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The Use of Indigenous Plant in Controlling Mosquito (Agent of Infectious Disease)

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ABSTRACT

The use of botanicals as alternatives to synthetic insecticides offers a more environmentally friendly method of insect control. The current study evaluated effects of two indigenous plants against *Anopheles mosquito.* Two plants namely neem tree (*Azadirachtaindica*) and Water hyacinth (*Echorniacrassipes*) were used to control mosquito biologically those were obtained from Gwiwa Low cost and Tashar Illela (at Maimasukka River) Sokoto, Nigeria respectively, various concentrations of the plants were prepared and used. Mortality (of dead larva) were recorded against the various concentrations, each plant was tested against anopheles effectiveness. For water hyacinth the highest percentage mortality was 86.6% at 15µg/L and 120µg/L the lowest percentage mortality was 73.3% at 30µg/L. While for Neem the highest percentage mortality was 100% at 120µg/L and lowest was 36.6% at 15µg/L. The government should encourage, empower and establish research institutes, give financial support for further research into the bioactivity of these plants to be able to formulate insecticidal coils that can be used to repel and prevent mosquito bites, which may eventually reduce the use of synthetic insecticides.

Keyword: Neem tree, Water hyacinth, Botanicals, Mosquito and Indigenous. .

INTRODUCTION

Mosquitoes are vectors of various diseases most notably, malaria. A vector is any agents that carries and transmit an infectious path agent into another living organism mosquito are responsible for transmission of parasitic and viral infection to millions of people worldwide with substantial morbidity and mortality [1]. Mosquitoes are considered one of the most dangerous creatures on the planet because of their ability to spread deadly diseases. The US centers for diseases control reported that the insect kill more than one million people a year just through the transmission of malaria, add to that is the numbers of those sickened and killed by other mosquito-borne disease such as dengue fever, yellow fever and West Nile Viries (WNV) is enough to see how mosquito earned their dangerous reputation [2].

Mosquitoes belong to the class insecta order diptera and family culicidae the two subfamilies are anopheline which include the genera aedes, culex, mansonia and magoguos [3]. Although a few species of mosquitoes are harmless or even useful to humanity, most are considered a nuisance because they consume blood from living vertebrates include human. The females of many species of mosquitos are blood eating pest; in feeding of blood some of them transmit extremely harmful livestock diseases, such as malaria, yellow fever and filariasis. Malaria and lymphatic filariasis (Lf) are two most important vector-borne parasitic diseases worldwide, in Africa; Nigeria has the largest burden of malaria and lymphatic filariasis [4].

Almost all tropical regions of the world are experiencing the resurgence and reoccurrence of the world's most deadly diseases i.e malaria, filariasis, dengue and chukungunya fever [5] and Nigeria is no exception.

Malaria caused by parasites primarily plasmodium falcifarum or p.vivax is transmitted when female anopheles mosquitoes pick up the parasite by feeding on infected blood of humans the parasite develops in the mosquito for 10 – 18 days, then is passed on to another human when mosquito injects saliva while feeding, the parasite migrate to liver, then to the blood stream (in red blood cells) the infected person begin to show symptoms such as fever, chills, sweating, headaches and other flu-like condition leading to even more severe case sometimes, e.g kidney failure and death especially if left untreated. Dengue fever is also spread by aedes mosquito which is able to transmit the disease (Dengue) about a week after biting on infected person the virus multiply in the blood stream severe cases could lead to bruising and bleeding as a result, of dengue hemorrhagic fever.

Similarly the West Nile Virus (WNV) is also transmitted by culex mosquitoes by feeding on infected birds after spreading through the mosquito systems, it pass into human through their saliva during feeding, the (WNV) multiplies in the human bloodstream and is carried to brain where it begin to affect the central nervous system and cause inflation of brain tissue (encephalitis) the infection can lead to convulsion, coma and death, even if the person survives, there is a good chance of permanent neurological damage. Other disease transmitted by mosquito includes yellow fever transmitted by Aedesaegypti and Chikungunya fever also transmitted by Aedesaegypti and Aedesalbopictus [5].

Mosquito control in view of their medical importance assumes global importance. In the context of ever increasing trend to use more powerful synthetic insecticides to achieve immediate results in the control of mosquitoes, an alarming increase of physiological resistance in the vectors, its increased toxicity to non-target organisms and high cost are not worthy [6]. Muriu *et al*., Raj *et al*., and Ashley *et al*., [7, 8, 9] also stated that most the synthetics chemicals are expensive and destructive to the environment and also toxic to humans and animals; therefore alternative vector control strategies especially effective and low cost are extremely imperatives.

Hence innovative vector control strategies like use of photochemical as an alternative sources of insecticidal/larvicidal agents in the fight against vector born-disease has become inevitable; above and beyond in recent epoch around the globe photochemical have gain massive attention by various researchers because of their biodegradable and eco-friendly values [10]. This

study aimed at Evaluation of botanicals (Two indigenous plants) as control agents of mosquitoes.

