Larvicidal activity of the latex extract of *Papaver somniferum* against vector mosquitoes

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Abstract

Larvicidal efficacy of latex extract of *Papaver somniferum* with four different solvents like Ethyl acetate, benzene, Petroleum ether and methanol were tested against the late third instar larvae of *Anopheles stephensi, Culex quinquefaciatus* and *Aedes aegypti*. The larval mortality was observed after 24h exposure. Among the four solvents the maximum efficacy was observed in ethyl acetate. The LC_{50} values of *An. stephensi, Cx. quinqefasciatus* and *Ae. aegypti* were 37.02 ± 1.04, 47.58±1.43 and 55.71±0.97 ppm respectively.

Keywords: larvicidal activity, mosquito, latex extract, *Papaver somniferum.*

INTRODUCTION

Malaria, filariasis, Japanese encephalitis (JE), Dengue and dengue hemorrhagic fever (DHF) are the four major mosquito-borne diseases in India. *Culex quinquefasciatus* is the major vector bancroftian filariasis and is also a common festiferous mosquito. All over the world, more than50% of persons with filariasis receive their infections from the bites of mosquitoes, very particularly *Cx. quinuefascatus* (Southgate, 1984).

The mosquito *Aedes aegypti* acts as a vector for an arbovirus responsible for yellow fever in central and South America and West Africa. It is also the vector of dengue hemorrhagic fever, which is endemic to South East Asia, the pacific islands area, Africa and the America (Maillard et al., 1993) Anopheles spp.

mosquito capable of carrying malaria. A number of *Anopheles spp.* are also vectors of filariasis and viral diseases (Service, 1983).

The prevalent occurrence of vector resistance to synthetic insecticides and the problem of toxic non-biodegradable residues containing the environment and adversely affecting non-target organism have dictated a renewed interest on the use of natural products for pest management (Sukumar *et al.*, 1991).

The aim of this study was to determine the larvicidal properties of *Pa. somniferum* against late third-instar larvae of the mosquitoes *An. stephensi*, *Cx.quinquifasciatus*, and *Ae. aegypti*.

MATERIALS AND METHODS

Fresh latex of *Pa. somniferum* was collected from Sanyasikaradu, Namakkal District, Tamil Nadu, India. The latex was extracted with four different solvent ethyl acetate, benzene, petroleum ether and methanol. These extracts were dried using a rotary evaporator and stored in a freezer at -20ºC until assayed. 1.0 gm of latex residue was dissolved in 100 ml of respective solvents and 1% stock solution was prepared. These solutions were used for mosquito larvicidal bioassay against vector mosquitoes.

For testing three bioassay of the plants against mosquitoes thee standard procedure are recommended by WHO (2005) was followed. The colonies of *An. stephensi*, *Cx. quinquefaciatus* and *Ae. aegypti* were cultured and maintained in the laboratory at 27±1ºC and 85% relative humidity. The third instar larvae of these three species of mosquitoes were maintained in separate containers in decholorinated water and larvae were fed on a powdered mixture of dog biscuits and yeast tablets in the ratio 3:1. Twenty five late third instar larvae were introduced into 150 ml paper cup containing 100ml of water with each concentration. A total of four replicates kept for each concentration. Equal number of control cups was kept without the extract. Mortality was recorded after 24 hrs. The moribund and dead larvae in four replicates were combined and expressed as a percentage of larval mortality for each concentration. The test cups were held at 27± 2 ºC and 80-90 relative humidity and a photoperiod of 12 hrs light followed by 12 hrs dark. In case of any control mortality between 5-20%, the observed percentage mortality was corrected using Abbott's formula (Abbott, 1925). This experiment was repeated three times with proper doses to get the median lethal dose LC_{50}. Data from all replicates was pooled for analysis. The control was also run

simultaneously, containing tap water and respective solvent. The larval mortality was counted after 24 hr and LC_{50} value were calculated according to Probit analysis (Finney, 1971).

