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COMPARATIVE LARVICIDAL EFFICACY OF *Carica Papaya* LEAVES AND SEED EXTRACT ON MOSQUITO LARVAL POPULATION IN RICE FIELDS IN BIDA METROPOLIS, NIGER STATE

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ABSTRACT

This study elucidates the susceptibility of leaf and seed extract of *Carica papaya* on mosquito population breeding in rice fields. The study was conducted in Bida, Niger State using two rice fields sampled for two weeks. Mosquito immature stages (Larvae) were used throughout for the experiment. The leaf and seed extract of *Carica papaya* were prepared on instars and evaluated Larva stages were evaluated in the laboratory. Mosquito instars larvae stages (L3-L4) were exposed to a concentration of 10mg/ml, 20mg/ml, 30mg/ml, 40mg/ml, and 50mg/ml of each prepared Larvicide, (Leave and seed extract of *Carica papaya*) within 24hours, the percentage mean survival of the Larvae were recorded. At a concentration of 10mg/ml, 100% of the Larvae died within 3 to 12hours of exposure to seed and leave extract of *Carica papaya*. The mosquito growth and development were inhibited. However, both the leave and seed of *Carica papaya* can be used to control mosquito breeding in anthropogenic habitats of which the seed of *Carica papaya* is the most effective, especially in rice fields.

Contribution/Originality: The study contributes to existing literature by the ways to control mosquito larvae infested farmlands using Carica papaya seeds extract. It employs sequential estimation formula which determines the concentration of extracts which mosquito larvae are susceptible.

1. INTRODUCTION

Mosquito are the most important vectors of pathogenic organisms. Understanding the spatiotemporal distribution of risk for mosquito-borne infections is an important step in planning and implementing effective control measures [1]. Based on fossil evidence, it is estimated that mosquitoes may have originated in the early tertiary period, some 70 million years ago or even earlier. Mosquitoes, because of their biting nuisance and their role in transmission of deadly human disease organisms are extremely important insects belonging to the Family Culicidae in the Order Diptera [2]. Mosquitoes can colonize a very diverse aquatic habitat types in terms of size and nature, including ponds, swamps, river and stream banks, salt water marshes, polluted water in septic tanks, rock pools, tree holes, discarded domestic containers, discarded tires, plant axils and pitcher plants, rice fields, etc. [3]. Mosquitoes are important vectors of several tropical diseases in humans; including malaria, filariasis, and numerous viral diseases, such as dengue, dengue hemorrhagic fever, yellow fever, and Japanese encephalitis. An estimated two billion people world-wide live in areas where these diseases are endemic [2].

Mosquitoes are distributed throughout the world. Some species exist at altitudes of <14,000 feet; while others can inhabit mines that are 3,760 feet below the sea level. Species range in latitudes northward from the tropics to the Arctic regions and Southward to the ends of the Continents. A wingless species has been reported to exist in Antarctica, while many species do exist in the most remote deserts [4]. There are about 3000 species of mosquitoes distributed world-wide. Of these, about 100 species are vectors of human diseases.

With Anopheles mosquitoes alone, about 380 species occur around the world; some 60 species are sufficiently attracted to humans to act as vector of malaria. A number of two Anophelesspecies are also vectors of filariasis and viral diseases [5]. About 550 species of Culex have been described, most of them from tropical and subtropical regions [6]. Mosquito constitute serious threat to the health of the people living in area where mosquito transmitted diseases are prevalent as a result of suitable breeding habitat. The use of lavicide is one of the hopes to the eradication of these vectors but the recent resistance shown by these methods as lead to the increase in the cost of control. It is therefore important to know the lavicide that has achieved the status of resistivity [7].

The aim of the study therefore was to know the effect or activity of the leaf and seed extract of *Carica papaya* on mosquito larval population and their resistance breeding in rice-field.

2. MATERIALS AND METHOD

2.1. Study Area

This study was carried out in Bida LGA of Niger State during the raining season of 2018. Bida is situated 85 km away from Minna the capital city of Niger State, it is between Latitude 9.0833^{0}N, and Longitude 6.0167^0 E, the maximum and minimum temperature within the months ranges from 41^{0}C and 17^{0}C. prior to 2018 rainy season, two sites were located for the study and they are located at Banyagi and Edogifu rice-fields along State Polytechnic Bida, between August and September [8].

