



Repellency Effect of Prepared Neem Tree Leaves Smoke against Mosquito

M. M. Jibrin^{1*} and A. D. Mohammed¹

¹Department of Biology, Umar Suleiman College of Education, Gashu'a, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author MMJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author ADM managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRIZ/2020/v3i330090

Editor(s):

(1) Dr. Oluyomi A. Sowemimo, Obafemi Awolowo University, Nigeria.

Reviewers:

(1) José Romário de Carvalho, The Secretariat of State for Education, Brazil.

(2) Eguaoje Abiodun Stanley, University of Benin, Nigeria.

(3) María Paula Zunino, National University of Cordoba, Argentina.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/56659>

Original Research Article

Received 02 May 2020

Accepted 09 July 2020

Published 25 July 2020

ABSTRACT

The study was design to evaluate the smoke repellency effect of prepared neem leaves, against mosquito. The dried neem powder was used for making the insecticide, 10 g of powdered leaves sample was weight into a 200 ml beaker, and 5.0 g of starch was weight and added to the leave sample in the beaker. The mixture was stirred and 5.0 ml of distilled water was added gradually to the mixture in little quantity while stirring. The beaker with wet insecticide mixture was dried in an oven until a constant weight was obtained. The prepared neem insecticide was distributed among the households to use at night, to substitute synthetic insecticides. The users were randomly selected within the study area. The data was collected based on the time of application, number of bites receive before and after the application this was done based on 0-5 rating scale. The result revealed that the prepared insecticide is 100% effective though the effectiveness is dependent to time taken after application. The questionnaire was also used to assess the view of the users on the adverse effect they experienced upon the exposure to neem tree leaves prepared sample. The study has been concluded that neem leaves smoke is effective in repelling mosquito, and it can be an alternative to the synthetic insecticides hence it is safe for the users and the environment.

*Corresponding author: Email: jmusamabu@gmail.com;

Keywords: *Azadirachtin indica*; neem leaves; mosquito; household; smoke and bite.

1. INTRODUCTION

Mosquitoes are the most viral issue of urban, sub-urban and rural environment [1]. Mosquitoes are the main carriers of dengue, malaria and several other diseases that cause tremendous problems even leading to death. Every year, the death rate continues to be higher due to many infections and diseases like dengue and malaria caused by mosquitoes. Nearly 700 million people are affected every year by mosquito borne illness resulting in greater than one million of deaths. Controlling such diseases is extremely difficult due to the higher reproduction rate and development of mosquitoes that are resistance to insecticides and commercially available repellents [2].

The health risks associated with arthropod disease vectors have long encouraged research into methods for protection in endemic areas, in both the grassroots [3], and scientific communities. Careful investigations into such grassroots protection methods by the scientific community is leading to the development of new bio-rational, effective and affordable products as well as increasing knowledge and confidence in traditional protection methods and reducing vector-borne disease.

Plant-based mosquito repellents are a viable source of material for use in protection against mosquitoes and mosquito-transmitted diseases [4], and have some advantages over the current gold-standard synthetic repellent, N,N-diethyl-m-toluamide (DEET) [3]. A variety of plants have been identified for their mosquito repellent properties through both grassroots and scientific investigations [3,4]. Volatiles from essential oils of Lamiaceae (culinary herbs), Poaceae (aromatic grasses) and Pinaceae (pine and cedar trees), are effective against various haematophagous arthropods and some essential oils, or their components, form the basis of commercial repellent formulations [4,5] Neem leaves possess excellent anti-viral property and can tremendously work as a mosquito repellent while burning [1]. It is anti-feedant that breaks the metamorphosis of mosquito repellent even at low concentration and hence acts as effective insect repellent [6]. Mechanism behind *Azadirachta* is to block the latic receptor and makes the mosquito to get away from the place [7]. The compounds that are toxic to mosquitoes are complex tetranorterpeneoid limnoid [8].

The formulation of this mosquito repellent is safe, eco-friendly, cheap, easy to use and has maximum efficiency against mosquitoes.

1.1 Justification

Mosquitoes are the prime vectors responsible for transmission of diseases to more than 70 billion people annually worldwide. As per the reports of World Health Organization, malaria alone kills 30 million people annually. Mosquitoes transmit the arbo-viruses which cause yellow fever, dengue hemorrhagic fever, epidemic polyarthritis, and several forms of encephalitis example. Bancroftian filariasis which is caused by a nematode transmitted by mosquito bite Globally, malaria kills 3 million people each year, including 1 child every 30 seconds. Plant product has been used by traditionally human communities many part of the world against the vectors and species of insects. The phyto-chemicals derived from plant sources can act as larvicides, insect growth regulators, repellent and ovipositional attractants and have deterrent activities observed by many researchers.

1.2 Aim and Objectives of the Study

The aim of the research is to study the repellency effect of prepared neem tree leaves smoke against mosquito.

The specific objectives are:

- 1-To determine the repellency effect of prepared neem tree leaves smoke against mosquito.
- 2-To compare the effect of neem tree leaves with synthetic insecticides.
- 3- To determine the adverse effect of both synthetic and prepared insecticide on human.

