

---

**SUSTAINABLE ENVIRONMENTAL PEST MANAGEMENT (NEW INVENTION)  
AT NIGER DELTA UNIVERSITY WILBERFORCE ISLAND, BAYELSA STATE,  
NIGERIA**

**A. Alamene and I.A.Ogidi**

Department of Crop and Soil Science, Niger Delta University Wilberforce Island, Bayelsa State. Email: alamenezawei@yahoo.co.uk\_Phone No. 07069365240

---

**ABSTRACT:** *Sustainable Environmental Pest Management was conducted at the Department of Crop and Soil Science Laboratory, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria for the control of Mosquitoes at Student Hostels, June 2019. The project was sponsored by Tetfund in collaboration with Niger Delta University, Wilberforce Island Bayelsa State Nigeria, 2018 on the use of plant extracts and plant essential oils (EOs). Plant extracts and EOs were used to formulate a bio-pesticide named Alamicide for effective mosquito control at the students' Hostels. Excel 2016 was used for the analysis of the data generated from 311 questionnaires received from the respondents, on the efficacy of Alamicide Bio-pesticide application (Fumigation) at the different student hostels were evaluated. Preliminary research findings shown that most of the students (respondents) both Boys and Girls (179) at their respective Hostel Rooms, had a percentage of 60.47% responded that there was significant effect of Alamicide Bio-pesticide application on the control of Mosquitoes when compared with no respondent of 117 students, this value had a percentage of 39.52% from the questionnaires received indicated that Alamicide had no significant application effect on the incident of mosquitoes control. However, from the overall analysis on percentage, Alamicide was significantly effective bio-pesticide that control mosquitoes in the students' Hostels. Duration of its application indicated that onetime application, its efficacy can last for a period of one-three days (1-3 days) or more as indicated in the graph. One hundred and seventeen (117) Students that had negative responses were the ones that did not obey the instructions from the researcher and his team members. When instructions were followed strictly after fumigation, i.e. windows and doors were closed for about 5-15mins, duration of efficacy can equally last up to 4-5days. This product is first of its kind in the world and its efficacy lasted up 1-5 days after onetime application when the researchers' instructions were strictly adhered to. Also when compared to other synthetic insecticides like Mobil, Sniper, Total, Mortem and Raid, their efficacy only lasted for few hours. This product is environmental friendly, had no negative side effect on human health when compared to the synthetic insecticides. One can comfortably stay and eat food immediately after application at the spot, because it is harmless, but you can't perform such activities when synthetic chemicals (are applied. From the respondents (Students) 84% wanted Tetfund Research Grants on Sustainable Environmental pest (Mosquitoes) management to continue at Niger Delta University, Wilberforce Island, Bayelsa State to completely eradicate Mosquitoes in student Hostels to solve the problem of malaria. The first phase of the research is almost completed except one of the boys Hostel. Second Phase is for Lecturers' offices and the University Administrative block. We are therefore convinced that on completion of the programme, the result will be outstanding when instructions are followed effectively.*

**KEY WORDS** Sustainable, pest, management, Alamicide Bio-pesticide, Synthetic insecticides, Instructions, Niger Delta University

---

## INTRODUCTION

It is generally accepted view that plant kingdom is recognized as the most efficient producer of chemical components, synthesizing many products that are used in defense mechanism against different pests. Higher plants contained a wide spectrum of secondary metabolites such as phenolics, flavonoids, quinones, tannins, essential oils, alkaloids, saponins and sterols that had antifeedant and repellent substances. Neem (*Azadirachta indica*) A. Juss and other botanical pesticides do not leave any residue on the crop and the environment, therefore, they are preferred over synthetic chemical pesticides that are hazardous to beneficiary insect pests, animals, human and the ecosystem. In the past neem been one of the botanicals has become a source of natural pesticide due to its non-toxic and environmentally safe nature, thereby replacing synthetic chemical pesticides.

