Physical characteristics and reproductive performance in *Aedes* (Diptera: Culicidae)

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Abstract

Body size is a physical factor of crucial importance underlying important traits of the reproductive dynamics of both sexes in mosquitoes. Most studies on the influence of body size in mating success of dengue vectors addressed sperm transfer to females and did not consider egg production, a prerequisite for population maintenance; male body size impact on reproduction has attracted little research interest with respect to sterile insect technique. In experiments involving differently sized adults, we examined whether the body size of the mates is a source of variation in reproductive outcome in *Aedes aegypti*. In the absence of male partners, large females (LF) showed better fecundity than small females (SF). In intraclass mating trials, egg production was much greater in largesized than smallsized pairs. There were comparable fecundities in large females mated with small males and large pairs. [SF•SM] and [SF•LM] pairs showed equivalent fecundity. Nonmating did not result in the production of viable eggs by either small or large females. We also observed that eggs produced by largesized females mated with small males had better hatching success than those from either small or large pairs. Mating between small females and large males resulted in poor egg viability.

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Introduction

Originating in Africa (Gubler, 2008), *Aedes aegypti* (Linnaeus) (Diptera: Culicidae) is now found in many urbanized areas worldwide (Womack, 1993). This mosquito species is a vector of three important viral diseases-yellow fever, chikungunya, dengue (Morrison *et al*., 2008) and Zika virus (Marcondes & Ximenes, 2016). This latter disease causes more human morbidity and kills more people than any other mosquito-borne diseases globally (Farrar *et al.*, 2007) and the World Health Organisation (WHO) rated dengue as the most important mosquito-borne viral disease in the world (WHO, 2013). No vaccines (Sabchareon *et al.*, 2012) or specific therapeutic agents have yet been made available for dengue, and prevention is currently limited to vector control measures (WHO, 2014). Insecticide use - the main strategy to combat dengue vectors (WHO, 2010) - has been ineffectual due to the development of resistance (Whalon *et al*., 2008). Indeed, *Ae. aegypti* has developed resistance to nearly all insecticide classes (Dia *et al*., 2012).

There are several currently active fields of research to develop effective means of control of dengue vectors, *i.e.*, the sterile insect technique (SIT), incompatible insect technique (IIT), and genetically modified mosquito (GMM) technologies (O'Connor *et al.*, 2012; Bellini *et al.,* 2007). The Food and Agriculture Organization (FAO/IAEA/USDA, 2003) reported that the triumph or failure of these control strategies is directly related to the ability of the released laboratory produced insects to effectively mate with their wild counterparts. For example,