J Vector Borne Dis 45, September 2008, pp. 249–250

Field evaluation of malathion fogging against Japanese encephalitis vector, *Culex tritaeniorhynchus*

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Key words Cage bioassay – *Culex tritaeniorhynchus* – Japanese encephalitis – malathion

Malathion technical fogging is considered as a potent tool for the control of vectors of various diseases. The purpose of fogging is to interrupt the further transmission by killing the vectors carrying pathogens. Fogging operation was launched in India in 1970 as an urgent remedial measure[1]. Thermal fogging with malathion is very effective in malaria and dengue outbreaks[2], but it has a very little impact in Japanese encephalitis (JE) outbreak, because of its unpredictable and infrequent occurrence[3,4]. Due to non-availability of any effective control tool for the control of JE vectors, malathion thermal fogging itself becomes an unavoidable part of vector control in JE outbreak. Malathion technical fogging is, therefore, recommended during JE outbreaks[5].

JE is endemic in Gorakhpur/Basti division since 1978[6]. In Gorakhpur, JE virus has been the leading cause of encephalitis in humans[7]. *Culex tritaeniorhynchus* (Diptera: Culicidae) is found to be one of the most important vectors of this disease in this area[8]. Every year a number of cases and deaths occur in this division due to this notorious disease[9]. Year 2005 was more dreadful, between 29 July to 31 December when 4114 JE cases and 1003 deaths were reported from Gorakhpur/Basti division. Fogging operations with malathion technical were conducted in these areas where suspected JE cases were occurred to interrupt any further transmission. During fogging operations this study was conducted to determine the susceptibility status of target mosquito — *Cx. tritaeniorhynchus*, the most abundant JE vector in this area.

Present studies were undertaken during pulse fog operations in the Village Pipra Moglan, CHC-Pipraich of District Gorakhpur on 24 September and Village Parsa Khurd, CHC-Partawal of Maharajganj district on 30 September 2005. Bioassays were conducted according to the method developed by Malaria Research Centre, Delhi, India[10]. Indoor resting mosquitoes were also collected using torchlight and aspirator during pre- (1800–1830 hrs) and post-fogging (2000–2030 hrs). Density was represented as per man hour (PMH).

The results revealed that the mortality rate of the mosquito in both the villages was quite high when exposed to malathion fog. In the Village Pipra Moglan, the mean mortality of *Cx. tritaeniorhynchus* mosquitoes was 98.8% whereas in Parsa Khurd village it was 96.25% (Table 1). Pre-fogging indoor density of this mosquito was 8 PMH in Pipra Moglan. However, after fogging it reduced to 0.5 PMH (87.5% reduction). In Parsa Khurd, pre-fogging indoor density of *Cx. tritaeniorhynchus* was 6 PMH, however, after fogging it reduced to 0.5 with a percent reduction of 91.66%.

Table 1. Percent mortality (after 24 h exposure) of *Cx. tritaeniorhynchus* exposed to malathion thermal fogging

Village (District)	% mortality* (Range)
Pipra Moglan (Gorakhpur)	98.8 (95.45–100)
Parsa Khurd (Maharajganj)	96.25 (90–100)

*Four replicates each with 20 mosquitoes in each village.

The results suggested that malathion fogging was quite useful in both the districts in reducing the density of *Cx. tritaeniorhynchus* during outbreak situations. The percent reduction in the indoor density of *Cx. tritaeniorhynchus* after malathion fogging in both the villages was comparatively lower than the mortality observed in the test cages. It may have happened either due to the entry of new mosquitoes from unexposed area or due to limited penetration of fog inside the rooms. It is essential that all doors and windows are left open so as to achieve the maximum possible penetration of the insecticide. It is reported that, even the impact of an insecticide fog on the vector population will be different from that of a sprayed surface on resting mosquitoes[11]. Further, space spraying intends to kill flying mosquitoes by contact with the insecticide in the air[12]. High mortality in test (cage kept) mosquito exposed to malathion fog justify its usefulness.

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Received: 3 March 2008 *Accepted in revised form:* 17 May 2008