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A Comparative Study of Larvicidal Effect of Cypermethrin and 2, 2-Dichlorovinyl Dimethyl Phosphate on Anopheles Mosquito Larvae.

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Abstract

One of the tool to prevent proliferation of mosquito- borne diseases is the application of synthetic insecticides such as organochlorine and organophosphate compounds. In this present study, we compared the larvicidal activity on mosquito larvae, two chemicals Cypermethrin and 2,2-dichlorovinyl dimethyl phosphate (DDVP) were used. The potency of the chemicals was evaluated on anopheles mosquito larvae. The result obtained indicated that higher larvicidal activity occurred with DDVP over a period of exposure that is 11.1% at 8 seconds. The concentration of chemical required to kill at least 50% of the larvae exposed (LC 50) over a period of exposure were found to differ for the two chemicals tested that is 11.1% concentration of DDVP and Cypermethrin at 8 seconds and 20 seconds respectively. The most potent of the two chemicals tested was 2,2-dichlorovinyl dimethylphosphate (DDVP) with LC 50 value of 11.1% at 8 seconds while that of cypermethrin was found to have a lower LC 50 11.1% at 20 seconds. This showed that these chemicals can be used in controlling anopheles mosquito

larvae, and could aid in the reducing mosquito borne diseases. Manufacturing of more effective and less toxic larvicidal agent to man and environment is advocated.

Keywords: Comparative Study, Larvicidal Effect, Cypermethrin, 2, 2-Dichlorovinyl Dimethyl Phosphate, Anopheles Mosquito Larvae.

Introduction

Vectors (arthropods) include insects such as tick, flies and mites that transmit disease. The most important insect is the anopheles (female) mosquito associated with the transfer of *Plasmodium spp* which cause malaria. Mosquito harbors the organism before it transfers of the organism into human through bite on the skin. In this case, the vector is an essential part of the life cycle of the organism and it is known as a biological vector (Sarojini, 2000). The female mosquito needs the blood of a warm-blooded animal for proper development of her egg. To get this she needs to feed on human blood via bite. The mosquito can take in as much as twice it body weight in blood, thus giving it a relative good

chance of picking up infectious agent such as malaria parasite circulating in the host capillary. The anatomy of mosquito is adapted to transmit disease (Sarojini, 2000). The mouth part of mosquito consists of sharp stylet that is forced through the host skin to the subcutaneous capillaries. One of the needle-like stylet is hollow and mosquito saliva is pumped through it. The saliva increases blood flow and prevent clotting as victim's blood is sucked into a tube formed by the other mouth part of the insect.

Justification

Malaria disease is the most widely spread mosquito-borne disease occurring in virtually all tropical and subtropical countries and the developing nations in the world. Malaria disease which has affected close to three million people and has claimed the lives of over 2.8 million over the last decade (Fulluck, 1982). The Centre for disease and control and prevention (CDC) has defined the re-emerging resistance of mosquito and malaria to chemical insecticide and drugs and the incidence in human has increased within the past decade and is threatening to increase in human population density in cities. This increase is due to the dynamics of microbial exposure and evolution in human themselves. Urbanization often crowds human and increase exposure to microorganism. Crowding leads to unsanitary condition which hinders the effective controls of the vector and affects the implementation of adequate medical care. This enables the widespread transmission and propagation and pathogen (CDC, 1980). In view of the effect of this disease, the effective control of certain tropical disease that are caused by most of these vectors belonging to the group of insects in phylum Arthropoda (class insecta) is vital. Most of the vectors are mosquito, sandfly, tsetse fly and black flies which transmit the causative agents of these diseases (malaria, leishmaniasis, sleeping sickness and onchocerciasis). Difficulty in their control has contributed to a challenge in their eradication (Science, 1985).

Aims and objectives

To confirm the larvicidal action of cypermethrin and 2,2-dichlorovinyl dimethyl phosphate (DDVP) on

anopheles' mosquito larvae and to compare the larvicidal strength of Cypermethrin and DDVP.

Scope of the study

This research is projected towards ascertaining the action of Cypermethrin and DDVP in destroying mosquito larvae and determining which is more effective than other.

Material and method

Collection and maintenance of mosquito larvae. A bucket and a cup were used to collect mosquito larvae at stagnant water point at the staff quarter A, B and Mala hostel of the Federal Polytechnic Bauchi. The culex larvae was recognized by their resting in parallel position to the surface of the water, while anopheles' larvae rest with the head downward in the body at an angle of 45 degree with water surface (Capenter, 1997). Materials used included; Beaker, calibrated cylinder, bucket and cup. Cypermethrin and DDVP reagents used were manufactured by Agrichem Pty Ltd (Australia). Varying concentrations of both chemicals were prepared (11.1%, 9%, 4%, 7%, 2%, 1%, 0.5%, 0.25%, 0.17%, 0.13% and 0.1%) in different beaker.

