Bioefficacy of some Indigenous Nigerian Plant Leaves on Mosquito Species

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Abstract
Mosquitoes have caused a great damage to humans and animals and the use of synthetic insecticides in the control of this pest is also harmful. Therefore, there is need to control it with natural, biodegradable, economical and environmental friendly insecticide. Leaves of different local plants (Azadirachta indica, Ocimum gratissimum, Cymbopogon citratus and Ageratum conyzoides) were extracted using soxhlet apparatus for petroleum ether extraction solvent. Also, distilled water was used for aqueous extraction separately. The different extracts were used to treat the pupal stage of three different mosquito species (Anopheles gambiae, Culex quinquefasciatus and Aedes aegypti) separately. It was observed from the result that the mean death in different extraction solvent was significantly different with higher mortality in petroleum ether extracts than aqueous extracts. Also, mean effect of each plant extract is significantly different on the death of mosquito at 0.05% confidence level Azadirachta indica leaf most effective followed by Ocimum gratissimum leaf and lastly Ageratum conyzoides leaf. Furthermore, at the same concentration, Anopheles gambiae recorded the highest mean death of 6.296 followed by Aedes aegypti with 5.558 and Culex quinquefasciatus 3.885. The leaves of the local plants used were effective in the control of mosquito species.

Keywords
Biodegradable; Pupal; Species; Extracts; Petroleum Ether; Aqueous

1 Introduction
The tremendous power of the small pests lies in its ability to transmit horrible diseases to human such as malaria, yellow fever, filariasis etc. Mosquitoes can transmit diseases such as dengue, malaria, yellow fever to humans, horses and a variety of other animals (William et al., 2004). Mosquito borne diseases have plagued civilization for thousands of years (Donald, 2008). Transmission of the disease occurs when an infected mosquito takes a blood meal (William et al., 2004). It is important to recognize that young adult female mosquitoes taking their first blood meal do not transmit diseases (Donald, 2008). Furthermore, the use of synthetic insecticide in the control this pest can cause severe health problem. Therefore, there is urgent need to emphasize on the use of natural, organic, biodegradable, affordable and environmental friendly plants in the control of mosquito species.

2 Materials and Methods
2.1 Collection of mosquito species
The eggs of the different species of Mosquito (Aedes aegypti, Anopheles gambiae and Culex quinquefasciatus) were collected from the egg colony at the National Arbovirus and Vector Research Centre, Enugu, Enugu State, Nigeria, and were reared in the laboratory to pupal stage (Table 1).

Table 1: Anova table to determine the effect of plant extracts on different mosquito species at the pupal stage

2.2 Collection of plant parts
Fresh plant (Figure 1; Figure 2; Figure 3; and Figure 4) parts were collected at Amudi in Ezinihitte Mbaise Local Government Area of Imo State and identified by a botanist in Forestry and Wild Life Department of Federal University of Technology, Owerri. Dead leaves were removed together with insect larvae from the twigs. The plant part was carefully washed, rinsed with tap water and air dried at room temperature of 28 ± 1°C for five days and stored in air tight glass containers for further use (Ebe et al., 2015).

Figure 1: Azadirachta indica (NEEM)

Figure 2: Cymbopogon citratus
2.3 Preparation of plant extract
The completely dried plant part was ground with Binatone Mx10 blender and sieved to obtain a fine powder of the plant part. 150 grams of each pulverised plant part was placed in a plain sheet of white paper, then placed in the timbel of the soxhlet apparatus compartment using petroleum ether extraction solvent (Okigbo et al., 2010; Ebe et al., 2014).

2.4 Preparation of test material
Stock solution was prepared by dissolving 5 g of the extract in 150 mls of water into which three drops of acetone was added to emulsify the oil in water and then making it up to 250 ml by mixing with distilled water in standard flask. All the test solutions were made by pipetting 5 ml-50 ml of the stock solution and introduced into 240 ml, 235 ml to 195 ml of distilled water respectively in separate labeled 500 ml bowls making it up to 245 ml in volume (WHO, 1981).

2.5 Susceptibility test
Twenty specimens of the different mosquito were picked using rubber pipette and placed in small separate specimen bottles containing 5 ml of water and then exposed to each of the concentrations of the extract giving a final volume of 250 ml in the bowls. Quaker oat powder was used to feed the larvae every twenty-four hours. Three replicates for each of the test concentration and control (without plant extracts) were tested for anti-larval effects. The larval mortalities were recorded at intervals of 8 hours for 48 hours exposure. All the mortalities were counted and recorded (Ebe et al., 2015).

3 Discussions
It was observed that A. indica leaf was more susceptible in all the species of mosquito used than the other leaf extracts followed by O. gratissimum leaf and the least was A. conyzoides as shown in Table 2. This may be due to their active component as reported by Banthorpe and Heinrich (2005) which stated that phytochemicals are the principal active components that are believed to exhibit the medicinal activities of oils.

Table 2 Multiple comparisons of the plants
Table 3 showed the estimated mean death of the different mosquito species. From the result, it was observed that Anopheles gambiae was more susceptible with mean death of 6.296 followed by Aedes aegypti and then Culex quinquefasciatus. This may be due to habitat factor. Anopheles gambiae breed and thrive in unpolluted fresh water while Culex quinquefasciatus breed and thrive in polluted water. This observation was in line with the findings of Subra (1980), Virendra et al. (2009) and Ebe et al. (2015). Furthermore, Senthikumar et al. (2009) reported that lethality depends on the mosquito species and extract.

Table 3 Estimated means of the different mosquito species
More also, it was observed in Table 4 that the mean death difference between Anopheles gambiae and Aedes aegypti was lower (0.738) than Anopheles gambiae and Culex quinquefasciatus (2.411). This showed that Culex quinquefasciatus is more resistant to the extracts used than Aedes aegypti and Anopheles gambiae was least resistant to the extracts used.

Table 4 Pairwise comparison on death of mosquito species

4 Conclusions
This study confirmed that the plant part extracts used were potential agents for the control of mosquito population. Toxicity of the tested plant extracts against the mosquito species depend on: the plant used, concentration of the extract and the species of mosquito exposed.

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