The problems caused by synthetic pesticides and their residues have increased the need for effective biodegradable pesticides with greater selectivity. Alternative strategies have included the search for new types of pesticides, which are often effective against a limited number of specific target species that are biodegradable into non-toxic products, and suitable for use in integrated pest management programmes (Gupta *et al.* 2010). Applied chemical pesticides are fast in reducing the loss of post-harvest diseases. Nevertheless, the excessive use of these chemicals for controlling mould fungi in fruits has been counter-productive, causing damage to the environment and humans, with increased demands to reduce the use of these chemicals that accumulate in fruits and vegetables (Nicholson, 2007). This damage increased significantly with improper use and randomly left to grow in order to reduce the use of these chemicals that accumulate in fruits and vegetables. It is claimed that these fruits were major health problems, if they became a crop of major commodities exported to different countries worldwide. As persistent hazardous chemicals, by governments and some organizations use over dose of many of these pollutants, in developing countries such as thiabendazole (BZ) and imazalil (Eckert, 1990), to gravity, previously used to control a wide range of fungi, led to an imbalance in the natural enemies in the environment, the application of these chemicals had no significant effect on the tested pathogen (Eckert and Sommer, 1967). Today, insect pest management has to be sustainable, less expensive, locally available and environmental friendly as an alternative to synthetic pesticides.

### Problem Statement/Justification

#### Statement of the Problem

The problem we are about to address is to stop the use of synthetic pesticides in fumigating the University Community. It has been a continuous practice of some group of persons claimed to be environmentalists quarterly every year on campus with indiscriminate use of synthetic pesticides in offices, hostels and on the environment has caused discomfort on the lives of people in the University Community that have caused great Health hazard at the University community. This observation was backed up by a survey that was conducted at ETF Building, Work's Office, Security Office, Part Time Office, Lecturers Offices and other general offices in the Campus. All respondents complained bitterly, because most people

were found nausea - had serious headache, vomiting, irritating, and soaked with the odor of chemical residues and also affected their eyes. Because of these constraints, environmental friendly botanicals that are safe to the users and easily available in the local environment and rapidly biodegradable with few hours. These bio-pesticides when applied will solve the problem of pollution of these hazardous chemical pesticides effect at Niger Delta University community, and its host community to prevent the spread of laser fever and Zika fever infection in the University Community.

### **Objective (s) of the Study**

#### **Aims, General and Specific Objectives of the Research Project:**

##### **Aims**

To evaluate the effect of plant extracts/oils on sustainable environmental pest management at Niger Delta University.

##### **General and Specific Objectives**

1. To evaluate the effect of seven (7) plant extracts and six (6) plant essential oils on sustainable pest management.
2. To investigate the different techniques of extraction of plant extracts and their application effect

##### **Project Goals** (Provision of the short and long term goals of the project)

##### **Short term goals**

1. Use of natural products of plant materials for sustainable environmental pest management.

##### **Long term goal**

1. Production of plant extracts / oils for pest management for commercial use
2. Technique of extraction of plant extracts to be made known to students/lecturers in the University community.
3. Create employment opportunity for student during vocation.
4. Serve as economic base for internally generated revenue for training all interested persons.
5. Production of these plant materials locally on commercial level.

This project will help to solve the problem of environmental pollution which is detrimental to the people working at the University Community.

**Project Impact:** In the long run, the success of this project (commercialization of plant extracts and plant essential oil production) would, consistently, provide employment opportunities for youths as well as provide sustainable environmental pest management programmes at the University community, instead of using synthetic pesticides which are hazardous to the people and environment. This project will also encourage students, Lecturers and farmers at the University host communities to be more practically oriented. It would also provide employment opportunities to youths and attract more people to

---

agriculture/business and service as a means of an Internally Generated Revenue (IGR) for the University.

