EFFICACY OF INSECTICIDE BASED DENGUE VECTOR CONTROL METHODS USED IN SRI LANKA: SPACE SPRAYING OF ADULTICIDES AND APPLICATION OF LARVICIDES

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Introduction

Dengue and dengue hemorrhagic fever are major public health problems in Sri Lanka. Number of cases and deaths due to dengue increased dramatically in the recent past and for the first eight months of 2009, a total of 22,757 cases and 232 deaths had been recorded (Ministry of Health, 2009). Dengue is a viral (*Flavivirus*), vector-borne disease transmitted by the mosquitoes *Aedes aegypti* (major vector) and *Aedes albopictus* (secondary vector). Control of the vector mosquitoes is the primary mean of disease control. Environmental management and the use of insecticides are the major strategies in vector control. Insecticides are used in the control programmes in two different methods. Space spraying of adulticides is carried out to reduce the adult female population and its longevity where as larvicides are applied to reduce the larval population (Ministry of Health, 2005). Malathion, pyrethrum, pesguard and deltacide are the commonly used insecticides for space spraying in Sri Lanka and temephos (abate) is the major insecticide used in larval control especially in water storage tanks. However, the efficacy of insecticide based vector control has become questionable because of the increase incidence of dengue despite heavy usage of insecticides in vector control programmes.

The present study was carried out to evaluate the efficacy of space spraying of adulticides and application of larvicides against *Ae. aegypti* and *Ae. albopictus*.

Materials and Methods

Efficacy of space spraying of malathion, pyrethrum, pesguard and deltacide was tested using standard WHO fogging cage bioassays (WHO, 2001). Cylindrical cages (20 cm length X 5 cm diameter) prepared using 16- mesh nylon were hung at 10 m, 25 m, 50 m, 75 m and 100 m (three replicates for each) away from the place of insecticide spraying/fogging (in down wind direction). Cages were hung 1.5 m above the ground. Adult mosquitoes (10-20) were released to each cage and the fogging was carried for 6-10 minutes. Standard dosages (50 ml/L) of malathion, pyrethrum, pesguard and deltacide were sprayed using hand operated fogging machines (Ministry of Health, 2005). After a 24 hour recovery period, mortalities were recorded. Experiments were repeated in three different habitat types *i.e.*

open ground area, an area with little vegetation (scattered bushes) and an area with dense vegetation (bushes and large tress).

Efficacy of 1 % temephos sand granules was tested against *Aedes* larvae using cement tanks (20x20 cm) filled with 10 L of dechlorinated water. Final concentration of the insecticide was 1 ppm (WHO standard dosage). Twenty mosquito larvae were introduced to each tank and ground fish food was given as larval food. Mortalities were tested after 24 hours. Control experiments were done in tanks with 10 L of dechlorinated water alone. For each day three replicates were carried out.

Results

Space spraying

Results of the space spraying experiments are shown in the Table 1.

Table 1. Percentage mortalities of *Aedes aegypti* and *Ae. albopictus* adults exposed to the space sprayed with malathion, pyrethrum, pesguard and deltacide at five different distances in three different habitat types (see the text for detail).

		Percentage Mortalities (%)														
		Open ground					With little vegetation					With dense vegetation				
		10 m	25 m	50 m	75 m	100 m	10 m	25 m	50 m	75 m	100 m	10 m	25 m	50 m	75 m	100 m
Malathion	a	100	76	0	0	0	60	5	0	0	0	50	0	0	0	0
	b	**100**	**80**	**0**	**0**	**0**	**50**	**4**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**
Pyrethrum	a	100	83	0	0	0	90	25	0	0	0	60	0	0	0	0
	b	**100**	**90**	**0**	**0**	**0**	**47**	**0**	**0**	**0**	**0**	**27**	**0**	**0**	**0**	**0**
Pesguard	a	100	100	32	0	0	*	*	*	*	*	100	72	0	0	0
	b	**100**	**100**	**38**	**0**	**0**	*	*	*	*	*	**100**	**85**	**38**	**0**	**0**
Deltacide	a	100	100	82	45	0	*	*	*	*	*	100	100	40	0	0
	b	**100**	**100**	**84**	**50**	**0**	*	*	*	*	*	**100**	**100**	**30**	**0**	**0**

a - *Ae. aegypti* **b-** *Ae. albopictus* * not conducted

Efficacy of 1 % temephos as a larvicide

For 10 months, the % mortality for both *Ae. aegypti* and *Ae. albopictus* larvae were 100%. The Figure 1 gives the change of the % mortalities of both species during the eleventh month.

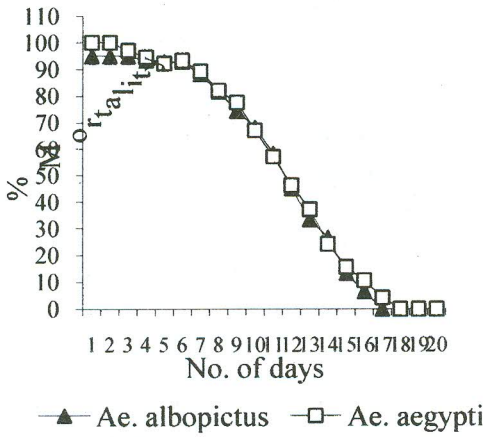

Figure 1. Percentage mortalities of *Aedes aegypti* and *Ae. albopictus* larvae during the eleventh month in 1ppm temephos solution (see the text for detail).

Discussion and Conclusion

According to results the most effective insecticide for space spraying is deltacide, followed by pesguard, pyrethrum and malathion. All the insecticides killed 100% mosquito adults at 10 m distance. However, the wind direction may cause a significant effect on this. The effect is negligible when the mosquitoes are 75 m away from the origin of spraying except for deltacide in open grounds. Results showed that the presence of vegetation hinder the effect of the insecticide space spraying.

Temephos (1 ppm) can be successfully used to control *Aedes* larvae in water storage tanks and other breeding places. The larvicidal effect of temephos is long lasting. Temephos is a cheap insecticide and has no mammalian toxicity at 1ppm concentration. This can be used to control larvae without being replaced by other expensive methods such as the use of *Bacillus thuringiensis* of which the effect is not long lasting.

Acknowledgment

Financial assistance by the National Science Foundation, Research Grant RG/2006/HS/02 is acknowledged.

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