Host feeding responses of *Aedes aegypti* (L.) exposed to deltamethrin

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ABSTRACT: Escape responses of mated and unmated nulliparous *Aedes aegypti* mosquitoes were compared using three different concentrations of deltamethrin in the presence or absence of a live animal host using an excito-repellency (ER) test system. Both insecticide contact (excitation) and non-contact (repellency) test configurations were compared. For contact trials, mated mosquitoes showed similar escape movements among the three concentrations when host stimuli were absent. Significant differences in responses were seen between the lower concentrations of (LC_{50} and LC_{75}) deltamethrin with and without hosts present ($P<0.05$). Presence or absence of host stimuli produced no significant differences in escape response for unmated females when exposed to the highest concentration (LC_{90}) of deltamethrin. Our findings indicate that as deltamethrin concentrations decrease to sublethal levels, mating status and host cues play a more significant role in escape behavior. Therefore, insemination can influence the outcome of feeding success and flight movement of nulliparous female *Ae. aegypti* in contact with deltamethrin and in the presence of live host stimuli. The ER assay system serves as a useful tool for observing excitation and repellency responses of *Ae. aegypti* to insecticides in the presence or absence of other environmental and biological cues that can affect mosquito behavior. ***Journal of Vector Ecology* 36 (2): 361-372. 2011.**

Keyword Index: *Aedes aegypti*, deltamethrin, host stimuli, feeding responses, excitation, repellency.

INTRODUCTION

Despite decades of organized malaria and dengue control activities, both diseases remain major health concerns in Thailand (MOPH 2009). Because no effective and acceptable vaccine or medical treatment is currently available for combating dengue (and Chikungunya virus), the control of these diseases in Thailand has focused primarily on the monitoring and reduction of the mosquito vectors. *Aedes aegypti* is a highly anthropophilic species and often resides in and near human dwellings preferentially feeding on humans (Gubler 1997, Thavara et al. 2001, Suwonkerd et al. 2006). This species can utilize many types of artificial and natural container habitats for oviposition and larval development, making source reduction as a method of control difficult. Other methods to prevent dengue transmission are to reduce human-vector contact using insecticides that attack the adult mosquito. Synthetic insecticides, particularly pyrethroids, have been used extensively (especially during high transmission periods or outbreaks) to control dengue vector mosquitoes in Thailand (Chareonviriyaphap et al. 1999, Somboon et al. 2003, Jirakanjanakit et al. 2007, Thanispong et al. 2008). In general, pyrethroids have been the insecticides of choice for many decades because of their high insecticidal activity, relatively low mammalian toxicity, rapid degradation in the environment, and relative lower cost compared to alternative class compounds. Deltamethrin is currently one of the most commonly used insecticides in public health programs and has been the mainstay for the emergency control of *Ae. aegypti* adults in Thailand since 1994 (Kongmee et al. 2004).

Pyrethroids have been widely used for controlling disease vectors due to their relatively low mammalian toxicity and broad spectrum efficacy in controlling indoor mosquito populations (Elliott et al. 1978, Najera and Zaim 2002). However, like DDT, most pyrethroids exhibit strong excito-repellency action in many mosquito species with physical displacement (avoidance) of treated surfaces a common reaction (Roberts et al. 2000, Chareonviriyaphap et al. 2004). DDT and most pyrethroids act as strong locomotor stimulants in many mosquito species, however the physiological and behavioral mechanism(s) for deterrence has not been determined and may vary for different species and compounds. Excito-repellency (or avoidance), a composite term that has been in common use for decades, is more appropriately defined in terms of an endpoint or multiple endpoints (i.e., movement away from a treated surface or area because of excitatory effects caused by chemical exposure) involving a series of responses to a stimulus and one or more combinations of behavioral mechanisms. It should be noted that terminologies with unintentional anthropomorphic (irritancy) or teleological (avoidance) connotations are synonymous with excitation and repellency, respectively.

When mosquitoes are exposed to an insecticide, two different behavioral responses are recognized, commonly referred to as irritancy and repellency (Rutledge et al 1999,