2.2. Sampling of Mosquito Larval

A sequential sampling technique, such as that developed by O'Malley [9] was used to estimate larval abundance in the breeding sites. Larva dipper was dipped inside the water several times to ascertain if mosquito's larvae are in abundance in the selected breeding sites [9].

The method described below will enables an inspector to rank a pool as without larvae or with larvae at a low, moderate or high level. If the number of larvae collected in at least 5 dips is 31 or more, the site is rated as "high". If only 1 or 2 larvae are collected in 10 dips, the site is rated as "low". If no larvae are collected, the site is rated as "nil". 10 dips must be taken to distinguish between "moderate and "high" [10].

2.3. Larval Collection

Mosquito larvae was collected by using standard dipper of 300 mL capacity to scoop water that contained larvae in to a 9 litre plastic buckets [11]. Each of the stages of the larvae (L1 – L4) following the WHO standard and was taken into the laboratory, larvae will be separated into 1st, 2nd, 3rd and 4th instars. The larvae was fed with fish feed collected from fish pond and was maintain at ambient temperature.

2.4. Collection of Plant Material

The leaves and seeds of C*arica papaya* was collected from Science Laboratory Technology (SLT) Garden and washed thoroughly, blotted and shade dried at room temperature for about 15 days. The dry samples was taken to the laboratory and grind with a blender into powder forms.

2.5. Preparation of Extract

Two hundred and fifty grams (250gm) of dry powder sample of the leave and seeds of *carica papaya* wad dissolved in 200 mL of acetone (as a solvent) and were left to stand at room temperature for 72 hours. The mixtures were filtered through a muslin cloth then with a whatman foil filter paper by suction. The filtrate was evaporated under vacuum evaporator at 45^0c until completely dried.

2.6. Preparation of Stock Solution and Different Concentrations of Leave Extract

One gram of the concentrated extracts of dried leaves and seed of *Carica papaya* was dissolved in 1000ml of distilled water and was kept as stock (10 mg/mL) solution. This stock solution was used to prepare the desired concentrations of the extracts for exposure of the mosquito larvae.

2.7. Bioassay of Larvae with Larvicide

In the present of experiment, bioassays were carried out on the mosquito Larvae to compare the effectiveness of the larvicide in each concentration and the treatment of Larvae with larvicide was conducted following the WHO standard procedure [11]. Twenty five (25) larvae (L3 – L4) were placed in a plastic bowls of about 200 mL capacity. The 100 mL of distilled water was measured and dispensed in the plastic bowls and was replicated three times for each treatment as well as the control.

Five different concentrations of the two larvicides (leaf and seed extract of *Carica papaya*) were used against the 3^{rd} and 4^{th} instars larvae in the bioassays. Distilled water was used as control. The number of Larvae surviving at the end of 24 hours was recorded and the survival rate (mean ± S.D) was calculated.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Survival Rate (mean ± S.D) o Mosquitoes during 24 Hour Exposure to Leave Extract of Carica Papaya

Table 1 shows the mean ± standard deviation of survival rate of early instars larval (L3-L4) stage of mosquito on expose to leave extract of *Carica papaya*. The result reveals a increase in mortality as the concentration of the leave extract of *Carica papaya* increases (10mg/ml – 50mg/ml). However, highest mortality with a concentration of 50mg/ml (i.e. lowest survivorship) was recorded at 6^{th} hour with zero survivorship occurring at the 12^{th} hours however, total survivorship was zero irrespective of the treatment concentration. On the other hand, mean survivorship for the control shows mortality at a percentage survival of 100% which was recorded even at the 24^{th} hours of the set up.

3.1.2. Survival Rate (mean ± S.D) of Mosquitoes during 24 Hour Exposure to Seed Extract of Carica Papaya

Table 2 shows the mean ± standard deviation of survival rate of instars larval (L3-L4) stage of mosquito on exposure to seed extract of *Carica papaya*.

The result reveals an increase in mortality as the concentration of the seed extract of *Carica papaya* increases (5 mg/mL – 50 mg/mL). However, highest mortality with a concentration of 50 mg/mL with a concentration of 50 mg/mL (i.e. lowest survivorship) was recorded at 3 hours with zero survivorship occurring at the 6^{th} hour. After the 24^{th} hour however, total survivorship was zero irrespective of the treatment concentration. On the other hand, mean survivorship for the control show mortality at percentage survival of 100% which was recorded even at the 24^{th} hour of the set up.