Testing for larvicidal activity

Twenty larvae were placed into the beaker containing different concentrations of the chemical and total mortality rate was observed over a period of time. There was fast erratic wrangling by the larvae when introduced into the solution at the different concentration which stops after the death of the larvae due to penetration of the chemicals. In the test solution, the dead larvae dropped to the bottom of the solution forming a pale-yellow appearance and slightly swollen.

Results

When twenty larvae were introduced into different dilution; 11.1%, 9%, 8%, 7%, 4%, 2%, 1%, 0.5%, 0.25%, 0.17%, 0.13% and 0.1% of DDVP and Cypermethrin in different beakers and the time of total death in seconds was noted. The time of total



death with Cypermethrin at the varying concentration were; 20sec,30sec, 37sec, 49sec, 60sec, 80sec, 205sec, 250sec, 380sec, 590sec and 700sec respectively. For DDVP, the time of total death at the varying concentrations were

8sec,10sec,12sec,15sec, 29sec, 45sec, 50sec, 60sec, 120sec, 200sec, 330sec and 400sec respectively as shown in table I and figure I shows the time of total death with Cypermethrin while table 2 and figure 2 shows the time of total death with DDVP.

Table I: Mortality rate of Cypermethrin.

Concentration (%)	Time of total death (sec)	NO. of larvae introduced	Total No. of dead larvae
11.1%	20 sec	20	20
9%	30sec	20	20
8%	37sec	20	20
7%	49sec	20	20
4%	60sec	20	20
2%	80sec	20	20
1%	205sec	20	20
0.5%	250sec	20	20
0.25%	380sec	20	20
0.17%	509sec	20	20
0.13%	590sec	20	20
0.10%	700sec	20	20

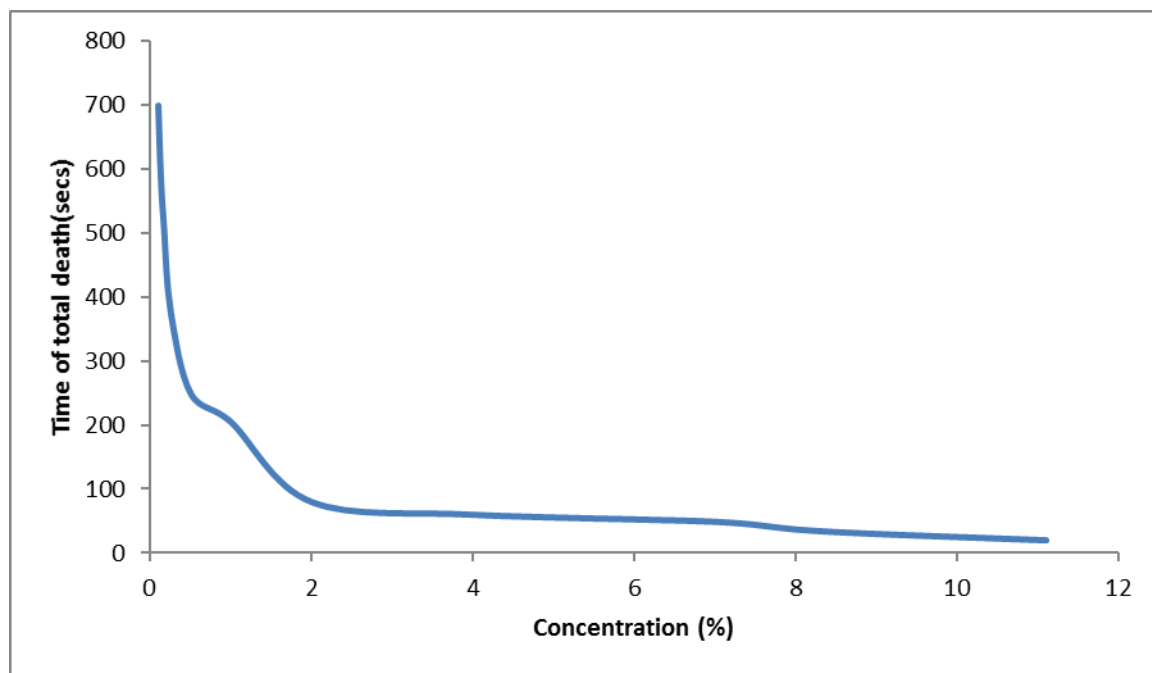


Figure 1: Mortality rate of Cypermethrin

Table 2: Mortality rate of DDVP.

