Journal of the American Mosquito Control Association, 24(4):513–519, 2008

BEHAVIORAL RESPONSES OF CATNIP (*NEPETA CATARIA*) BY TWO SPECIES OF MOSQUITOES, *AEDES AEGYPTI* AND *ANOPHELES HARRISONI*, IN THAILAND

SUPPALUCK POLSOMBOON,[1] JOHN P. GRIECO,[2] NICOLE L. ACHEE,[2] KAMLESH R. CHAUHAN,[3] SOMCHAI TANASINCHAYAKUL,[4] JINRAPA POTHIKASIKORN[5] AND THEERAPHAP CHAREONVIRIYAPHAP[1,6]

ABSTRACT. An investigation of the biological effect of catnip oil (*Nepeta cataria* L.) on the behavioral response of field collected *Aedes aegypti* and *Anopheles harrisoni* was conducted using an automated excito-repellency test system. *Aedes aegypti* showed significantly higher escape rates from the contact chamber at 5% catnip oil compared to other concentrations ($P < 0.05$). With *Anopheles harrisoni*, a high escape response was seen at 2.5% catnip oil from the contact chamber, while in the noncontact chamber a higher escape response was observed at a concentration of 5%. Results showed that this compound exhibits both irritant and repellent actions.

KEY WORDS Behavioral responses, irritancy, repellency, *Aedes aegypti*, *Anopheles harrisoni*, catnip

INTRODUCTION

Many areas of the world are at risk for a wide variety of arthropod-borne diseases with millions cases occurring each year (WHO 2007). A significant growth in human population, demographic movement from rural to more crowded urban areas, and an increase in tourism-based facilities have contributed to an increasing trend in disease transmission. Prevention of these diseases remains almost entirely dependent on various methods of vector control. Control of vectors by insecticides remains the most important means of reducing disease transmission and protection from mosquito bites (Roberts et al. 1997).

Chemicals protect humans from the bite of mosquitoes through 3 different actions: irritation after making contact, repelling prior to contact, or by killing the insects (Grieco et al. 2007). Most research has focused on the toxic function of chemicals, whereas comparatively few studies have concentrated on nontoxic chemical actions. Nontoxic action can be categorized into 2 distinct mechanisms, contact irritancy and noncontact repellency. Irritant responses result from physical contact with chemical-treated surfaces, whereas repellency is an avoidance response devoid of making actual contact with the chemical (Chareonviriyaphap et al. 1997, Roberts et al. 1997). Much of the early research on behavioral responses was concentrated on the synthetic chemicals (Pothikasikorn et al. 2007). In Thailand synthetic compounds, including organophosphates, carbamates, and pyrethroids, have been used with varying degrees of success in national public health vector control programs (Reiter and Gubler 1997). Since 1994 the Ministry of Public Health (MOPH) in Thailand has recommended the use of deltamethrin in public health to control malaria and dengue haemorhagic fever. Recent studies have reported the spread of deltamethrin resistance in several field *Culex quinquefastiatus* Say and *Aedes aegypti* L. populations from Thailand (Somboon et al. 2003). Alternative compounds or new methods of controlling mosquito vectors are needed. One source of alternatives lies in botanical compounds that are commonly used as ''insect repellents.'' These compounds are effective, safe, and increasingly available for domestic use against indoor and outdoor biting mosquitoes and arthropod pests.

One option for preventing the transmission of a vector-borne pathogen to a host is the use of a topical insect repellent. N, N-diethyl-3-methylbenzamide (DEET), that is effective in protecting humans from mosquito bites (Qiu and McCall 1998). Recently several botanical extracts, such as eucalyptus (*Eucalyptus citriodora* Hook), citronella grass (*Cymbogon nardus* Rendle), thyme (*Thymus vulgaris* L.), clove (*Syzygium aromaticum* L.), and catnip (*Nepeta cataria* L.), were tested as alternative topical mosquito repellents (Barnard 1999, Zhu et al. 2006). Among these the essential oil from catnip proved to be a safe and promising insect repellent. This oil contains 2

[1] Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand.
[2] Department of Preventive Medicine and Biometrics, Uniformed Services University of Health Sciences, Bethesda, MD 20814.
[3] Invasive Insect Biocontrol and Behavior Laboratory, Plant Science Institute, USDA-ARS, Beltsville, MD 20705.
[4] Department of Entomology, Faculty of Agriculture, Kasetsart University, Kamphaengsean Campus, Nakhon Pathom 73140, Thailand.
[5] Department of Microbiology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.
[6] To whom correspondence should be addressed.