SJIF Impact Factor: 3.458

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 2.
Issue: 5.
Page N. 36-39
Year: 2018

Original Article www.wjahr.com

EFFICACY OF TEMEPHOS AND DIFLUBENZURON USE IN MALARIA VECTOR LARVAE CONTROL

[1]Walid Adam Eltahir, [2]*Mohamed Osman Elamin, [3]Ibtehag Mahgoub and [4]Elmobasher A. Faraj

[1]MOH, Sudan.
[2]Faculty of Public Health, Umm Al-Qura Universaity, KSA.
[3,4]MoPH.

Received date: 24 June 2018 **Revised date:** 15 July 2018 **Accepted date:** 05 August 2018

Corresponding author: Mohamed Osman Elamin
Faculty of Public Health, Umm Al-Qura Universaity, KSA.

ABSTRACT

The present study was undertaken to evaluate the efficacy of Temephos 1ppm EC with an application rate of 1 ppm and Diflubenzuron 25% WP with an application rate of a 1, 0.5, 0.25 and 0.125 g/m2 respectively, against larvae of Anopheles and Culex species under field conditions in Soba area. The efficacy of Temephos and Diflubenzuron was determined using WHO standard procedures.The percentage of reduction in larval density was calculated using Mulla's formula. More than 80% reduction in larval density of Anopheles and Culex mosquites was given by Temephos 50% EC with an application rate of 1 ppm. The larval protection period given by this compound was 9 days. Diflubenzuron gave more than 80% emergence inhibition at 1 and.0.5 g/m2 dose. The larval protection period at this doses was 7 days. The study revealed that there was no significant increase in the residual activity of Diflubenzuron WP at the two rate of dose 1g/m2 and 0.5 g/m2 dose. (p>0.05). More work is needed to identify suitable larvicides with longer larval control periods.

KEYWORDS: Temephos & Diflubenzuron, Malaria Larvae.

INTRODUCTION

Malaria affects 300 million people one World and kills one million people every year. As in 2004, 107 countries have been reported as areas at risk of malaria transmission. Although this number is considerably less than in 1950 in 140 endemic countries, 3.2 billion people are still at risk. Around 350 -500 million clinical cases are reported every year .Vast majority of malaria deaths occur in Africa South of the Sahara where malaria also represents obstacles to social and economic developments. 90%of these deaths occur in Africa mostly in young children (WHO2005). Malaria is a major public health problem in Sudan and the disease affects almost all people living in Sudan with variable degree of pathogenicity .The highest disease prevalence is reported in the south and the risk of malaria transmission varies from 1 to 74% based on climatic conditions (WHO, 2005). It was estimated that malaria causes 7.5 million cases and 3500 death annually in the Sudan. Chemical control with insecticides is still the main stay of most vector control programmes in the Sudan. Insecticides, can be classified as petroleum oil, pyrethroids, chlorinated hydrocarbons, organophosphates, carbmates and growth regulators (Warrel&Gills,2002). Chemical control methods are used to supplement environmental improvement techniques and to deal mainly in emergency situations 3 (Kenway, 2004). The Malaria Control Program (MCP) in Khartoum State currently use Temephos for larval control in fresh water and Diazinon for polluted water, in conjunction with routine vector control operations that include treated bed nets and Pyrethroids spraying for control of adult mosquitoes. Larval control in the past had been dependent mainly on the use of chemicals such as Paris green and larvicidal oils. Presently, organophosphorus insecticides such as Temephos and Diazinon are used as larvicides in fresh and polluted water respectively. Larviciding is a general term for killing mosquitoes by applying natural agents or commercial pesticides to control the larval and pupal stages. Since both of these life stages live in aquatic environments, larvicides are always applied to water (USEPA 1998). Larvicide's treatments can be applied from either the ground or air. Larviciding, originally implemented as a malaria control procedure in the early 1900s, has become a main stay of mosquito control over the years (Harrison, 1978). Mosquito control programmes incorporate a larviciding component into the overall plan to reduce mosquito breeding. Safely altering the aquatic environments, even temporarily, for the purpose of controlling mosquitoes, requires a good working knowledge of both the target species and the larvicide. The once widely used practice of smothering everything with waste oil is no longer acceptable, and mosquito control is 4 rapidly approaching an age of prescription applications, where a competent operator will apply one or a combination of larvicide's in an environmentally sound manner under a given set of conditions (FCCMC, 1998,). Rationale of the study: Khartoum Malaria Control Program is intensifing operations to meet expectations of the World Health Organization’s (WHO) Roll Back Malaria Program (RBM). Drawbacks such as vector resistance to these compounds, costs and environmental pollution provide a basis for redefining long-term larval control strategies for the country. Temephos application has proven to be a feasible strategy under these dry and semiarid climatic conditions since mosquito larval breeding sites are discrete and easily targeted by field teams. Most of the insecticides however, quickly lose their efficacy due to build up of resistance by vectors to those insecticides. Currently, there is resistance to DDT and Malathion in N. Halfa, Gezira and Rahad Irrigation Schemes (NMCP, 2005). Resistance management can be achieved by rotating unrelated insecticide. Use of the same larvicide for a long-time may, however, precipitates resistance in mosquito larvae. Therefore, it is necessary that larvicides should be evaluated for future use. 5 Objective To evaluate the efficacy of Temephos and Diflubenzuron in control malaria vector larvae in Khartoum state 2007.