Table-1. Survival rate (mean ± S.D) of mosquitoes during a 24 hour exposure to leave extract of *Carica papaya.*

Treatment	0 min	10 min	20 min	30 min	Duration 1 hours	3 hours	6 hours	12 hours	24 hours
Control	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00
10mg/ml	25.00±0.00	23.67±0.58	21.67±2.51	20.67±2.08	19.33±2.30	15.33±1.52	9.33±2.51	2.67±1.52	0.00±0.00
20mg/ml	25.00±0.00	23.67±0.58	21.67±0.58	20.00±1.00	15.67±2.09	11.00±1.00	6.67±2.89	1.67±0.58	0.00±0.00
30mg/ml	25.00±0.00	22.67±0.58	22.00±0.00	21.00±0.00	18.33±0.58	15.00±2.00	10.33±1.52	3.33±0.58	0.00±0.00
40mg/ml	25.00±0.00	22.33±0.58	20.33±2.09	19.67±1.52	15.00±1.00	11.67±1.16	6.67±1.15	0.00±0.00	0.00±0.00
50mg/ml	25.00±0.00	23.00±1.00	20.00±1.00	19.33±1.52	17.00±1.00	13.00±1.00	10.00±2.00	0.00±0.00	0.00±0.00

Table-2. Survival rate (mean ± S.D) of mosquitoes during a 24hour exposure to seed extract of *Carica papaya.*

Treatment	0 min	10 min	20 min	30 min	Duration 1 hours	3 hours	6 hours	12 hours	24 hours
Control	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00	25.00±0.00
5mg/ml	25.00±0.00	23.67±0.58	20.33±1.15	12.33±2.09	5.33±1.52	2.00±1.73	0.00±0.00	0.00±0.00	0.00±0.00
10mg/ml	25.00±0.00	23.00±1.00	20.33±0.57	11.33±2.30	4.33±2.31	2.33±1.52	0.00±0.00	0.00±0.00	0.00±0.00
15mg/ml	25.00±0.00	23.67±0.57	21.33±1.52	13.67±2.09	7.00±2.64	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
20mg/ml	25.00±0.00	22.67±0.58	19.00±1.00	10.00±3.61	4.33±4.93	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
25mg/ml	25.00±0.00	23.33±0.58	19.33±1.15	10.67±1.15	5.33±1.52	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
50mg/ml	25.00±0.00	23.33±0.58	20.66±0.58	9.67±1.52	5.00±1.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00

4. DISCUSSION

4.1. Survival Rate (mean ± S.D) Of Mosquitoes during 24 Hours Exposure to Leave Extract of Carica Papaya

The result of this study shows that mosquitoes larval (L3-L4) were susceptible to leave extract of *Carica papaya*. This corresponds to the study of Arizona [12]. The result of this study shows that all larvae exposed to leave extract of *Carica papaya* died at the 24th hour with the lowest concentration of 10 mg/mL while with the highest concentration of 50 mg/mL they died at 12hour of exposure to the leave extract of *Carica papaya*.

Survival rate (mean ± SD) or mosquitoes during 24 hours exposure to seed extract of *Carica papaya*. The result of this study shows that mosquitoes larval (L3-L4) were susceptible to seed extract of *Carica papaya*. This correspond to the study of Briegel [13]. The result of this study shows that all the larvae (L3-L4) expose to seed extract of *Carica papaya* died at the 6thhour with the lowest concentration of 5mg/ml while with the highest concentration of 50 mg/mL they died at the 3hours of exposure to the seed extract of *Carica papaya*.

Therefore, between the two larvicides, seed extract of *Carica papaya* claims to be more effective because all the larvae instars died within 3 hours at the highest concentration of 50 mg/mL.

5. CONCLUSION

The finding of this study shows that the two larvicides (Leave and seed extract of *Carica papaya*) recommended by World Health Organization are still susceptible by mosquitoes and should be sued properly. Therefore the application of leave and seed extract of *Carica papya* as larvicides will help to reduce the population of mosquitoes in Bida, Nigeria and Worldwide.

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