



Acute and reproductive toxicity of *Annona squamosa* to *Aedes albopictus*

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ABSTRACT

The current study involved evaluation of the toxicity of acetone soluble fraction of the ethanol extract of *Annona squamosa* Linn. seeds on *Aedes albopictus* (Skuse). Toxicity of fresh sample has been compared with that of solar radiated and heat treated aliquots of the same. Acute toxicity of fresh acetone fraction on adults was evident with LC₅₀ and LC₉₀ values of 15.21 and 60.38 µg/ml, respectively. Larvicidal bioassays recorded LC₅₀ and LC₉₀ values ranging from 0.44 to 5.97 and 1.64–43.36 µg/ml, respectively for different instars. Ovicidal bioassays yielded EC₅₀ and EC₉₀ values of 18.82 and 69.61 µg/ml. The study further revealed ovipositional deterrent and chemosterilant activities of the extract on the target mosquito. Bioassays using solar radiation and heat treated samples of the active fraction have showed toxicity levels similar to those of fresh sample. Chemical analysis of acetone soluble fraction of seed extract of *A. squamosa* has revealed ethyl oleate and iso-octyl phthalate as major components. Adulticidal, larvicidal, ovicidal, ovipositional deterrent and chemosterilant activities of the fraction on *A. albopictus* were proved. The investigation further confirmed stability of the active fraction on exposure to solar radiation and high temperature.

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1. Introduction

The Asian tiger mosquito, *Aedes albopictus* (Skuse) (Diptera: Culicidae) is an important vector of dengue, chikungunya and other viruses and has extended its distribution range throughout the world [1–3]. Although proper sanitation can control the mosquito to an extent, the use of synthetic insecticides is often necessary in control operations [4]. Indiscriminate use of synthetic insecticides for the control of mosquitoes has led to the development of resistance by them [5] and accumulation of harmful chemicals in the environment [6,7]. These factors have necessitated an intensive search for effective, target specific and environmental friendly insecticides against mosquitoes. Man has used plants as insecticides and repellents since time immemorial. Phytochemicals have been proved to have biological activities against mosquitoes [8]. Pyrethrum from *Chrysanthemum cinerariaefolium* (Asteraceae) is one of the best-known natural insecticides and has provided a lead for the synthesis of various pyrethroid derivatives. Following the discovery of this phytotoxin, numerous studies have been conducted concerning the larvicidal properties of plants in general

[9–18]. Compounds derived from plants of the family Annonaceae are known to exhibit toxic effects on wide range of organisms [19–28]. Present study has attempted to explore the toxic effects of acetone soluble fraction of the seed extract of *Annona squamosa* Linn. on *A. albopictus* (Skuse). Investigation on stability of the extract was also performed.

2. Materials and methods

2.1. Preparation of the active fraction

The seeds of *A. squamosa* were collected from the month of September–January (2008–2009), shade dried and powdered in an electrical blender. The dried powder was defatted by extracting in petroleum ether for 48 h. The defatted dried seed powder was then extracted with ethanol (1:2.5 w/v) at 27 ± 2 °C for 48 h. The crude extract was filtered and concentrated on a water bath at 40 °C to get a light brown thick paste (~5 g). The concentrated crude extract was dissolved in acetone to yield a soluble and an insoluble fractions. Acetone soluble fraction (Hereafter called as FE), measuring 150 ml was filtered through a membrane filter (Millipore, 0.45 µm) and concentrated to yield a light brown waxy paste and refrigerated until use. The FE (1.56 g) was dissolved in acetone (156 ml) to prepare a 1% (w/v) stock solution. Different concentrations of test solution ranging from 1 to 100 µg/ml were prepared by adding appropriate amount of stock to tap water.

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