2. MATERIALS AND METHODS

2.1 Study Area

The research was conducted in Gashu'a, Yobe State Nigeria. Gashu'a is a community in yobe state in northeastern Nigeria, on yobe river a few miles below the convergence of Hadeja river and Jama are river. Average elevation is about 299 m. the population in 2006 was about 125,000 [9] the hottest months are marchb and April with the

temperature ranges of 38-40°C. In the rainy seasons, June-September, temperature falls to 23-28° Celsius with rainfall of 500 to 100 mm. [10] coordinates are 12°52'5"N 11°2'47"E / 12.86806°N 11.04639°E.

2.2 Collection of Plant of Material

The researcher used neem tree plants from Umar Suleiman College of Education Gashu'a, Campus. The samples of the neem leaves were collected directly from the plant to avoid yellow and dried leaves.

2.3 Preparation of Sample

Collected neem tree leaves were kept under the shade to dry (shade dried), the neem leaves were blended into powder using motor and pestle to obtain a neem tree leaves powder. The dried neem powder was used for making the insecticide.

2.4 Preparation of the Insecticide

The powdered neem leaves sample was weighed into a 200 ml. 5.0 g of a binding material (starch) was weighed and added to the neem sample in a beaker. The mixture was stirred to obtain a homogeneous mixture. 5.0 ml of distilled water was added gradually to the mixture in quantity of 1.0 ml while stirring [2]. The cleaned weighed beaker ($M1$) was filled with the mixture and the weight taken ($M2$). To obtain the true weight of the prepared mixture (M), the difference between the weights $M2$ and $M1$ was computed as M . thus $M = M2 - M1$ The beaker with the wet insecticide mixture was dried in an oven at a regulated temperature range of 30°-40°C. The sample was weighed after every 10 minutes until a constant dried weight was obtained after 30 minutes. The beaker with the dried insecticide was weighed to obtain the accurate weight by deducting from that of M . [11].

2.5 Method of Data Collection

The prepared neem insecticide was distributed among households within the study area and they were educated on how to use them. The households used them and were closely monitored for the effectiveness. They applied the insecticide in the evening in the comfort of their homes. The results were obtained based on the following:

- Time of application
- Number of bites received before, during and after bites period.
- Adverse effects suffered.

Number of bites were recorded based on five rating scale of 0-5.

0	1-20
1	21-40
2	41-60
3	61-80
4	81-100
5	100 and above

2.6 Statistical Analysis

The data obtained was subjected to simple percentage. Efficiency Rate = total number of bites received before application / Total number of bites received after application %Efficiency = (Efficiency rate / Total number of bites received before application) x 100%.

3. RESULTS

In Table 1 the result revealed that in the first hour of observation the researcher recorded 18 bites before the application of insecticide. While after the application of prepared insecticide in Table 2 the result recorded zero bite in the first hour this indicates 100% efficacy of prepared neem tree leaves smoke against mosquito, and the check (synthetic insecticides) also have the same effect as in prepared neem tree leaves smoke.

Table 1. Number of bites received before application of prepared insecticides

Time/Hours	Users					Total
	A	B	C	D	E	
1	3	4	3	4	4	18
2	4	5	4	5	4	22
3	4	5	4	5	5	23
4	5	5	5	4	5	24

The second hour of observation shows that 22 bites were recorded before the application of insecticide. While after the application of prepared insecticide, only two (2) bites were recorded in the second hour this indicates 100% efficacy of prepared neem tree leaves smoke against mosquito, and the check (synthetic insecticides) also have the same effect as in prepared neem tree leaves smoke.

Table 2. Number of bites received after application of prepared insecticides

Time/Hours	Users					Total	Total Rate of efficiency	% Efficiency
	A	B	C	D	E			
1	0	0	0	0	0	0	18	100
2	0	1	0	0	1	2	20	90
3	1	0	1	0	1	3	20	86
4	0	1	1	0	1	3	21	87

Table 3. Bites received after application of synthetic insecticides

Time/Hours	Users					Total	Total Rate of efficiency	% Efficiency
	A	B	C	D	E			
1	0	0	0	0	0	0	18	100
2	0	0	0	0	0	0	22	100
3	0	0	0	0	0	0	22	100
4	0	1	0	0	1	2	22	95

The third hour records 23 bites before application, three (3) bites after the application of prepared insecticides and zero bite after the application of synthetic insecticides.

Last hour result revealed that 24 bites recorded before the application while three (3) bites were recorded after the application of prepared insecticide this shows 95% efficacy and two (2) bites were recorded after the application of synthetic insecticide.

Table 4. The adverse effect of using synthetic insecticide

Effect	Number of Complains
Catarrch/ Caugh	10
Dizziness/Body Weakness	9
Headache	11
Eye Irritation	14

The results in Tables 4 and 5 observe the adverse effect on human health and that of environment. During the application of synthetic insecticide ten (10) people were contacted with catarrh compared while two (2) using prepared insecticides. Nine (9) respondents were having dizziness in using synthetic insecticide and one

(1) person was recorded for prepared insecticides. Eleven (11) people complain of headache while using synthetic insecticides and one (1) person found with headache in using prepared insecticide. The smoke of synthetic insecticides causes eye irritation to fourteen (14) users compared to two using synthetic insecticides.