## LITERATURE REVIEW

The natural plant products derived from plants effectively meet this criterion and have enormous potential to influence modern agrochemical research. The use of botanical pesticides is now emerging as one of the prime means to protect crops and their products and the environment from pollution (Sanjay and Tikku, 2009). Botanicals degrade more rapidly than most synthetic chemical pesticides, and therefore are considered to be eco-friendly and less likely to kill beneficial pests compared to synthetic pesticides with longer environmental retention. Most of the botanical pesticides generally degrade within a few days, and sometimes even within few hours (Siddiquito and Gulzar, 2003). Recently Alamene and Rossall, 2015 successfully evaluated the efficacy of plant essential oils and biocontrol agents on the growth of mycotoxins production of *Aspergillus* Spp. on groundnut which was significantly effective in suppressing the tested pathogen at The University of Nottingham, United Kingdom.

Mosquitoes and rodents are the principal vectors of many of the vector-borne diseases affecting human beings and other animals, particularly, the current outbreak of lassa fever that has caused the death of many people in Nigeria. These pests constitute a major public health problem as vectors of serious human diseases (El Hag *et al.* 1999). Hubalek and Haluzka, (1999) reported that *Culex pipiens* is the vector of West Nile Virus which causes encephalitis or meningitis which is known to affect the brain tissue, finally resulting in permanent neurological damage. Several mosquito species belonging to genera Anopheles, Culex and Aedes are vectors for the pathogens of various diseases like malaria, filariasis, Japanese encephalitis, dengue fever, dengue haemorrhagic fever and yellow fever (Hubalek and Haluzka, 1999). *Aedes aegypti* is the principal vector of dengue fever and dengue haemorrhagic fever and it is reported to infect more than hundred million people every year in more than 110 countries in the tropics (Halstead, 2000). Borne diseases is the interruption of disease transmission by either killing, preventing mosquitoes to bite human beings (by using repellents) or by causing larval mortality in a large scale at the breeding centers of the vectors. Conventional pesticides such malathion, DDT and pyre-throids that are generally used for mosquito control are known to cause the problem of environmental pollution, residual effects and resistance by their indiscriminate use. Development of resistance to malathion (Guneady *et al.* 1989) and to deltamethrin (Chen Wen-Mei, 1990) in adult *C. pipiens* has been reported. Due to the problem of pollution and vector resistance, safe plant products are being tested around the world as pest control agents. Plant products reported for insecticides, growth inhibition and repellent activity against mosquito vectors was made known during a survey of literature on larvicidal effects of plant products on mosquitoes indicates that most of the studies included well known horticultural and commonly grown plants.

Ecological and economic imperatives for the management of harmful insects. Insect control constitutes a major and ancient preoccupation of human beings. Insects form the largest class of the animal kingdom and include nearly 80% of known animal species. Among them, tens of thousands of species are considered as high risk species for Man. They have a double impact such as medical; insects are pathogenic agents or disease vectors for men and domestic animals and agricultural; they devastate crops. Phytophagous insects damage rice crops (58% losses), cotton (47%), cause the loss of more than a third of corn and sugar-cane crops and nearly a fifth of wheat.

Thus, the control of herbivorous insects still remains a great economic goal for a world population likely to double within the next 50 years according to the demographic predictions (Regnault-Roger, 1997). Therefore, over the past 30 years, the market for pest management products for crop protection has shown a regular growth of 7–10% per year, a turnover of around 25 billion US dollars (Guillon, personal communication). The growth of bio-pesticides has been accompanied by a deep reorganization of the industrial sector, for commercialization of bio-pesticides has taken over synthetic pesticides. Two factors contributed to this change: the expensive cost of commercialization licenses and the numerous cases of Eco toxicity or toxicity to mammals which occurred in the past. Even after half a century of sustained struggle against harmful insects, an ideal insecticide has not yet been found. All insecticides modify the ecological balance to varying degrees, since they are intended to reduce the impact of insect species harmful to humans. However, since the second world war, the intensive utilization of synthetic or oil based insecticidal molecules has shown secondary effects which reduce the positive results and continue to cause increasing concern. Mammalian toxicity, disruption of the food chain and numerous cases of insect resistance to insecticides have been observed together with a phenomenon by which more harmful insects take the place of a decimated and sensitive species in a given ecological niche. So, diversifying approaches for a better control of harmful insects is now a major concern. This could be done by carrying out several kinds of treatment diversifying the biochemical targets in the insect and using genetic engineering, physical and chemical methods and entomophagous control. The combination of all these methods, used simultaneously or alternately, would certainly decrease the undesirable and secondary effects and also reduce the amounts of insecticide employed, as it is well known, since Paracelse (16th century) that ‘the dosage makes synthetic pesticides to be poisonous’.

