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Research Paper

Larvacidial activities of three plant extracts of common wire weed (*Sida Acuta*), Catnip (*Nepeta Cataria) and* Neem*(Azadirachta Indica)* against the larva of mosquito (*Anopheles Gambiae)*

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ABSTRACT

Malaria is a parasitic disease caused by a protozoan of the genus *Plasmodium*. Extensive use of chemical insecticides for control of vector borne diseases has created problems related to physiological resistance to vectors, adverse environmental effects, high operational cost, pest resurgence and vertebrate toxicity. Hence the emphasis on botanical insecticide which are more eco-friendly and effective. This study look at the potential of some indigenous plant extracts to control the larva of mosquito in the pond. The bioassay of the extracts show their high potential as larvacides which increase with increase in concentration of 2,5 and 10mg/L respectively. The *Nepeta cataria* shows highest mortality ratio at different concentration of the extract with LC_{50} of 0.98mg/L. The phytochemical screening shows the three extract to contain active chemicals of alkaloids,flavonoids, saponins and terpenoids at different concentrations.The study concluded that the extracts are very active against the larva of the mosquito, therefore more effort should be made to harness the potential of these available raw material as botanical pesticide.

Keywords: Malaria, plant extract, larvacidial.

INTRODUCTION

One of the ways of controlling malaria in the tropics is by attacking the vector of the disease; mosquito. *Anopheles gambiae* is the carrier of the most dreaded form of the parasite; *Plasmodium falciparum*. The resistance of the vector to the most notable form of the pesticide has been a major source of concerns hence, the promotion of botanical pesticides which are known to be safe and active. The deleterious effects of plant extracts or pure compounds on insects can be manifested in several manners including toxicity, mortality, anti-feedant growth inhibitor, suppression of reproductive behaviour and reduction of fecundity and fertility (Jbilou et al., 2006). The misuse and excessive use of synthetic insecticides may cause some undesirable effects not only to the agricultural ecosystem but also to human health due to insecticide residue in food (Dadang et al., 2009). Apart from this, there has been a major concern for the promotion of botanical pesticides as environmental friendly pesticides although there could still be a need to depend on chemical insecticides in case of epidemics outbreak (Abdelouaheb et al., 2009). Prior to the discovery of the Organochlorine and Organophosphate insecticides in the late 1930s and early 1940s, botanical insecticides were important products for pest management in industrialized countries (Isman 1997). Neem plants (*Azadirachta indica)* is one of these plants of interests, the plants has been used as botanical insecticides and are relatively safe towards non-target organism, less likely to induce resistance, due to their multiple modes of action on insects (Umar et al., 2007). Apart from the extract, dried neem leaves and bark are commonly used in villages for protection against infestation of stored grain and other products by insects. *Sida acuta* and *Nepeta cataria* are

another plants that their insecticidal potency has been reported by various authors (Adeniyi et al., 2010; Karou et al., 2007).

Interest in plants with insecticidal properties has been on the increase recently around the world today, either singly in integrated pest management or in conjunction with synthetic pesticide and many of these extracts have been reported by various authors to be highly effective. This study aim to compare the effectiveness of the three local medicinal plants for their effectiveness to control mosquito larva.

MATERIALS AND METHODS

Sample collection and preparartion

Fresh leaves of three natural plants (*A. indica, S. acuta* and *N. cataria*) were collected from the premises of The Federal Polytechnic, Ilaro, Ogun State and other places within the township of Ilaro where they grow as wild plants. The plants were identified by cross-checking with herbaria plants in the biology laboratory of the institution. The leaves were air – dried at room temperature (29^{o}C) for 3 weeks, crushed and stored in air – tight polythene bags

Extraction of plant materials

Methanol extraction was carried on the plants. 250g each of the ground samples was suspended in 4000ml methanol for a period of 72 h at room temperature. The mixture stirred thoroughly and filtered through whatman filter paper and the extracts were concentrated using a rotary evaporator. The concentrates were evaporated to dryness in a water bath (40^{o}C) and stored in labelled specimen bottle for bioassay.

Larvae rearing

A.gambiae mosquitoes were obtained from National Institute of Medical Research (NIMR), Yaba, Lagos ,Nigeria. Adult of both sexes were fed with 5g/250ml of sucrose solution in a caged plastic covered with net. Eggs of these mosquitoes were subsequently cultured in the biology laboratoory of the institution. Larvae were reared in plastic containing tap water and maintained at 25 – 27^{o}C, cool environment and dark photo period cycle. They were fed with fresh food containing mixure of Cabin Biscuit and Regal – dried yeast (75 – 25 by weight) until reached the 4th instars larvae.

Phytochemical screening

Chemical tests were carried out on the powdered samples using standard procedures to identify the constituents as described by Sofowora (2003), Trease and Evans (1989) and Harborne (1973). The wasdone qualitatively and quantitatively.