Table 5. The adverse effect of using the prepared insecticide

Effect	Number of complains
Catarrch/ Sore throat	2
Dizziness/BodyWeakness	1
Headch	1
Eye Irritation	2

Table 6 shows the resultant effect of prepared insecticides as it has positive effectiveness to its heat, and smoke are normal to bearing capacity to human system. The result in the same table show the negative effect of prepared insecticide is its unpleasant odor.

4. DISCUSSION

The result obtained from the study indicates the effect of prepared neem leaves smoke against

Table 6. Effects of prepared insecticide

Households	Heat	Smoke	Odour	Effectiveness
A	Normal	Normal	Unpleasant	Positive
B	Normal	Normal	Unpleasant	Positive
C	Normal	Not much	Unpleasant	Positive
D	Normal	Little	Unpleasant	Positive
E	Normal	Too much	Unpleasant	Positive

mosquito as the efficacy is dependent to the number of hours after the application of prepared insecticides, this findings agrees with that of [12], Herbal mosquito repellent, the mosquitoes were found to drop down and die within 10 to 15 minutes. 7 mosquitoes were found dead on the floor in different places and all other mosquitoes got vanished in few minutes. [13], Volatile extracts from the smoke of burning dried leaves were found to be more repellent than those from fresh leaves, which in turn were more repellent to mosquitoes than volatiles from dried leaves. The study also found that, no adverse effects were reported from the use of the prepared sample. [11], the prepared insecticide burn and smoke effectively as required and are non-toxic and non-allergic to humans. Environmentally, the production process is over 90% pollution free and does not involve any known chemical reactions. The raw materials for the production are entirely natural products.

5. CONCLUSION

The developed organic herbal was quite efficient in repelling mosquitoes without harming the human health. This study resulted in development of eco-friendly organic herbal repellent with long lasting protection, safe for human life, with no side effect, as an alternative to commercially available synthetic chemical repellents.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Palanisami S, Natarajan E, Rajamma R. Development of eco-friendly herbal mosquito repellent. *Journal of Innovative Biology*. 2014;1(3):132-136.2.
2. Sukumar K, Perich MJ, Boobar LR. Botanical derivatives in mosquito control: A review. *Journal of American Mosquito Control Association*. 1991;7: 210-37.
3. Moore SJ, Lenglet AD. In: *Traditional Medicinal Plants and Malaria*. Wilcox M, Bodeker G, Rasoanaivo P, editor. London: CRC Press, Taylor and Francis. An Overview of Plants Used for Insect Repellents. 2004;344–363.
4. Maia MF, Moore SJ. Plant-based insect repellents: a review of their efficacy, development and testing. *Malar J*. 2011; 10:11. DOI: 10.1186/1475-2875-10-S1-S11.
5. Carroll SP, Loye J. PMD, A registered botanical mosquito repellent with deet-like efficacy. *J Amer Mosq Control Assoc*. 2006;22:507–514. DOI: 10.2987/8756-971.
6. Farahna M, Bedri S, Khalid M, Idris M. Anti-plasmodial effects of *Azadirachta indica* in experimental cerebral malaria. *American Journal of Medical Science*. 2010;2:518-525.
7. Patel EK., Gupta A., and Oswai RJ. A Review On: Mosquito Repellant Method. *International journal of Pharmaceutical, Chemical and Biological Sciences*. 2012; 2(3):310-317.
8. Mordue AJ, Nisbet AJ. Azadirachtin from the neem tree *Azadirachta indica*: Its action against insects. *Anais da Sociedade Entomológica do Brasil*. 2008; 29.
9. Gashua. *Geo Names*. Retrived 1 October; 2009.
10. Gashua AB. where Gani got his lung cancer? *Sunday Tribune*; 13 September, 2009. Archived from Original on 22 February, 2013. Retrieved 1 October, 2009.
11. Kwasi Opoku Boadu, Samuel Kofi Tulashie, Michael Akrofi Anang, Jerome Desire Kpan. Production of natural insecticide from Neem leaves (*Azadirachta indica*). *Asian Journal of Plant Science Research*. 2011;1(4):33-38. ISSN: 2294-7412
12. Ramya Petchimuthu, Clayton Fernando R, Anand G, Gowtham PS, Dhivagar K, Vanavil B. Assessment of efficiency of eco-friendly organic mosquito repellent developed using elephant dung. *International Journal of Recent Technology and Engineering (IJRTE)*. 2019;8(452). ISSN: 2277-3878.
13. Fitsum Fikru Dube, Kassahun Tadesse, Göran Birgersson, Emiru Seyoum, Habte Tekie, Rickard Ignell, and Sharon R Hill; Fresh, dried or smoked? Repellent

properties of volatiles emitted from
ethnomedicinal plant leaves against
malaria and yellow fever vectors in

Ethiopia. Malaria Journal.2011;10:
376
DOI: 10, 1186/175-2975-10-375.

© 2020 Jibrin and Mohammed; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/56659>*