## RESEARCH METHODOLOGY

The study involved seven (7) botanicals: Neem, Garlic, Onion, Lemon grass, Cent leaf, Moringa and Ginger natural products with six (6) plant essential oils: Clove Camphor, Neem, Garlic Onion, and Green Oregano. The procedure of formulation of Alamicide Bio-pesticide is not yet exposed to the public, because it is a new invention, which have to undergo for patent before mass production for the people of Nigerians and the entire Global World.

### **Questionnaires'**

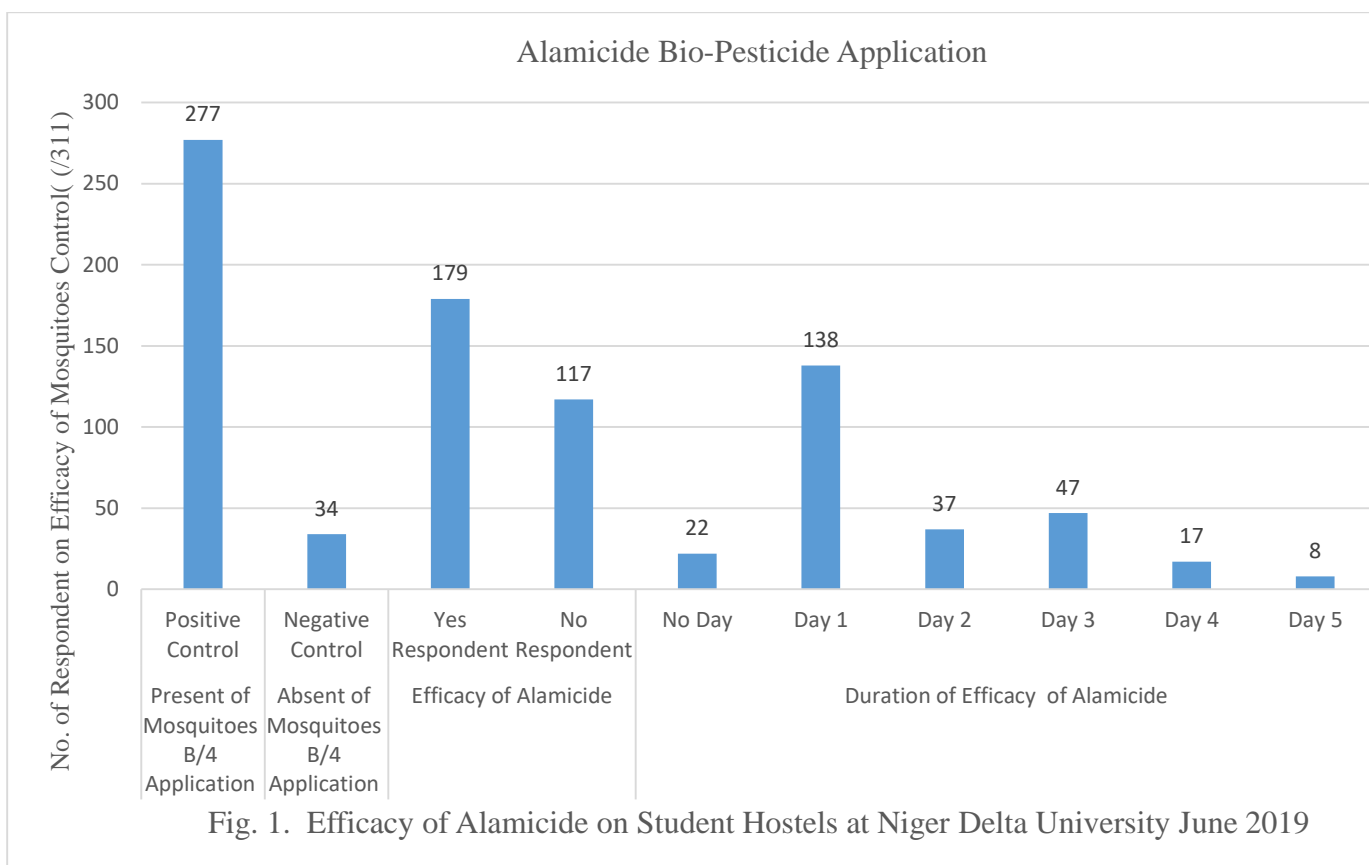
Total of 400 Questionnaires' were distributed to the students at their different Hostels, three days after the fumigation. Out of the lot the research team received 311 copies. The breakdown is reflecting on the graph of the respondents on the efficacy of Alamicide Bio-pesticides Application.