RESULTS AND DISCUSSION

Data of the larvicidal activity *Pa. somniferum* against three species of mosquitoes are presented in Table 1. Of the four solvent extracts subjected to bioassay ethyl acetate extract of *Pa. somniferum* exhibit the maximum efficacy and the methanol extract was least effective for all the three species of mosquitoes (Table 1). Of all three species of mosquitoes *An. stephensi* was more sensitive to all the extracts followed by *Cx. quinquefasciatus* and *Ae. aegypti.*

Table 1. Larvicidal activity of latex of *Pa. somniferum* against vector mosquitoes.

Solvent	Test organisms	LC_{50}	LC_{90}	95% CONFIDENCE LIMITS (PPM)		Regression	X^2
				LCL	UCL		
Ethyl acetate	*An. stephensi*	37.02±1.04	82.27±1.43	11.75±1.43	55.03±1.93	Y=17.71+0.85X	32.38*
	Cx.quinquifasciatus	45.58±1.43	88.79±1.32	38.89±1.10	56.03±1.26	Y=5.40+0.93X	8.96*
	Ae. aegypti	55.71±0.97	99.32±0.31	51.54±0.56	55.64±0.29	Y=3.02+0.82X	2.01*
Benzene	*An. stephensi*	48.99±0.99	106.64±0.9	24.71±1.30	68.12±1.04	Y=15.81+0.69X	23.88*
	Cx.quinquifasciatus	61.72±0.48	109.98±1.0	59.65±2.04	68.68±1.69	Y=0.76+0.80X	1.27*
	Ae. aegypti	64.16±1.33	110.9±1.3	56.99±1.03	66.44±0.54	Y=2.69+0.77X	4.54*
Pertolium ether	*An. stephensi*	58.62±1.23	127.50±1.2	30.85±1.10	80.80±1.15	Y=15.90+0.57X	22.57*
	Cx.quinquifasciatus	66.92±0.59	131.3±0.6	48.75±0.58	83.89±0.47	Y=0.60+0.78X	14.67*
	Ae. aegypti	79.49±1.12	142.6±1.0	66.61±1.43	92.77±1.19	Y=1.55+0.61X	8.99*
Methanol	*An. stephensi*	110.64±1.06	228.3±1.01	76.87±0.97	141.13±1.2	Y=11.52+0.34X	15.07*
	Cx.quinquifasciatus	118.7±1.3	243.02±0.2	75.26±0.36	159.55±1.1	Y=10.47+0.33X	21.88*
	Ae. aegypti	125.46±0.48	236.63±1.2	96.39±0.66	154.55±0.6	Y=5.27+0.36X	14.01*

*Significant at P<0.05 level. Each value (X±SD) represents mean of six values.

The LC_{50} values of *An. stephensi* from 37.02 to 110.64 ppm, *Cx. quinquefasciatus* ranges from47.58 to 118.74 ppm and *Ae. aegypti* ranges from 55.71 to 125.46 ppm Chi-square values were significant at P<0.05 level for all the four solvents tested. Many workers have reported the larvicidal properties of several plant extracts against different mosquito species. The results of current investigation are comparable with earlier

studies. The leaf extract of *Cucumis pubescens* with four different showed the larvicidal properties against *An. stephensi*, *Cx. quinquefasciatus* and *Ae. aegypti* (Mullai and Jebanesan, 2004). Bioassay guided fractionation and gc-ms analysis of euphorbia lactea extract for mosquito larvicidal activity (Samidurai and Nishamathew 2014). Mohan *et al* (2005) have examined the different extracts of fruits of *Solanum xanthocarpum* served as a potential larvicidal against *An. stephensi, Cx. quinquefasciatus*. The present investigation reveals that there is a scope to use *Pa. somniferum* latex as a potential larvicide to control all three species of mosquito larvae. The isolation of such component(s) and compound isolation is our laboratory, which will be reported in the near future.

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