A FIELD CONTROL TRIAL OF *CULEX QUINQUEFASCIATUS* LARVAE BY POLYMER FORMULATIONS OF OMS-786 AND OMS-971 IN JAKARTA

IG. Seregeg*and T. Suzuki**

ABSTRAK

Suatu uji coba lapangan penggunaan larvisida OMS-971[a] (chlorpyrifos) dan OMS-786[b] (temephos) dalam formulasi lepas terkendali (controlled release formulation = CRF) terhadap larva *Culex quinquefasciatus* telah dilakukan dalam selokan-selokan di Kampung Sunter, Jakarta Utara. Tidak ada penurunan yang nyata baik kerapatan larva maupun kerapatan pupa, segera setelah penebaran larvisida tersebut dalam dosis 1 ppm. Akan tetapi penurunan kerapatan larva baru terlihat selama satu sampai dua bulan sesudah penebaran. Pada penelitian ini chlorpyrifos terlihat sedikit lebih berpengaruh (effective) dibandingkan dengan temephos. Pengaruh dari temephos" sand granules' sebagai formulasi pembanding hanya berlangsung paling lama satu minggu, pada penggunaan dosis sebesar 1ppm. Keadaan dasar selokan dengan endapan lumpur yang tebal diperkirakan telah melumpuhkan daya kerja temephos SG, yang langsung tenggelam ke dasar selokan setelah penebaran. Hal ini berbeda dengan formulasi chlorpyrifos dan temephos yang bersifat lepas terkendali (CRF), berada dalam suatu keadaan yang tetap mengapung di atas permukaan air. Chlorpyrifos dapat memberikan daya kendali terhadap larva sebesar 70 - 94% pada minggu ke 5 – 8 dan terhadap pupa sebesar 87% pada minggu ke 6 dan 92% pada minggu ke7. Temephos CRF memberikan daya kendali terhadap larva sebesar 90 – 96 % pada minggu ke 4 – 8 dan menurun menjadi 75 – 96% pada minggu ke 8 – 9.

INTRODUCTION

It was reported that EC formulations of OMS-2 (fenthion) and OMS-971 (chlorpyrifos) were effective for *Culex quinquefasciatus* control by Graham et. al. (1972)[1] and by Bang et al. (1975)[2], respectively. Recently, polymer controlled release formulations of chlorpyrifos or temephos have been tested as mosquito lauvicides [3-9].

In the present studies, polymer formulations of two insecticides, i.e. OMS-786 (temephos) 7.2% controlled release formulation, and OMS-971 (Chlorpyrifos) 10% controlled release formulation were tested against *Cx quinquefasciatus* larvae in polluted drains in Jakarta, as part of the WHO Programme for the Evaluation and Testing of New Insecticides. In addition, OMS-786 sand granules were also tested as a comparative formulation. The results are presented in this paper.

STUDY AREA AND TREATMENT

The study area was Kampung Sunter, a newly developed residential area situated in north-eastern part of Jakarta Almost all the drains along the roadside in the area were made of concrete, and

* Sub-Division of Entomology, National Institute of Helath Research and Development, Jakarta, Indonesia.
** Entomologist, WHO Vector Biology and Control Research Unit No. 2, P.O. Box 302, Jakarta, Indonesia.

a OMS-971 (Chlorpyrifos, Dursban^{R}): 0,0 - diethyl 0 - (3,5,6 - trychloro-2pyridyl phosphorothioate. The sample was manufactured by Dow Chemical Co.

b. OMS-786 (temephos, Abate^{R}) : 0, 0, 0' - tetramethyl 0, 0' - thiodip – phenylene phosphorothioate. The sample (ECOPRO 17) was manufactured by Environmental Chemicals Inc.

a few of earthenware walls. All of them were highly polluted and were heavily infested with only *Cx. quinquefasciatus*. Altogether 25 drains, some moderately and others heavily infested with larvae, were selected for the trial.