However, 22 respondents (Students) did not respond on the efficacy of Alamicide Bio-pesticide but only responded on Tetfund Research Grants on Sustainable Environmental Pest (Mosquitoes) management should be encouraged or not. This illustration is shown in Fig. 2. The Data received were subjected to percentage analysis of the respondents.

### **RESULTS PRESENTATION**

Excel 2016 was used to analysis the data, and plotted two graphs to ascertain the efficacy of Alamicide Bio-pesticide application (Fumigation) on students Hostel at Niger Delta University Wilberforce Island, Bayelsa State, June 2019. This research was sponsored by tetfund in collaboration with Niger Delta University 2018.

Research findings shows that most of the students (respondents) both Boys and Girls in their respective Hostel Rooms, 179 students response had a percentage of **60.47%** responded that there was significant application effect of Alamicide Bio-pesticide on the control of Mosquitoes when compared with no respondent of student, 117 had a percentage of **39.52%** from the questionnaires' received indicated that Alamicide had no significant effect on the incident of Mosquitoes control. However, from the overall analysis on percentage, Alamicide was significantly very effect bio-pesticide that control mosquitoes at the different student Hostels and kept other insect pests bay, that is just a few dropof the bio-pesticide at the corner of your room.



**Efficacy of Alamicide bio-pesticide against the frequent occurrence of mosquitoes in student Hostels both Boys and Girls at the Niger Delta University, Wilberforce Island Bayelsa State, Nigeria. June, 2019.**

### Duration of Efficacy

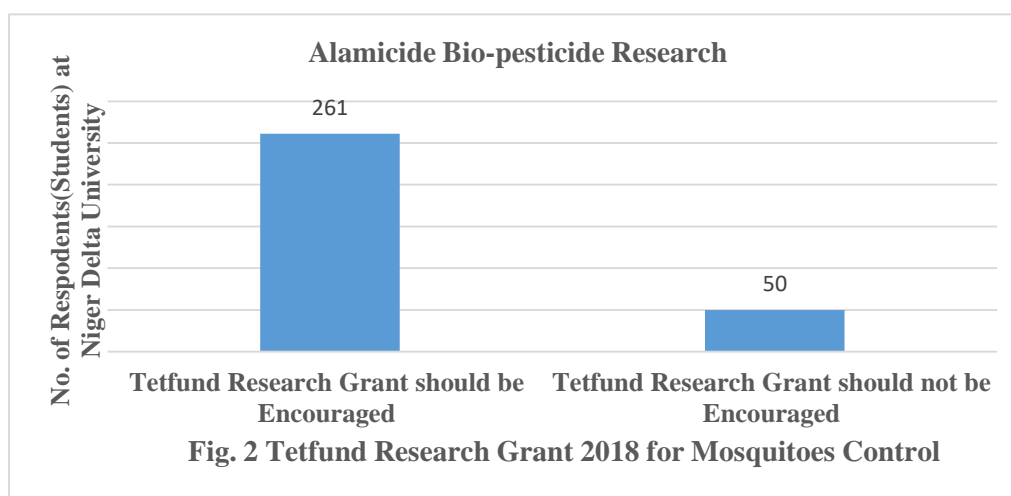
Duration of its application efficacy indicated that onetime application, its efficacy can last for a period of one-three days (1-3 days) or more as indicated in the graph (see Fig. 1). Those students that say No from their responses are the ones that did not take the instructions from the researcher with his team members. When instructions were followed strictly after fumigation, i.e. windows and doors were to be closed for about 5-15mins, duration of efficacy can equally last up to 4-5days as shown in Fig.1. This product is first of its kind in the World where efficacy lasted up to 1-5 days when researcher instructions were strictly adhered to, when compared to the synthetic insecticides like Mobile, Total, and Raid, their efficacy can only last for few hours after the application.

