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RESEARCH ARTICLE

Larvicidal effects of the major essential oil of *Pittosporum tobira* against *Aedes aegypti* (L.)

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Abstract

Essential oil obtained from the leaves of *Pittosporum tobira* was extracted and its chemical composition and larvicidal effects were studied. Analyses were conducted by gas chromatography and mass spectroscopy (GC-MS) to determine the primary constituents of the essential oil of *P. tobira*. The yield of *P. tobira* essential oil (PTEO) was 0.1%, and GC-MS analysis identified its major constituents as undecane (31.11%), 4-methyl-1,3-pentadiene (11.34%), (1,3-dimethyl-2-butenyl)benzene (5.45%), and L-limonene (14.08%). The essential oil had a significant toxic effect against early fourth-stage larvae of *Aedes aegypti* (L.), with an LC_{50} value of 58.92 ppm and an LC_{90} value of 111.31 ppm. Finally, the LC_{50} and LC_{90} values of L-limonene were 39.7 ppm and 78.11 ppm. These results could be useful for seeking newer, safer, and more effective natural larvicidal agents against *A. aegypti*.

Keywords: Aedes aegypti*; essential oils; larvicidal effects;* Pittosporum tobira*; l-limonene*

Introduction

Synthetic insecticides have created a number of ecological problems, such as the development of resistant insect strains, ecological imbalance, and harm to mammals. Natural products are generally preferred because of their less harmful nature to nontarget organisms and due to their innate biodegradability[1]. The mosquito *Aedes aegypti* is the important vector of dengue fever and dengue hemorrhagic fever in many parts of the world. In the absence of effective vaccine and drugs, dengue prevention and control programs have depended on vector control. Management of this disease vector using synthetic organic chemical insecticides has failed because of insecticide resistance developed by the *Aedes* mosquitoes[2]. In the search for environmentally safe and relatively inexpensive methods for controlling mosquitoes, plant extracts have received much interest as potential bioactive agents against mosquito larvae. Most of the mosquito control programs target the larval stage in their breeding sites with larvicides[3], because the adulticides may only reduce the adult population temporarily[4]. Therefore, a more efficient way to reduce the mosquito population is to target the larvae.

Pittosporum tobira (Pittosporaceae) is a small, slender, evergreen tree that grows on the southwestern Pacific coast of Jeiju Island. The seeds undergo a gradual change in color from green to red in late autumn to winter[5]. Nickavar *et al.* reported the volatile components of the flower and fruit oils from *P. tobira* grown in Iran, obtained through hydrodistillation and analyzed by gas chromatography-mass spectroscopy (GC-MS)[6]. Rodrigues Frederico *et al.* reported the volatile components of the leaf, flower, and fruit volatile oils of *P. tobira* grown in three locations in Portugal[7]. The essential oil from *P. tobira* (leaves) shows that target sites other than those used by antibiotics will be active against multidrug-resistant microbial pathogens. However, very little information is available on such activity of aromatic herbs[8]. Maoka *et al.* reported the isolation and structural elucidation of novel carotenoids from the seeds of *P. tobira* grown in Japan[9,10]. Fujiwara *et al.* reported the isolation and structural elucidation of new carotenoids from the seeds of *P. tobira*[11–13].

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