EFFECT OF LEAF EXTRACTS OF *Draceana aborea* L. AND *Vitex doniana* SWEET ON THE LARVAE OF *Anopheles* MOSQUITO

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ABSTRACT

The leaf extracts of Draceana aborea and Vitex doniana of Agavaceae and Verbenaceae families respectively, were tested on the larvae of anopheles mosquito for their botanical insecticidal effects. The results of the investigation showed that the minimum percentage mortality concentration (MPMC) of these leaf extracts on the test organisms were at 7.5ml/20ml and 10ml/20ml as the starting points for D. aborea and V. doniana, respectively. Findings equally revealed that the combination of D. aborea and V. doniana leaf extracts exerted synergistic effects on these organisms at 5.0ml/20ml, whereas the use of the D. aborea and V. doniana extracts separately resulted in reduced efficacy. Analysis of variance showed that, there was no significant difference (P = 0.01) between the synergy and the individual treatments of the leaf extracts on these organisms. Preliminary phytochemical screening showed the presence of flavonoids, free phenolics, condensed tannins, pseudotanins, triterpenes, glycosides and saponins which have some insecticidal effects on their targeted organisms. These findings represent one of the steps in identifying plants, with insecticidal properties from the rich Bioresources in the Mosaic of the Low-Land Rainforest vegetation zone of Southeastern Nigeria.

Keywords: *Draceana aborea, Vitex doniana, Leaf* extract, Botanical insecticide, Phytochemical, *Anopheles* mosquito

INTRODUCTION

Mosquito has perhaps attained the greatest public nuisance than any other arthropod in recent time. This is because of responsible for 273 million clinical cases and 1.13 million deaths annually in Sub-Sahara Africa (USAID, 2006). Synthetic insecticide which inhibits or kills insects has now become popular target for elimination by environmental conservationists. This is because they are considered to be important sources of man-made pollutants and are detrimental to the environment and the surrounding biodiversity (Clark, 2000). Their negative impacts on the environment are becoming of global concern, such problems like environmental contamination, bioaccumulation, residues in foods and feeds and pest resistance.

More recently, attention has been turned to plant extracts as alternative sources of insecticidal compounds, against the synthetics. Among the botanical insecticides used are Rotenone and Azadirachtin. Rotenone acts as a stomach poison and can effectively control leaf feeding insects such as beetles and aphids. Rotenone is produced from the roots of *Lonchocarpus* sp. grown in South America. Its mode of action is the inhibition of cellular respiration in nerve and muscle cells causing rapid cessation of feeding. Rotenone is useful against leaf feeders; because it degrades rapidly in the air and sunlight (Anne, 2005). Hence it is used as fish poison in water management. Azadirachtin acts as an insect repellent, feeding deterrent and growth regulator. Its active ingredient Azadirachtin is extracted from *Azadirachta* seed that has both insecticidal and fungicidal activities (Anne, 2005). The insecticidal properties derived from these plants have prompted the examination of other plants for new insecticidal compounds.

Dracaena arborea belongs to the family Agavaceae and the genus is composed of about 500 species of woody stemmed plants mostly occurring in the tropics and subtropics. *Vitex doniana* belongs to the family Verbenaceae. This large genus is distributed throughout the tropics and subtropics (Onochie *et al.,* 1964). The preponderance of these plants within the mosaic of the lowland rainforest vegetation zone provides an adequate means of their utilization as cheap sources of biological agents for study on the production of bio-insecticides. Moreover, it will serve as a cheaper means of treatment for low income earners and rural dwellers who cannot afford high cost of modern insecticides.

The aims of this study were to determine the effect of *D. arborea* and *V. doniana* leaf extracts on the larvae of Anopheles mosquito. To compare the mortality rate of these extracts to that of synthetic insecticide (pest ox). To determine the synergistic effect of the two plants and finally evaluate the minimum percentage mortality concentration (MPMC) of these plant extracts.

MATERIALS AND METHODS

Preparation of Plant Extract: The leaves of the *D. arborea* and *V. doniana* plant were collected, washed and oven dried at 50 o C for 40 minutes. Twenty grams of each of the pulverized leaves of *D. arborea* and *V. doniana* were introduced into 200 ml of 95% ethanol and left for 24 hours. At the end of this duration it was filtered and the solutions collected were stored at 4 o C pending use. Synergy extract was prepared by the combination of 10 g each of the *D. arborea* and *V. doniana* pulverized leaf and treated as above. Pest Ox a synthetic insecticide was used as a reference.

Preparation of Test Organisms: One albino rat was bought, shaved and allowed to stay in a netted cage with a container of stagnant water. Anopheles mosquitoes were equally introduced into the cage to have a blood meal on the albino rat and lay eggs which formed the sources of our larvae. Four concentrations of 5.0ml, 7.5ml, 10.0ml and 12.5ml of leaf extracts were introduced into 20ml of water along side with 100 larvae of Anopheles mosquitoes collected with a syringe respectively. Three replications each, of these were allowed to stand for 3 hours. Fifty larvae of the target organism, which were not subjected to any treatment but ordinary pond water served as control. Mortalities were expressed as mean percentage of three replications per treatment. Treatments were analyzed for significant differences using analysis of variance (ANOVA).

Preliminary phytochemical screening of the two leaves was done in the Department of Phamarcognocy University of Nigeria Nsukka.