The length of the selected drains ranged from 22 m to 70 m (mean : 52.8 m); the width from 44 cm to 60 cm (mean : 48.7 cm); the depth from 6 cm to 25 cm (mean : 13.3 cm); and the volume of water from 0.9 m^3 to 7.5 m^3 (mean: 3,6 m^3).

Five drains were treated each with OMS-786 SG (A), OMS-786 CRF (B) and OMS-971 CRF (C) at a target application rate of 1 ppm based on the volume of water. Ten drains served as untreated checks (U). The amount of insectictide formulations required for each drain was weighed in the laboratory. The insecticides were thrown evenly by hand into the treated drains. The treatment was done on 28 September 1978.

EVALUATION METHOD

The effectiveness of the treatment was evaluated with the relative density of larvae and pupae as measured by dippers. In each drain, 20 dips were made randomly in the centre of the drains, to avoid migrated larvae from adjacent larvae drains. Stage I - II larvae, stage II - IV larvae and pupae in the twenty - samples were counted, then, they were released in the same place of the same drains.

Pre - control surveys were started on 11 September 1978, 17 days before the treatment. Post - control surveys began 29 September 1978, one day after the treatment, and thereafter twice a week till the 12th week of the treatment.

RESULTS

The effect of the three insecticide formulations is shown in Tabel 1. In the drains treated with OMS-786 SG, the control was nearly 100% for the larval density one day after the treatment, and 99.4 % in the pupal density four days after the treatment. The percentage decreased, thereafter, and 2 weeks after the treatment it was zero both for larvae and for pupae.

In the drains treated with OMS-786 CRF, no marked reduction was observed immediately after treatment, but 90-96% control was observed during 4th to 6th week for larvae and 75 — 96% during 8th to 9th week for pupae. Also, in the drains treated with OMS-971 CRF, no marked control was observed immediatelly after treatment,, but 70 — 94% control was observed during 5th to 9th week for larvae, and 87% in 6th and 92% in 7th week for pupae.

DISCUSSION

Long residual effectiveness of polymer formulations against mosquito larvae has been reported by many research worker. Evans et al. (1975)[7] reported that the controlled release formulation of chlorpyrifos was effective against several species of stagnant and floodwater mosquito larvae for 22 weeks at the dosage of 1 ppm. Nelson et al. (1978)[8] found that it was effective against *Psorophore confinis* for 11 weeks at the rate of 2 ppm.

On the other hand, Mulla et al. (1978)[9] reported that both temephos and chloripyrifos polymer formulations failed to produce adequate control in ponds where water flow into each pond was in excess of 4 gals per min. but

Table 1. Control percentage* of *Culex quinquefasciatus* larvae and pupae by the treatment of three insecticide formulations.

Days or weeks after treatment	OMS 786 SG (A)		OMS–786 CRF (B)		OMS–971 CRF (C)	
	Larvae	Pupae	Larvae	Pupae	Larvae	Pupae
1 day	99.94	57	3	25	0	0
4 days	88	99.4	67	71	32	53
1 week	36	54	0	26	0	61
2 weeks	0	0	50	6	31	40
3 weeks	0	14	47	75	21	40
4 weeks	0	0	90	86	24	36
5 weeks	0	9	92	74	75	22
6 weeks	21	0	96	94	94	87
7 weeks	0	0	93	94	88	92
8 weeks	**	**	92	88	70	63
9 weeks			62	85	51	66
10 weeks			49	54	80	6
11 weeks			0	71	0	44
12 weeks			23	46	32	14

* Control % = $100 \frac{C1}{T1} \times \frac{T2}{C2} \times 100$, where C1 = pre-control count in check, C2 = post-control count in check. T1 - pre-control count in treated, and T2 = post-control count in treated.

** Observation discontinued.

where water flow as considerably low, chlorpyrifos prevented mosquito larval breeding for over 35 days at the rate of 1 lbs per acre. He also reported that polymer formulation of temephos is inadequate for mosquito larval control in stagnant water habitat.