METHODOLOGY MATERIALS AND METHODS

Study Sites: This study were conducted in Soba Garb south of Khartoum State. The area is semi urban and extends between latitudes 115.10o - 16-30o) North and (31.35o -39.20o) East. The area is bordered from the East by the Blue Nile and Khartoum Medani high way from the South. Small farms near the area are distributed along the river; mainly cultivating vegetables, fruits and Abu sabeen (animal fodders) Such habitat made the area a suitable place for mosquitoes. Soba Garib is peri-urban agricultural area mainly for dairy & poultry farming. The source of irrigation of these farms is major canals filled by different sizes, pumps from the Blue Nile, distributing water into the farms through a network of small canals by passive gravity. Some farmers dig water pores from which the farms are irrigated by pipes. **Study design:** Acomparative study for evaluation of the efficacy of Temephos & Diflubenzuron. Larvicides tested: The efficacy of two larvicides was tested Temephos 50%Ec produced under the trade name (jaguar) produced by Elhelb Company, Egypt. 33 Diflubenzuron 25% WP produced under the trade name (Natsho) by the Egyptian Company for Chemical Products. Larviciding sites: Thirty small man-made ponds with dimension 100X100x 50 cm were filled with water and were allowed to be natural breeding sites of mosquitoes. Ten sites were used for Temphos 50% EC testing, ten sites were used for Diflubenzuron 25% WP testing and ten were used as non-insecticide treated control. (Plate no.1) Thirty five small man-made ponds with dimension 100X100x 50 cm were filled with water and were allowed to be natural breeding sites of mosquitoes, ten sites were used for 0.5g/m2 diflubenzuron testing, ten sites were used for Diflubenzron 0.25g/m2 testing , ten sites were used for Diflubenzron 0.125g/m2 testing and 5 were used as noninsecticide treated control Larvicide application: Temephos 50% EC, (1ppm) and Diflubenzuron 25% of different dose were sprayed using Hudson Expert sprayers (capacity 10 liters). Sampling procedure: The larval density was estimated using standard dipper (350ml capacity withy 9cm diameter) for all the experimental ponds. A minimum of 10 dips, were taken from each experimental ponds. The numbers of anopheline immature developmental stages (L1, L2, L3, 34 L4, Pupae and Culex developmental stages per the 10 dip were recorded. Prior to treatment, mosquito larvae in each pond were sampled. Sampling after application was made after 24 and repeated every 48 hours post treatment. The sampling continued for a period of 14 days. Larvae collected from the habitats were categorized into 1st, 2nd, 3rd and 4th instars, and pupae numbers were recorded. The larval density per dip is calculated by dividing the total number of larvae collected by the number of dips taken (10dips). Percent reduction in different instars larvae and pupae were calculated using the Mulla, s formula as follows: % Reduction= 100- C1XT2 x100 C2XT1 Where, C1= pre-treatment immature density in control sites C2= post treatment immature density in control sites T1= pre-treatment immature density in treated sites T2= post treatment immature density in treated sites Persistence of the larvicides in different breeding habitats of the target species was determined from the post treatment density. Achievment of > 80% reduction in the treated habitats is considered as an effective dose for field application. 35 Other doses of Diflubenzuron 0.5g/m2, 0.25g/m2 and 0.125g/m2 were compared following the same procedure. Data analysis: The data was analyzed using SPSS program version 11.5 and other computer software.

