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ORIGINAL ARTICLE

EVALUATION OF SUBLETHAL EFFECTS OF *Ipomoea cairica* LINN. EXTRACT ON LIFE HISTORY TRAITS OF DENGUE VECTORS

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SUMMARY

Plant derived insecticides have considerable potential for mosquito control because these products are safer than conventional insecticides. This study aimed to investigate sublethal activities of *Ipomoea carica* or railway creeper crude acethonilic extract against life history trait of dengue vectors, *Aedes albopictus* and *Aedes aegypti*. The late third instar larvae of *Ae. albopictus* and *Ae. aegypti* were exposed to a sublethal dose at LC_{50} and larvae that survived were further cultured. Overall, *Ipomea cairica* crude extracts affected the whole life history of both *Aedes* species. The study demonstrated significantly lower egg production (fecundity) and eggs hatchability (fertility) in *Ae. albopictus*. The sublethal dose of crude extracts reduced significantly the width of larval head capsule and the wing length of both sexes in both *Aedes* species. The significance of sublethal effects of *I. cairica* against *Aedes* mosquitoes was an additional hallmark to demonstrate further activity of this plant despite its direct toxicity to the larvae. The reduced reproductive capacity as well as morphological and physiological anomalies are some of the effects that make *I. cairica* a potential candidate to be used as a new plant-based insecticide to control dengue vectors.

KEYWORDS: *Aedes*; Control; Mosquito; Plant extract; Sublethal effects.

INTRODUCTION

Dengue fever has become a pandemic threat[1] and a major public health challenge to the health officials and policy makers in nearly all the tropical areas of the world[2]. Frequent outbreaks[3], hospitalisations[4] and the increasing number of people at risk, over 40% of the world's population[1], are reminders of the constant menace of this disease. Efforts to reverse the trend to a higher incidence of mosquito-borne outbreaks have mainly being based on the use of synthetic insecticides, particularly organophosphates and pyrethroids[5]. Dinetro-o-cresol was first used as a synthetic insecticide in 1892, and since then more potential insecticides have been discovered[6]. Although insecticide-based strategies have sometimes been successful[7,8], the monolithic reliance on these two classes of products has led to adverse effects. Their widespread misuse have caused the development of mosquitoes[9] resistance, with the main vector, *Aedes aegypti*, ranking eighth in the list of species with the highest reported number of resistant cases worldwide[10]. The fact that these two classes of insecticides have identical modes of action has generated a cross-resistance problem[11,12]. These problems have hampered the effectiveness of current control measures. Despite the efforts to test other substances, only a few insecticides have become available[13]. These circumstances have stimulated the search for new sustainable control strategies, such as the use of botanical insecticides[14,15].

Plants produce a broad range of bioactive chemical compounds[16]. Several plants have been screened due to their insecticidal properties and crude extracts of many plant species have shown promising mosquitocidal activities[17,18]. Some phytochemical insecticides are even more effective than synthetic ones[19]. *Aedes aegypti* in Thailand was found to be susceptible to the essential oil of the plants *Carum carvi, Curcuma zedoria, Piper longum, Apium graveolens* and *Illicium verum* even though these mosquitos had already shown resistance to the permethrin insecticide[20]. Besides being generally target-specific[21,22], plant-derived insecticides decompose quickly[23], and they are not stored in organisms[24], and in ecosystems[25]. Due to a poor penetrance in ecosystems, large animals are not affected by plant-derived insecticides[26]. They contain no halogen molecules and are bioactive at lower concentrations[27]. Reductions in progeny size and longevity, delayed development and repellency to adults parasitoids[28] as well as the development of resistance due to overuse[29], are characteristics that have been attributed to botanical insecticides. These characteristics have raised some arguments on the need to reduce the amount of botanical insecticides applied[30]. Phototoxic activities, the geographical source of plant, the use of solvents during extraction are factors that could also affect the effectiveness of plant-derived insecticides on mosquitoes[17]. The formulation of spot treatment applications are recommended rather than broadcasting over large areas, as this represents a serious menace for non-target invertebrates

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