MATERIALS AND METHODS

Collection of Sample

Neem leaves (Azadirachtaindica) and water hyacinth (Eicchoriniacrassepis) were collected from Gwiwa low cost and TasharIllela (maimasukka river) respectively; both areas are located in Sokoto state of Nigeria. Eight hundred mosquito larvae were collected from some breeding sites near a river at Eka – Gwiwa (Sokoto state); Out of which four hundred and eighty were analysed and used.

Materials

Test tubes, micropipettes, dropping pipettes, distilled water, electrical weighing balance, measuring cylinder beakers (250ml capacity), stock solution (Neem) and stock solution (water hyacinth).

Sample Processing and Analysis

The two plants (leaves) were air dried for nine days and grounded into fine powders separately. The mosquito larvae were analyzed by observing the laying position of each larva on water, to segregate anopheles from other larvae which is commonly culex. The differentiation was based on the fact that anopheles larvae lay flat on water surface unlike culex and other larvae that protrude upright at an angle a little bit. Because two plants (leaves) were used, each was used separately but following the same procedure of WHO [6] with a little modification. 1000mg equivalent to (1g) each of neem and water hyacinth grounded leaves were dissolved separately in 10ml of sterile distilled water. In test tubes, each mixture was homogenized for five minutes, which give a concentration of 1000mg/10ml stock suspension. From the suspension in "a" a stock was made by adding 0.1ml into 9.9ml of sterile distilled water followed by agitation for one minute. The stock is equivalent to 1000mg/liter. From the stock solution of the leaves powder; dilutions were prepared using micropipettes of 15µl, 30µl, 60µl, 90µl, 100µl, and 120µl, (micro litres) thisgives a concentration of 0.1, 0.2, 0.4, 0.6, 0.66 and 0.8 (mgs/litre) respectively.

The microliters in "C" above were added separately to 15ml of sterile distilled water in 6 beakers. A control beaker was also set.

To each set of beakers (i.e for each plant) 30 anopheles mosquito's' larvae were added using dropping pipette. Mortality was observed starting from five minutes (5min), 15min, 30min to 240min; taking the observation after 15minutes, the dead larvae was removed and recorded i.e mortality rate was determine and lethal concentration (Lc) 50 and 90 from the graph of mortality against concentration.

RESULT AND DISCUSSION

Insecticides derived from plants are believed to be relatively safe and biodegradable. Therefore in this research work the efficiency of water hyacinth (E. *crassipes*) powder and that of neem leaves (*A. indica*) powder have been tested on anopheles mosquitoes larvae and the differences in the action of two powders identified as presented in **Table** 1.

Percentage mortality of Anopheles on water Hyacinth (E. *crassipes*) Powder at various Concentrations is presented in **Figure** 1. The highest mortality was observed at 120 µg/L concentration. For water hyacinth the activity took up at the first 5minute in 100µg/L concentration. In the first one hour activity was evident in all concentrations except of that of 30µg/L. after three and half hours activity (larval mortality) increases across all concentrations and does not seize up to 240 min complete four hours. It was observed that the highest percentage mortality (86.6%) was recorded at the first and last two concentrations i.e 15µg/L, 100µG/L. followed by 76.6% recorded at 90µg/L **Table** 1. This is in accordance with Pavitha and Poornima [11] who found that the repellent activity test for the cream formulation showed 89.87%, 87.5% and 90% protection while the smoke toxicity test for the incense coil showed 66.25%, 70% and 67.5% protection against *An. stephensi*, *Cx. infulus* and *A. aegypti*, respectively.

Percentage mortality of Anopheles in Neem Leaves (A. *indica*) Powder at various Concentrations is presented in **Figure** 2. The highest mortality was observed at 100 µg/L concentration. For the Neem the activity took up after 30min in 120µg/L and 90µg/L concentrations. In the first one hour the activity was evident in three concentrations 90µg/L, 100µg/L and 120µg/L. in the next hour activity (larval mortality) increases across all concentrations and does not seize up to 240 min complete four hours. It was observed that the highest percentage mortality (100%) was recorded at 120µg/L concentration **Table** 2.

Table 1: Activity of Various Concentrations of Water Hyacinth on Mosquito Larva

Time/min	15 µg/L	30 µg/L	60 µg/L	90 µg/L	100 µg/L	120 µg/L
5min	0	0	0	0	1	0
15min	0	1	1	1	1	1
30min	1	0	1	1	2	1
45min	0	0	1	1	2	1
60min	2	0	1	2	1	1
75min	2	1	1	1	1	1
90min	1	2	1	1	1	2
105min	3	2	2	1	2	2
120min	2	2	0	1	1	1
135min	2	1	1	2	1	2
150min	2	2	1	1	2	2
165min	2	1	2	1	2	2
180min	1	1	2	2	1	2
195min	2	2	2	1	2	2
210min	2	3	2	2	2	2
225min	2	2	2	2	2	2
240min	2	2	2	3	2	2
Percentage	$\frac{26x100}{30}$=86.6	$\frac{22x100}{30}$=73.3	$\frac{22x100}{30}$=73.3	$\frac{23x100}{30}$=76.6	$\frac{26x100}{30}$=86.6	$\frac{26x100}{30}$=86.6