The effect of Temephos 1ppm against mosquito aquatic stages in the experimental ponds, within the first 24 hours post treatment with Temephos (1ppm) larval stages of Anopheles and Culex disappeared from the treated ponds, while the pupal stages disappeared in day 4. In day 8 post-treatment the first instars larvae started to show up and by day 10 the three other larval stages were observed in treated ponds.

RESULTS

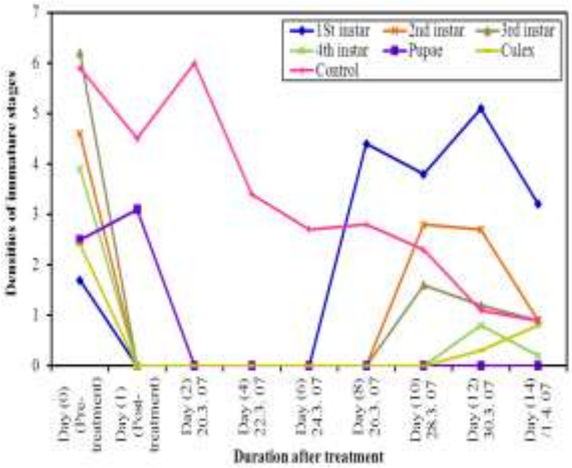

Figure 1: The effect of Temephos 1ppm EC against mosquito developmental stages in the experimental ponds.

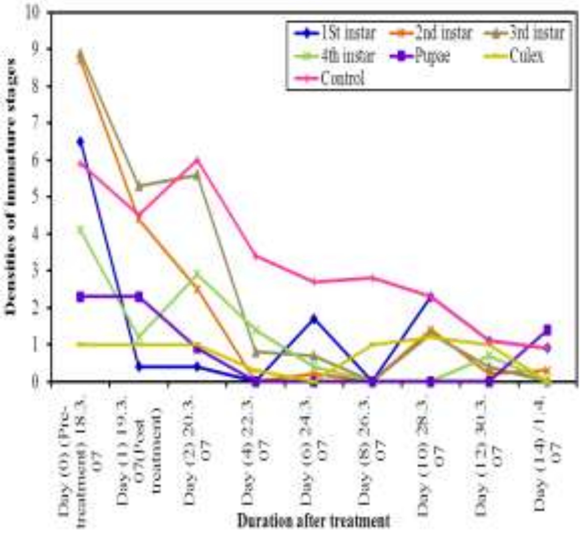

Figure 2: The effect of Diflubenzuron 1g/m against Mosquito aquatic stages in the experimental ponds.

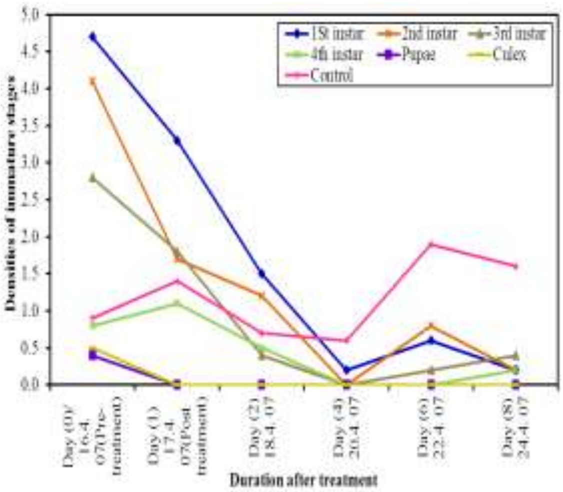

Figure 3: The effect of Difubenzuron 0.25g/m against immature stages of two mosquito in experimental the ponds.