In the present studies, no marked reduction of larval and pupal density was observed immediately after treatment of either chlorpyrifos or temephos polymer formulation. Nevertheless, considerable reduction of larval density was observed during one month to two months after the treatment of either chemicals. Chlorpyrifos was found to be more effective than temephos. The apparent poor results of these chemicals during the first month after the treatment was probably due to the slow release of the toxicants at the initial phase and greater adsorption by organic materials

in the drains.

The effect of temephos sand granules lasted for less than one week, but drastic reduction of both larval and pupal density was observed immediately after the treatment.

ACKNOWLEDGEMENT

The authors are grateful to Profesor A.A. Loedin and his predecessor, Head, National Institute of Health Research and Development, Jakarta who provided the laboratory space and staff to carry out this work; to the field staff of the Division of Entomology who assisted this project; to Drs. N.G. Crat and C.P. Pant for their guidance from Vector Biology and Control Division, WHO, Geneva; to Dr. Y.H . Bang, Project Leader, WHO Vector Biology and Control Research Unit No. 2, for his support, and to Environmental Chemicals Inc. and Dow Chemical Co, who provided the chemicals.

REFERENCES

1. Graham, J.E., Abdulcader, M.H.M., Mathis, H.L., Self, L.S. and Sebastian, A. (1972) Studies on the control of *Culex fatigans* Wiedemann. *Mosq. News 32 ;* 399 — 416.
2. Bang, Y.H., Sabuni, I.B. and Tonn, R.J. (1975) Integrated control of urban mosquitoes in Dar-es- Salaam using community sanitation supplemented by larviciding. *East Af. Med. J. 52 :* 578 — 588.
3. Miller, T.A., Nelson, L.L., Young, W.W., Roberts, L.W., Roberts, D.R., and Wilkinson, R.N. (1973a) Polymer formulations of mosquito larvicides. I. Effectiveness of polyethylene and polyvinyl chloride formulations of chlorpyrifos applied to artificial field pools. *Mosq. News 33 :* 148 — 155
4. Miller, T.A., Nelson, L.L., and Young, W.W. (1973b) Polymer formulations of mosquito larvicides. IV. Larvicidal effectiveness of polyethylene and polyvinyl chloride formulations of chlorpyrifos during an 18 months field test. *Mosq. News* 33 : 172 — 175.
5. Nelson, L.L., Miller, T.A. and Young, W.W. (1973) Polymer formulations of mosquito larvicides. V. Effects of continous low-level chlorpyrifos residues on the development of *Culex quinquefasciatus* Say population in the laboratory. *Mosq. News 33 :* 396 — 402
6. Roberts, L.W., Roberts, D.R., Miller, T.A., Nelson, L.L. and Young, W.W. (1973) Polymer formulations of mosquito larvicides. II. Effects of a polyetylene formulation of chlorpyrifos on *Culex.* populations naturally infecting artificial field pools. *Mosq. News 33 :* 155 — 161.
7. Evans, Jr. E.S., Nelson, J.H., Pennington, N.E., and Young, W.W. (1975) Larvicidal effectiveness of controlled-release formulation of chlorpyrifos in a Woodland poop habitat. *Mosq. News 35 :* 343 — 350.
8. Nelson, J.H., Evans, E.S., Pennington, N.E., Meisch, N.M. and Young, W.W. (1978) Larval control of *Psorophora confinnis* (lynch-Arribalzaga) with a controlled-release

formulation of chlorpyrifos. *Mosq. News 36* : 47 — 51.

9. Mulla, M.S. and Darwazeh, H.A. (1978) Effectiveness and residual activity of polymer formulations of mosquito larvicides. *Proc. Paers 46th Ann. Conf. Culif. Mosq. Vec. Cont. Assoc. 1978 p.* 123 — 125.