RESULTS AND DISCUSSION

The results of the phytochemical screening for the leaves of the two plants were done. The result revealed the presence of high levels of free phenolic and glycosides in the two leaves and moderate levels of flavoniods and triterpenes in *V. doniana*. There were complete absence of Stroides and Alkaloids in the tow leaves (Table 1).

Table 1: Phytochemical composition of the leaves of *D. arborea* and *V. doniana*

Compounds	*D. arborea*	*V. doniana*
Flavoniods	+ + +	+ +
Free phenolics	+ + +	+ + +
Condensed tannins	+ + +	+ +
Pseudotanins	+ + +	–
Steroids	–	–
Alkaloids	–	–
Triterpenes	+ + +	+ +
Glycosides	+ + +	+ + +
Saponins	+ +	+

** Legend + + + + =Excessive, + + + = High, + + =Moderate, + = Low and - = Absent*

The percentage mortality rate and the minimum percentage mortality concentration (MPMC) of the leaf extracts on the test organisms were 17.666, 13.222, 19.666 and 70.111 at 7.5mg/20ml, for *D. arborea* and *V. doniana* and 10.0mg/20ml, 5.0ml/20ml for synergy and pest ox respectively (Table 2).

The mortality of the test organism to *D. arborea*, *V. doniana*, synergy and (pest ox) chemical insecticide were evaluated by observation. The results showed that the extracts exhibited a moderate toxicity or low killing effect on the test organisms. The toxic effects however increased with increase in the concentration of the leaf extract. It also showed that among the treatments, pest ox has the highest mortality rate of 70.111 at the least concentration of 5.0ml/20ml followed by synergy 19.666 at 5.0 ml / 20 ml (Table 2). This was in line with the result of Aliero (2003), who reported that, the exposure of Anopheles mosquito larvae to undiluted extracts of seed oil, leaf and back of crude extracts of *Azadirachta indica* for 12 hours led to 100, 98, 48% mortality respectively. The minimum percentage mortality concentration (MPMC) of *D. arborea* was 7.5ml/20ml and that *of V. doniana* was 10.0ml/20ml, respectively as indicated figures with asterisk in table 2. The mortality effect of these plant extracts can be compared with the lethal death (oral LD50) caused by rotenone, pyrethrins, sabadilla, and azadrachtin plant extracts which have oral Lethal death ranging from 60mg/kg to 4,000mg/kg (Addor, 1995) .

It is important also to note that *when D. arborea* and *V. doniana* were combined (synergy), a high mortality effects were recorded at a concentration of 5 ml / 20ml (Table 2) . Statistical analysis of variance showed that, there was no significant difference ($P > 0.01$) between the synergy and the individual treatments of the leaf extracts on these organisms (Table 3).This means that these plants extract exerted synergistic effect on the test organisms. Total mortality was consistently positively correlated with insecticidal concentrations and the duration of exposure. This was in agreement with the work of Essam *et al.* (2005) who showed that the effect of *Callitris glaucophylla* extracts on the development of *Aedes aegypti* was higher as the concentration in increases. The effects of these plant extracts on the targeted organisms have further confirmed the insecticidal potentials of some metabolic compounds produced by plants that will be environmental friendly.

Phytochemical screening confirmed the presence of flavonoid, phenolics, tannins, pseudotanins, triterpenes, glycosides and saponins. This agreed favourably with the report of Isman (1997), who reported that, natural defense of plants against herbivory consist almost of mixtures of closely related compounds, rather than a single toxicant alone. He further pointed out that Rotenone contains six or more insecticidal isoflavonoids, glycosides and tannins which caused the death of insects.

However further studies on the stability and phytotoxicity of these bio-active compounds could enhance our knowledge and facilitate its large scale production for commercial use.

Table 2: Mortality rate of anopheles mosquito larvae exposed to leaf extracts of *D. arborea* and *V. doniana*

Plants	Concentration					
	5.0ml/20ml	7.5mg/20m	10.0mg/20ml	12.5mg/m	15mg/20ml	Control
D. arborea	6.333	17.666*	33.666	48.333	52.222	0.000
V. doniana	3.111	5.333	13.222*	35.111	46.666	0.000
Synergy	19.666*	30.333	46.333	58.222	60.000	0.000
Pest Ox	70.111*	96.666	-	-	-	0.000

Table 3: Deviation from mean on mosquito larvae mortality exposed to leaf extracts of *D. arborea* and *V. doniana*

Plants	Concentration					
	5.0ml/20ml	7.5mg/20m	10.0mg/20ml	12.5mg/ml	15mg/20ml	Control
D. arborea	6.333± -0.090	17.666*0.951	33.666 ± 0.331	48.333±0.740	52.222±0.441	0.000
V. doniana	3.111±0.000	5.333±0.596	13.222*±0.341	35.111±0.32	46.666±0.411	0.000
Synergy	19.666*±9.666	30.333±0.490	46.333±0.521	58.222±0.454	60.000±0.4	0.000
Pest Ox	70.111*±0.275	96.666±0.033	-	-	-	0.000

Conclusion: In conclusion, the effect of *Dracaena arborea* and *Vitex doniana* leaf extracts in this study have shown and suggested that these plants have potential bio-actives properties on Anopheles mosquito larvae, although the insecticidal activity of pest ox on the test organism was the highest and causes 100% mortality within a short period of time. These botanicals could be more environmentally friendly and cheaper and should be harnessed.

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