

Research Note

A comparative study of adult mosquito trapping using dry ice and yeast generated carbon dioxide

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Abstract. Adult mosquito collections were conducted for 12 weeks in two residential areas in Kuala Lumpur. The CDC light traps were compared using dry ice and yeast as sources of carbon dioxide attractants for mosquitoes. The efficacy of the dry ice baited trap was significant over yeast generated CO₂ trap. The predominant species obtained were *Culex quinquefasciatus*, *Stegomyia albopicta* and *Armigeres subalbatus*.

Researchers have used CDC light traps to sample mosquito populations for many years (Service, 1976). However, it has been found that light traps on their own are not very attractive to mosquitoes (Vythilingam *et al.*, 1992). Most often the light traps are augmented with carbon dioxide from dry ice. However, in some remote areas where it is difficult to obtain dry ice one is hampered in the collection of mosquitoes using CDC light traps. In a recent study in Japan Saitoh *et al.* (2004) evaluated the efficacy of yeast generated CO₂ as an attractant for mosquitoes in field collections by using yeast which converts sugar into CO₂ and ethyl alcohol.

Thus the objective of this study was to compare the efficacy of CDC light traps using CO₂ from two different sources.

Two sites were selected in Kuala Lumpur and mosquito trapping was conducted from June to August 2005. Federal Hill is an upper middle class residential area situated in the heart of Kuala Lumpur. It is surrounded by forest. The second site was 3 km away from the

Institute of Medical Research which houses the staff quarters.

Four traps were operated in each area from 1800 hours each night to 0600 hours the following morning. In each area two CDC light traps were augmented with dry ice (Vythilingam *et al.*, 1992) while another two used CO₂ generated from yeast mixture. A five liter plastic bottle contained the mixture of 18 gm yeast (*Saccharomyces cerevisiae*), 250 gm of sugar and 3250 ml of water. The five L bottle was connected to a 500 ml bottle with tubes. The smaller volume bottle was used to hold the overflow water solution. CO₂ generated was released from a 5mm hole on the side of the 500 ml bottle. A rubber tube was connected from the bottle and placed near the CDC light trap entrance. The yeast mixture was prepared five hours prior to setting up the traps. The four traps were arranged in a quadrate and the position of the two sources of CO₂ was rotated for each collection. Distance between the traps varied between 1.7 m to 5m on different collection days.

Although other insects were present, only mosquitoes collected during the study were counted and identified to species. Number of mosquitoes/trap/night were transformed to log (X+1). This transformation is necessary in view of the many influences other than population changes that affect the size of trap collections (Bidlingmayer, 1969). The transformed data were statistically analysed using the SPSS program for t test and mean comparison.

A total of 864 mosquitoes were collected of which 677 (mean log 0.9748) was from the dry ice augmented trap and 187 (mean log 0.4696) from the yeast generated CO₂ trap. Therefore the efficacy of dry ice as an attractant for mosquitoes was significant (P=0.00). The predominant species was *Culex quinquefasciatus*, followed by *Stegomyia albopicta* and *Armigeres subalbatus* (Table 1). There was a significant difference for all three species between the two traps indicating that the trap augmented with dry ice was more efficient than the yeast generated CO₂ trap.

Similar results were obtained by Saitoh *et al.* (2004) in their experiment. The amount of CO₂ released is important

in attracting the mosquitoes. Thus one way would be to increase the yeast sugar mixture so that more CO₂ will be obtained. Petric *et al.* (1995) studied the relationship between sample size and evening temperatures in order to provide better standardized CO₂ baited trap samples. They reported that blood seeking activity of mosquitoes showed a significant correlation with evening temperature. However, the catch ratio depended more on the CO₂ baited traps. In addition, research by Vythilingam *et al.* (1992) in Malaysia, using CO₂ and octenol augmented CDC light traps gave increased yields of trapped mosquitoes.

It has been well established that CDC trap without CO₂ is not attractive to mosquitoes. CDC traps augmented with CO₂ from dry ice is an efficient trap. However, since it is difficult to obtain dry ice in many remote areas in tropical countries, yeast generated CO₂ traps could be used since it is easily available and cheap. Thus this technique should be further researched and evaluated to make its use feasible in regions where obtaining dry ice is an obstacle to conducting effective mosquito surveillance.

Table 1. The calculated means for the different mosquito species collected and the P values at the 95% confidence interval

Species	Trap	N	Mean log	t- value	P value
<i>Culex quinquefasciatus</i>	Dry ice	36	0.7222	3.101	0.003
	Yeast	36	0.3328		
<i>Culex vishnui</i>	Dry ice	36	0.0551	1.808	0.075
	Yeast	36	0.0084		
<i>Stegomyia albopicta</i>	Dry ice	36	0.4318	2.576	0.012
	Yeast	36	0.2048		
<i>Stegomyia aegypti</i>	Dry ice	36	0.133	1	0.321
	Yeast	36	0.000		
<i>Armigeres subalbatus</i>	Dry ice	36	0.2422	3.620	0.001
	Yeast	36	0.0216		

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