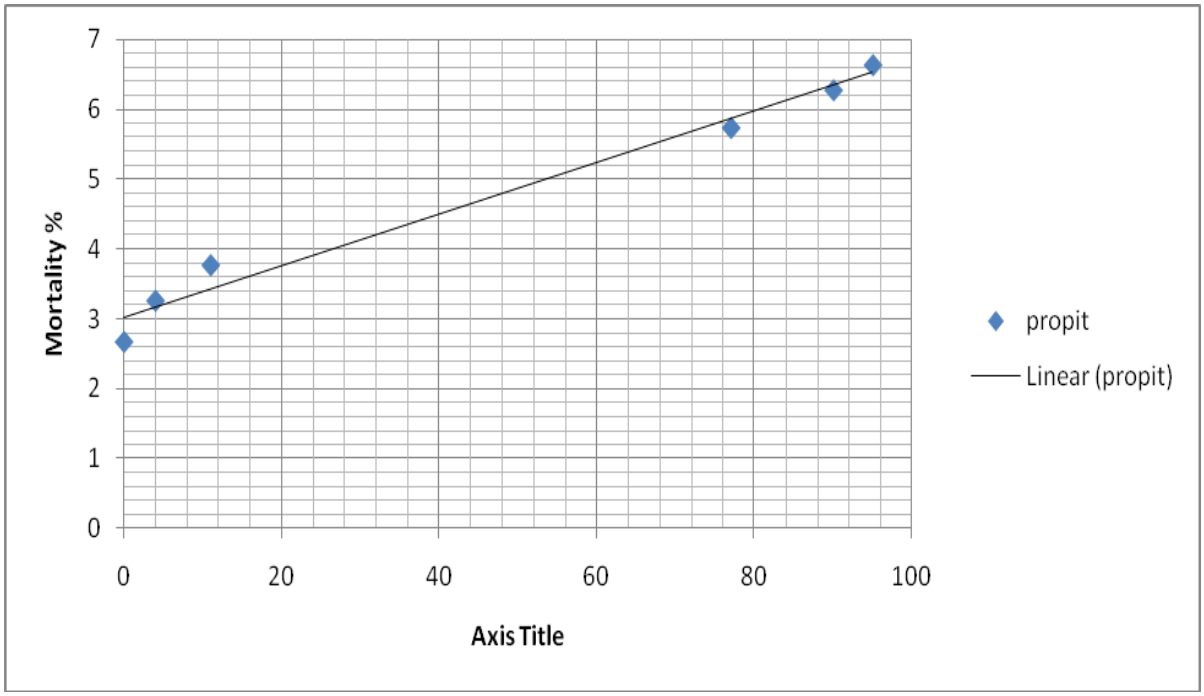

Figure 1:

Discussion:

The need for using natural products in the control of schistosoma snails necessitated continuous research in this field especially products of plant origin. This effort aimed at finding the effect of the aqueous extract of Mahogany bark on *Biomphalaria* snails. Many studies in Sudan were conducted as with other local plants but using Mahogany bark this study this used for the first time.

Mortality rate of *Biomphalaria* snails was recorded after every 24 hrs. Snail mortality was established by the contraction of body within the shell (Singh *et al*., 1996).

Lethal concentration was observed between exposure time and different concentration of extracted leaf material of plants. The LC 50 values are tabulated in the table.

Recommendation

1/ Aqueous extract of Mahogany bark is recommended in the control of *Biomphalaria* snails.

2/ Extraction and standardization of the active ingredient are important.

3/ Use of extracts from different types of soils on different strains of snail as well as those from other parts of the plant are important to come out with a solid LC50 and LC90.

4/ Studies on the toxic effect of extracts soluble in solvents other than water are also recommended.

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