Table 2: Activity of Various Concentrations of Neem on Anopheles Mosquito Larva

Time/min	15 µg/L	30 µg/L	60 µg/L	90 µg/L	100 µg/L	120 µg/L
5min	0	0	0	0	0	0
15min	0	0	0	1	0	1
30min	0	0	0	0	0	1
45min	0	0	0	1	1	1
60min	0	0	0	1	1	2
75min	1	0	1	1	1	1
90min	1	1	1	1	1	1
105min	1	0	1	1	1	2
120min	1	1	1	1	2	2
135min	1	2	2	2	2	2
150min	1	3	3	3	3	3
165min	0	2	2	2	3	3
180min	1	2	2	2	2	3
195min	1	2	3	3	3	3
210min	1	2	2	2	3	3
225min	1	2	2	2	3	2
240min	1	2	3	3	3	-
Percentage (%)	$\frac{11x100}{30}$=36.6	$\frac{19x100}{30}$=63.3	$\frac{21x100}{30}$=70	$\frac{26x100}{30}$=86.6	$\frac{29x100}{30}$=96.6	$\frac{30x100}{30}$=100

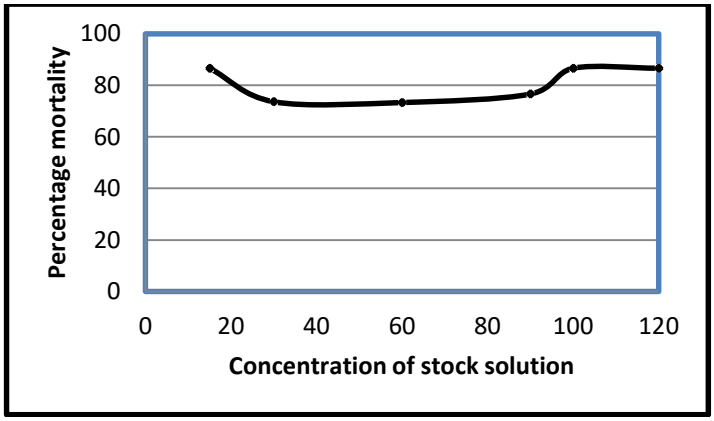

Figure 1: Percentage mortality of Anopheles on water Hyacinth (E. *crassipes*) Powder at various Concentrations.

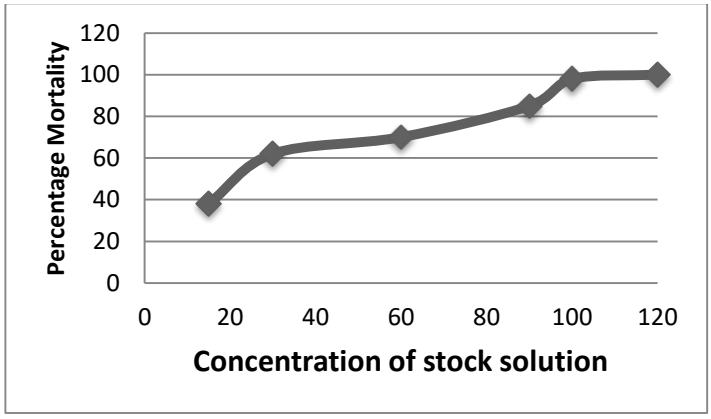

Figure 2: Percentage mortality of Anopheles in Neem Leaves (A. *indica*) Powder at various Concentrations.

Generally, for the two leaves activity increases with increases in time and concentrations. This indicated that if time frame is increased there is possibility of achieving a 100% larval mortality. The lethal concentrations 50 (LC50) and lethal concentration 90 (LC90) of neem were extrapolated from figure 2 as 0.15 µg/L and 0.65 µg/L respectively. The result was also in agreement with the study of Karunamoorthi *et al.* [10] on the mosquito repellent activity of the essential oil of *Juniperus procera* against *Anopheles arabiensis* at 1 and 5 mg/ cm^2 concentrations. The result showed repellency and protection (80.60% in 311 min) against *A. arabiensis*, while water hyacinth there was no LC50 and LC90. Hence further research needed:

Das *et al.* [12] demonstrated the inhibitory effect of Neem oil volatiles on gonotrophic cycle in Anophelesstephansi and Anopheles culifacies. A Neem oil formation containing 32% Neem seed oil an emulsified 5% and 63% isopropanol (solvent) was investigated for its larvicidal activities against anopheles mosquito. It was toxic to larvae with LC 50 value of 11ppm and also reported to possess insect growth regulators.

CONCLUSION

It can be concluded that water hyacinth took effect quicker than Neem, but with increase in time the effect of Neem is more effective than that of water hyacinth. Both of them are relatively less toxic eco-friendly and was identified effective in controlling mosquito larva under natural field condition. It's recommended that government and any other malaria control agency should put their helping hands to the development of this procedure because it's highly effective and less expensive and extremely convenient for the betterment of our environment against mosquito control.

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