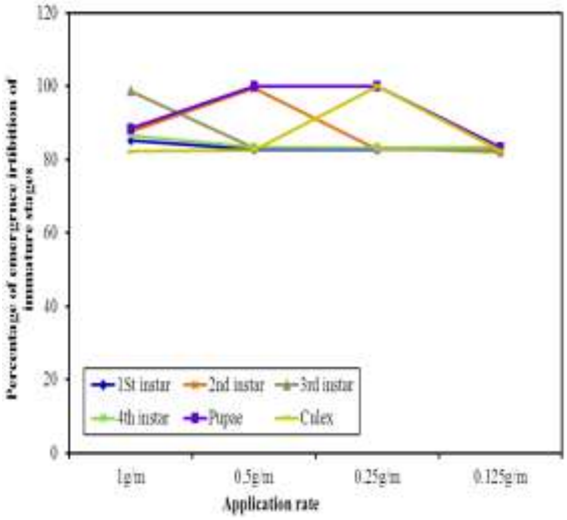

Figure 4: Percentage of Diflubenzuron with different application rates (g/meter) against immature stages of two mosquito species in the experimental ponds.

DISCUSSION

Discussion Source reduction is known to be an efficient and cost effective way of mosquito control (CDC', 1999). Therefore, the control of mosquito larvae before they emerge into adults through the use of larvicides has been an effective method of control since the early1900s. The residual effect of larvicide's varies considerably but it is relatively short in most of them (WHO, 2003). One of the important organophorus compounds which has been used in the Sudan for the control of mosquito larvae is Temephos. During this study the efficacy of this compound as alarvicide against Anopheles arabinses was tested. It was found that Temephos 1ppm caused more than 80%mortality in all the larval stages of An.arabinses and Culex larval stages within the first twenty four hours post treatment. Temephos is an organophosphorous compound which works by inhibiting the activity of cholinesterase at neuromuscular junction causing the paralyses and death of the larvae that ingest it (Hurlbert, 1975). At the same time, it was found during this study that a single application of this insecticide in the experimental ponds controlled mosquito larvae for a period of 9 days. That means the control teams should repeat the application of this insecticide every week. If we consider the diversity and numbers of breeding habitats of the anopheline mosquitoes, in additions to the limitations and shortage in man power, it could be concluded that weekly 57 application of Abate in the breeding sites of mosquitoes is a difficult job that might not lead to proper mosquito larvae control. It was found in a study conducted by Pierce et al (1990) that, the application of 1ppm Abate completely control mosquito larvae for aperiod of 90-100 days. It was also stated in the Temephoes insecticidal technical information brochure that the application of 1ppm Abate completely control mosquito larvae for 90-100 days in containers of clear water. During this study the water used was fresh tap water which was not flushed or changed; therefore the concentration of the compound used was almost constant and not subjected to any of the factors that affect its concentration such as change in water Ph and flooding. Therefore, the period of larval control provided by this compound seems to be shorter compared to what was described in Abate insecticide technical information brochure. The same authors found that the use of Abate at the same concentration in tidal marshes where continuous breeding of flushing occur provided larval control for 10-14days. According to Yaseuno et al (1982), temephos has good stability in natural fresh saline water. During this study the efficacy of diflubenzuron was also tested in different doses. Dimmilin was used for the first time in the Sudan in the 1970th in the Blue Nile Project to control mosquito larvae. (Eltaib,2007). 58 The results showed that this compound was effective up to day four post application when no developmental forms were observed, but it was noticed that by day 8 the compound tested lost its larvicidal efficacy. The same results were obtained in Blue Nile Project (Eltaib, 2007.). The result obtained in this study showed no significant difference between the different concentrations of diflubenzuron tested in this study. According to the biopesticies fact sheet (internet information), this compound may be applied within the concentration used in this study at maximum of six times per year. In Saudi Arabia in the malaria control program, (Dimmilin) was applied in extensive inaccessible sites once every three month that equals the use of Dimmilin six times per year (Nugud,2007)

