UNIVERSITI TEKNOLOGI MARA

ENCAPSULATED CITRONELLA OIL AS MOSQUITOES REPELLENT AGENT IN WATER BASED PAINT

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ABSTRACT

Mosquito has been recognized as vectors for a number of infectious diseases but current control measures are less efficient and chemical mosquito repellent harmful to human and environment. Other alternative which is natural repellent is very volatile and release rapidly. Thus the study aim to produce a Citronella oil (CiO) paint as mosquito repellent tools that give long time protection and safe to health and environment. To provide control release, CiO was encapsulated via coacervation method by using arabic gum and gelatin as wall materials. Performance of the CiO paint was indicated by its mosquito repellency properties and standard paint characteristics which are paint VOCs content, adhesion and viscosity. Mosquito repellency performance was measured by release kinetic study and repellency test against *Aedes aegypti*. Both encapsulation methods have provided good encapsulation efficiency around 94%. Capsules from complex coacervation have lower release kinetic compared to simple coacervation. The complex coacervation's capsules also more suitable to be added in water based paint because the capsule's wall able to sustain in wet and the capsule's wall start ruptured in dried conditions. Water based paint was prepared for the study because emission of chemical VOCs from the commercial paint was considered can decrease the concentration of citronella compounds in air and addition of CiO has increase the paint's viscosity gradually. CiO was added in water based paint at 0 to 5 %v/v and 3.5 % CiO paint has function as mosquito repellent. However, release kinetic study found that citronella released from the paint in just 4 days and give too strong odor. While 12% Encapsulated CiO (ECiO) paint has lower release kinetic and able to provide protection for 1 year and 236 days. With the calculated dosage, the ECiO paint able to give 100% repellency to A. *aegypti*.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND STUDY

Mosquitoes have been recognized as vectors for a number of infectious diseases such as Japanese Encephalitis, chikungunya, malaria, dengue fever and filariasis. According to World Health Organisation (WHO), more than 40% of the people around the world are now at risk of mosquito borne-diseases especially dengue [1]. In fact, recent report by New Straits Times, Malaysia recorded 9,453 cases and 17 deaths because of dengue within a first month of 2014 [2]. Furthermore, presences of the mosquitoes are extremely annoying with painful and itchy bites.

The mosquitoes are relatively fragile insects with adult life span last about 7 to 14 days. They get nutrients in their diets from nectar of flowers and plants. Blood is crucial for the development of mosquito eggs which is only female mosquitoes are sucking blood. By using highly sensitive sensory hairs along their antenna, mosquitoes are able to detect many changes in their environment including to seek the blood. They are more attractive to sweat people and dark appearances. The mosquitoes are called 'year bridge vectors' because they suck blood from both birds and other mammals, incluing humans [3]. Current research in the development of mosquito repellents are focusing in the disruption of the mosquito receptors that able to inhibit the attractiveness of the mosquitoes to human [4].

Many methods were introduced to prevent and reduce mosquito-borne disease from people surrounding. Current control measures have focusing only on the small group of mosquitoes by using chemical solutions, lotion, fumigation, coils, mats, oil spray, aerosol, and gel. However, many of these products contain N,N-diethyl-m-toluamide (DEET) which causes insomnia, impaired cognitive function, central nervous system symptoms, and allergic reaction. Outdoor foggers will keep the mosquitoes away for several hours, but once the chemical dissipates, they may return to the area. Pesticides are only a short-term solution to nuisance mosquito problems [5][6]. Another alternative of mosquito control is by using natural resources which is natural insect repellent. It was introduced over 50 years ago [7].