Bioassay and larva mortality

Bioassays were performed with 4th larvae stages using concentrations from 2, 5 and 10mg/L for each of the extracts and untreated water for control. A minimum of 15 larvae per concentration were used for all the experiments to maintain uniformity of batches of larvae. Larvae mortality was assessed after every 24 h of exposure and moribund larvae were counted dead (Azmi et al., 1998). The experiments were repeated four times for each concentration of the extracts and percentage average mortality was calculated by using.

$$\text{Percentage mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times \frac{100}{1}$$

Corrections for mortality wasmade using Abbot's (1925) formula;

$$\text{Corrected \% of mortality} = 1 - \frac{\text{n in T after treatment}}{\text{n in C after treatment}} \times \frac{100}{1}$$

Where n = Number of larvae
T = Treatment
C = Control

RESULTS

Table1 shows that the alkaloids, saponins, tannins, terpenoids and flavonoids were present in all the extracts of *A.indica*, *S. acuta* and *N. cataria*. *Steroids* and cardiac glycosides were present in the extracts of *A. indica* and *S.acuta* but absent in *Nepeta cataria* while phlobatannins was present in the extracts of *N. cataria* only.

Table 2 shows the quantitative phytochemicals determination of the three plant extracts of *A. indica, S. acuta and N. cataria.* Alkaloids, saponin, and flavonoids were present at different level in all the extract.

Tables 3, 4 and 5 show the percentage larvae mortality when treated with the extract of the *A. indica, S. acuta and N. cataria, respectively* at concentration of 2,5,10mg/L and control. The probit analysis at LC_{50} of the extract shows 6, 5 and 0.98mg/L respectively.

DISCUSSION

Identification of various plant extract that have larvacidal

Table 1. Qualitative analysis of the phytochemicals content of plant extracts.

Phytochemicals	*Azadirachta indica*	*Sida acuta*	*Nepeta cataria*
Alkaloids	+	+	+
Flavonoids	+	+	+
Saponins	+	+	+
Steroids	+	+	-
Tannins	+	+	+
Phlobatannins	-	-	+
Terpenoids	+	+	+
Cardiac glycosides	+	+	-
Reducing Sugar	-	-	-

+ = Presence of constituent
- = Absence of constituent

Table 2. Quantitative phytochemicals analysis of the three plant extracts.

Phytochemicals	*Azadirachta indica* (%)	*Sida acuta* (%)	*Nepeta cataria* (%)
Alkaloids	3.5660	1.2210	4.0220
Saponins	1.7605	1.8400	1.1720
Flavonoids	4.0720	2.0070	3.4900

Table 3. Larvae mortality at different concentration of *Azadirachta indica* from 24h to 192h

Conc. (mg/L)	% Mortality	Corrected mortality	LC_{50}
2	43.33±1.85	41.4± 0.37	
5	50± 2.412	48.3± 0.48	6 mg/L
10	61.6±1.16	60.7± 0.23	
Control	3.3±%		

Each value (X ± S.E.) represents mean of four values for the period of 192 h.

Table 4.Larvae mortality at different concentration of *Sida acuta* from 24 to 192h.

Conc.	% Mortality	Corrected mortality	Lc_{50}
2	33.3±1.62	33.3± 0.29	
5	50±2.44	50 ±0.48	5mg/L
10	71.6±1.83	71.6±0.36	
Control	0.0		

Each value (X ± S.E.) represents mean of four values

potential activities against mosquito can be of advantage in reducing the problem of resistance and concern for the environmental safety. Control of vectors especially parasitic vectors is a common way of disease control. Larva control of mosquito can reduce the population of the insect which could be transformed into reducing the burden of the disease. Mosquito breeds in water where it hatches into larva until adult. The use of conventional pesticide in water introduces many risks and health hazards to the people and the environment. A.*indica, S. acuta* and *N.cataria* extracts that were focused in this study all proved to hold good insecticidal promises against malaria vector. The potential of these extract either having larvacidal or insecticidal activities has earlier been explored by various authors. Also, many authors have widely reported the chemotherapeutic ability of some of these extract either as malaria herbs or other medicinal uses (Abdelouabeb et al., 2009; Umar et al., 2007). The phytochemical screening results indicated that the leaves extracts of these plants were rich in alkaloids, flavonoids and tannins and saponins which may be responsible for the insecticidal properties observed in these plants. These phytochemical have earlier been reported

Table 5. Larvae mortality at different concentration of *Nepeta cataria* from 24 to 192h.

Conc. (mg/L)	% Mortality	Corrected mortality	LC_{50}
2	71.6±0.75	71±0.15	
5	75.0±0.53	74.5±0.13	0.98 mg/L
10	91±0.76	90.8± 0.76	
Control	1.7±0.25		

Each value (X ± S.E.) represents mean of four values.

to have larvacidal and insecticidal abilities by other authors (Sofowora 1993). Neem crude extract or oil has specifically been reported to inhibit metamorphosis thereby disallowing pupation or adult emergent of the mosquito (Kabaru and Gichia, 2001).The result of this study agreed with the finding of Okumu et al.(2007) where it was reported that neem is highly toxic to mosquito and delay pupation. Exposure of *A.gambiae* larvae to sub-lethal doses of neem and catnip leaves extract in the laboratory prolonged larvae development and pupation (Su and Mulls 1999).This view is in consistent with this present study. The probit analysis of percentage mortality of the three extract at Lc_{50} shows moderate to average level of concentration. This is also in agreement with the finding of Shaalan et al.(2005) and Zhu et al.,2008).

In conclusion, the three plants have shown great potential as botanical pesticides. The plants are abundant in Africa therefore cheap raw material that should be harnessed for the control of malaria and reduction in Africa diseases burden.

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