CONCLUSION

(Temephos) is effective against Anopheles and Culex species in different immature stages at an application rate of 1 ppm, (efficacy above 90%). The larval control period given by this compound was 9 days. ƒ The efficacy of Diflubenzuron tested during this study was found to be 87% with a larval control period of 7 days. ƒ Due to their short larval control period both compounds are to be applied weekly if they are to be used for larval control in permanent breeding sites.

RECOMMENDATIONS

More work is needed to identify suitable larvicides with longer larval control periods. Due to the short larval control period of the currently used larvicides, recruiting more mosquito control staff is recommended, to enable the mosquito control teams to cover all the breeding places of mosquitoes weekly. • According to their short period efficacy, larvicides use in malaria control in Khartoum State must be changed to others with long period. • Insecticides must be imported from their original country to meet standard characteristics of chemical properties • Further field trials should be conducted to evaluate the efficacy of Temephos & Diflubenzuron in polluted and salty water.

REFERENCES

1. Annual C.D.C, report (1999) Insecticides used in vector control, control disease center. Annual C.D.C, report, 2001.
2. Insecticides used in vector control, control disease center. Annul NMCP, report, 2005 Eltaib.F, (2007) Personal communication University of Gezeira, Faculty of Public& Environmental Health. FCCMC, (Florida Coordinating Council on Mosquito Control), 1998.
3. Demonstrable Increase or other Indicator of Arthropod Population Level., University of Florida, Vero Beach, FL. Florida Administrative Code, 1995. Rule 5E-13.036, Hurlbert, S.H. (1975) Secondary effects of pesticides on aquatic ecosystems. Residue Rev. 59:81- 148. Harrison, 1978.
4. Mosquitoes malaria and man History of the hostilities since 1880, John Murray, London. Keyway, M. A. (2004). mechanism of resistance.pp.125-179 Lawryk, N. J., 1991.
5. Organic phosphorus pesticides In Handbook of Pesticide Toxicology Hayes, W. J., Jr. and Laws, E. R., Jr., Eds. Academic Press, New York, NY,.5-3 64 Lacey, L.A., 1990.
6. Persistence and Formulation of Bacillus sphaericus 284-294. In: de Barjac, H., and Sutherland DJ (Eds.). Bacterial Control of Mosquitoes and Black Flies: Biochemistry, Genetics and Applications of Bacillus thuringiensis israelensis and Bacillus sphaericus. Rutgers University Press, New Brunswick, NJ. 349.
7. Nugud, A. A. (2007), Personal communication, National Health Laboratory. Pierce, R.H. Brown, R.C. Hardman, K.R. Henry, M.S. Palmer, C.L.P. Miller, T.W. and Wichterman, G. (1989a).
8. Fate and toxicity of temephos applied to an intertidal mangrove community. J. Am. Mosq. Control Assoc. 5(4):569-578. Rozendaal, J. A. (1997).
9. Vector control method for use by individual and communities. WHO .Geneva. Service, M.W., 1980; 112, 113, 114, 115, 116.
10. A guide to medical entomology. 4th edition, London. Snarski, V. M., 1990.
11. Interactions between Bacillus thuringiensis subsp. israelensis and fatheadminnows, Pimephales promelas Rafinesque, under laboratory conditions. Applied and Environmental Microbiology Schreiber, E.T and Jones, C J. Florida Mosquito Control Handbook. Florida Cooperative Extension Service, Gainesville, FL, 2000; 56(9): 2618-2622.