Concentration (%)	Time of total death(sec)	NO. of larvae introduced	Total No. dead
11.1%	8 sec	20	20
9%	10sec	20	20
8%	12sec	20	20
7%	15sec	20	20
4%	29sec	20	20
2%	45sec	20	20
1%	50sec	20	20
0.5%	60sec	20	20
0.25%	120sec	20	20
0.17%	200sec	20	20
0.13%	330sec	20	20
0.10%	410sec	20	20

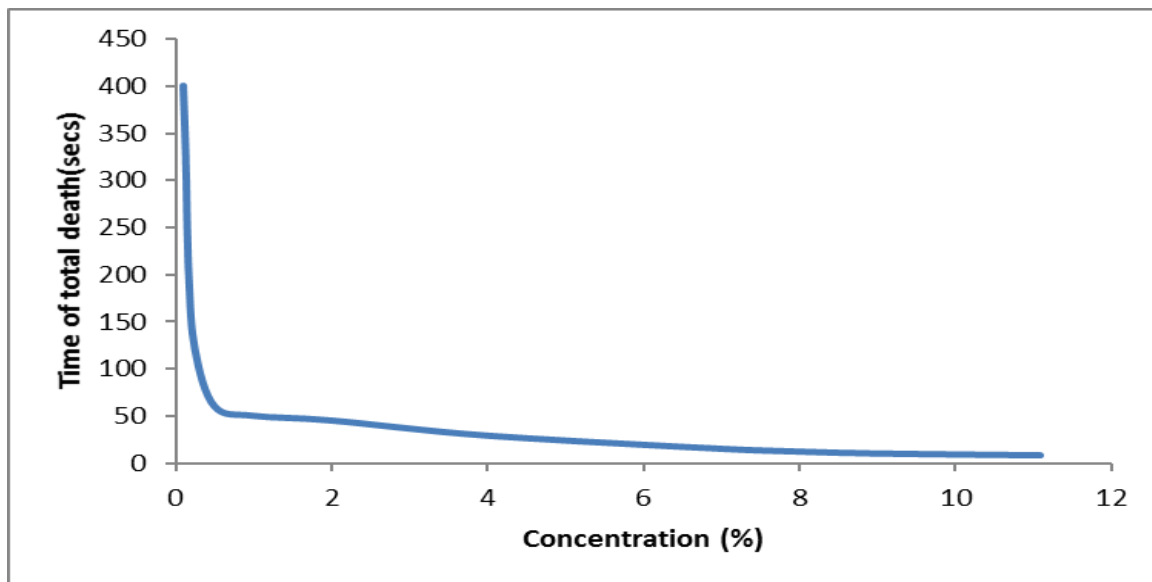


Figure 2: Mortality rate of DDVP.

Discussion

The larvicidal activity of the two chemicals was different, with DDVP having a high larvicidal effect and mortality rate when compared to Cypermethrin which have low larvicidal effect. Though these chemicals may have some human effect such as cough, catarrh and irritation. But they can be used in controlling mosquito vector at both adult and larvae stage. Considering different control measure used against mosquito, a significant effort is still directed

toward the search for cheaper less polluting and very effective means of controlling the vector (WHO,1980). It is generally believed that one of the effective ways to manage vector disease such as mosquito borne disease like malaria is to eradicate the vector. Attacking the adult mosquito is expensive and often necessary. Controlling the mosquito by attacking its life stage has been discovered to be cheaper and effective; either attacking the egg, larvae or pupal at their habitat (WHO,1984). The developed countries have succeeded in eradicating



most vector most especially mosquito, which was first discovered during the second world war when massive use of insecticide such as DDT and the synergies was used in order to reduce the catastrophic effect of mosquito on the large armies between 1920-1948 (Fried,1997). According to Van-Emdem 1992, in the tropical region that specie of mosquito takes minimum of six days to develop to adult from newly deposited egg, this could be eliminated by spraying of insecticide on the habitat to destroy the larvae. This has been an effective way to controlling the vector. Hence it is very necessary in mosquito control.

Conclusion

The experimental results show that these chemicals can be used not only against flying insects (mosquito) but can be used in attacking mosquito life stage such as larvae and pupal. These chemical DDVP and Cypermethrin can also be used in controlling both flying and non-flying insect like termite, though their activity or potency may vary due to morphological and physiological state.

Recommendations

Production of more effective, less toxic chemicals to both man and the environment is advocated. Synthetic insecticide should be promoted and used at all level of the society. There is need for increased awareness and education on the control, management of mosquito as well as mosquito- borne diseases by using synthetic insecticide and drug adherence in methods/formulation use and application.

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