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LETTER TO THE EDITOR

Response to the letter sent by Dr. Viroj Wiwanitkit entitled "Coffee waste, vector control and dengue"

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The authors are happy to know that since its publication date—May 3, 2017 through June 2017—our paper has been read 135 times (according to Research Gate) by researchers and used as an element of reflection by Dr. Wiwanitkit.

Testing the effects of coffee on insect vectors with respect to its potential use in control strategies is a common practice in Medical Entomology and did not start with our study. A more careful examination of the literature on coffee-mosquito research has shown that many scientists have done so in these last 14 years worldwide. For instance, Laranja and colleagues (Laranja et al. 2003) from the Universidade Estadual Paulista (Brazil) examined the effects of used coffee grounds on the biological features of *Aedes aegypti*. Derraik and Slaney (Derraik and Slaney 2005) from the University of Otago (New Zealand) have tested the toxicity of used coffee grounds against a container-breeding mosquito species. Laranja and colleagues (Laranja et al. 2006) from the Universidade Estadual Paulista (Brazil) assessed whether or not caffeine from coffee promotes an increase in insect resistance over time. Guirado and Bicudo from Instituto de Biociências, Letras e Ciências Exatas (Brazil) performed similar investigations in 2007 (Guirado and Bicudo 2007) and 2010 (Guirado and Bicudo 2010), as did Satho et al. (Satho et al. 2015) from Fukuoka University (Japan) in 2016. Others scientists have tested coffee against agricultural insect pests (Mostakim and Khan 2014).

A common nature of these studies is that they found coffee as a promising alternative to less desirable synthetic insecticides. However, none of these research works has elaborated on coffee application methods or techniques. In addressing the issues of dengue vector control, the World Health Organization has argued for the need to take eggs into account in containment strategies because this development stage is a prerequisite for the production of subsequent generations (Dieng et al. 2006) and can spread the viruses (Thenmozhi et al. 2007; Sarkar 2010).

Rather than simply testing the extracts of coffee and its waste for embryocidal properties, our study also examined whether exposure to coffee could alter the lifespan of a dengue vector. So, it has never been a question of using coffee for operational vector control in our study. Despite encouraging results in these directions, there are still many unknowns such as the (i) insecticidal capacity of different coffee extract concentrations; (ii) variations in coffee insecticidal activity over time; (iii) reproductive capacity of females that escape coffee exposure; (iv) biting activity of such females; (v) sexual competitiveness of males that survived coffee exposure; (vi) relationship between coffee toxicity and oviposition attraction; and (vii) cytotoxicity and genotoxicity evaluations of selected coffee concentrations using animals, among others. Putting the expected results from these remaining studies together, we might be able to recommend or not coffee as a tool for dengue vector control. Particular advice will be given to scientists who want to use coffee in vector control to make sure that the coffee is not contaminated with molds or fungi, as these are common in coffee beans (Christensen 1975; Viegas et al. 2017) and exposure to mycotoxins can cause allergic

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