### Environmental Friendly

This product is environmental friendly, had no negative side effect on human health when compared to the synthetic insecticides for example Mobil, Snipers, Raid and Total etc. One can stay comfortably and eat food at the spots, immediately after application, because Alamicide bio-pesticide is harmless, but you can't perform such activities when synthetic chemicals (Insecticides) are applied, because, when their residues are inhaled, it can result to serious sickness.

### Tetfund Research Grant

The research team discovered from the analysis that respondents (Students 261) had a 84%), wanted the Tetfund Research Grants on Sustainable Environment pest (Mosquitoes) management to be continue at Niger Delta University, Wilberforce Island Bayelsa State to completely eradicate Mosquitoes in student Hostels to solve the problem of malaria. This illustration is shown in Fig. 2, while 16% of students (50) did not encouraged the exercise, these set of students are the ones, that did not follow the research protocol 2019.to a test the efficacy of Alamicide Bio-pesticide



**Niger Delta University Students recommendation on the efficacy of Alamicide Bio-pesticide project sponsored research grant by Tetfund March, 2018.**

### CONCLUSION

This research break through has brought a very big up-liftmen to the Department of Crop and Soil Science and the Niger Delta University Wilberforce Island Bayelsa State, Nigeria for new generation innovation (Invention). For the people Nigeria and the Global World

### Reference

- Alamene A, Rossall S, 2015. Effect of Plant Essential oils and Biocontrol Agents on the growth of and Mycotoxin Production by *Aspergillus* spp. on groundnut. Ph,D Thesis. The University of Nottingham UK.
- Eckert JW 1967. Sommer NF. Control of diseases of fruits and vegetables by post-harvest treatment. *Annual Review of Plant Pathology* (5): 391-432
- Eckert JW 1990. Recent developments in the chemical control of post –harvest diseases. *Acta Horticulture*. (269): 477-494.



- El Hag EA, Nadi AH, Zaitoon AA 1999. Toxic and growth retarding effects of three plant extracts on *Culex pipiens* larvae (Diptera: Culicidae). *Phytother. Resource*. 13: 388-392.
- Hubalek Z, Halouzka J 1999. West Nile Fever – A reemerging mosquito-borne viral disease in Europe. *Emerging Infections Diseases*. 2: 519-529.
- Gupta S, Dikshit AK. 2010. An eco-friendly approach for pest control. *Journal of Biopesticides* 3 (1): 186-188.
- Nicholson GM, 2007. Fighting the global pest problem: Preface to the special Toxicant issue on insecticidal toxins and their potential for insect pest control. *Toxicant*. 49 (4): 413-422.
- Regnault-Roger C, 1997. The potential of botanical essential oils for insect pest control. Laboratoire d'Ecologie Moléculaire (UPRES 159), IBEAS-Sciences Biologiques, Université de Pau et des Pays de l'Adour, 64000 PAU, France. *Integrated Pest Management Reviews* 2, 25–34
- Sanjay G, Tikku AK 2009. Botanicals in Pest Management Current Status and Future Perspectives, *Biomed Life Science* PP.317.
- Siddiqui FA, Gulzar T 2003. Tetra cyclic triterpenoids from the leaves of *Azadirachta indica* and their insecticidal activities. *Chemical Pharmacy Bulletin* (Tokyo) (51): 415-41

### Acknowledgement

I have to thank the following Institutions for their kind sponsorship for the success of this great research breakthrough.



NDU 2018