



***LARVICIDAL ACTIVITY OF LEMON OIL AND LEMON CRUDE EXTRACT
AGAINST SPODOPTERA LITURA***

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**A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in
fulfilment of the requirement PRT4999 for the award of the degree of Bachelor of
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CERTIFICATION

This project entitled ‘Larvicidal activity of lemon oil and lemon crude extract against *Spodoptera litura*’ was prepared by Naufal Fahmi bin Rahim and submitted to the Faculty of Agriculture in fulfilment of the requirement of PRT4999 A / 4999 B for the award of the degree of Bachelor of Agriculture Science.

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ABSTRACT

Plant essential oil play important role as one of the biopesticide in controlling insect pest. Lemon oil extract have the potential to be used as biopesticide to against insect pest of cruciferous crop. Larvae of *Spodoptera litura* are known to cause enormous losses to many important cultivated crops. Thus the objective of this study is to evaluate the larvicidal activity of lemon extract against *S. litura*. Experiment was conducted at Toxicology laboratory, Department of Plant Protection Faculty of Agriculture, UPM Serdang. Larvicidal activity of *S.litura* larvae was determined using leaf dipping method and feeding deterrence index. The larvae mortality, leaf area and dry weight of feaces were recorded at 24, 48, 72 and 96 hours after treatment. The treatment concentration for both lemon crude extract (LCE) and lemon oil extract (LOE) were 0.01%, 0.05%, 0.1%, 1%, 2%, Spinosad as the positive control and negative control was distilled water. The mortality data was subjected to Probit Analysis to determine the toxicity level by the LC₅₀ value. Results showed that LC₅₀ value at 96 hours exposure was 237.958 ml/L for lemon crude extract and lemon oil extract was 496.412 ml/L. The antifeedant showed the rate increases when the concentration and exposure time increased. All concentration gave 100% antifeedant rate at 96 hours. The lowest antifeedant was 1.87% at 0.01% LOE at 24 hours. LCE and LOE showed positive result for controlling *S.litura* as well as environmental friendly.

ABSTRAK

Minyak pati tumbuhan memainkan peranan penting sebagai salah satu daripada racun serangga bio dalam mengawal serangga perosak. Ekstrak minyak pati lemon mempunyai potensi untuk digunakan sebagai racun serangga bio terhadap serangga perosak tanaman berdaun. Larva *Spodoptera litura* diketahui menyebabkan kerugian yang besar kepada banyak tanaman yang ditanam. Oleh itu, objektif kajian ini adalah untuk menilai ketoksikan pati minyak lemon terhadap *S. litura*. Eksperimen dijalankan di Makmal Toksikologi, Jabatan Perlindungan Tumbuhan, Fakulti Pertanian, UPM Serdang. Kematian larva *S.litura* ditentukan dengan menggunakan kaedah celupan daun dan indeks pencegahan makan. Kematian larva, kawasan daun dan berat kering najis direkodkan pada 24, 48, 72 dan 96 jam selepas rawatan. Kepekatan rawatan bagi ekstrak mentah lemon (LCE) dan ekstrak minyak lemon (LOE) adalah 0.01%, 0.05%, 0.1%, 1%, 2%, Spinosad sebagai kawalan positif dan kawalan negatif adalah air sulingan. Data kematian tertakluk kepada Analisis Probit untuk menentukan tahap ketoksikan nilai LC_{50} . Keputusan menunjukkan bahawa nilai LC_{50} pada pendedahan 96 jam adalah 237.958 ml / L untuk LCE dan LOE ialah 496.412 ml / L. “Antifeedant” menunjukkan kadar kenaikan apabila kepekatan dan masa pendedahan meningkat. Semua kepekatan memberikan kadar “antifeedant” 100% pada 96 jam. “Antifeedant” terendah adalah 1.87% pada LOE 0.01% pada 24 jam. LCE dan LOE menunjukkan hasil positif untuk mengawal *S.litura* serta mesra alam sekitar.

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CHAPTER 1

INTRODUCTION

Plant essential oils in general play important role as natural sources of pesticide in controlling the insect pest (Tripathi et al., 2009). In nature, essential oil has been recognized for protection of the plant as antibacterial, antivirals, antifungals, insecticides and also herbivore for reducing their appetite. According to Mohd Shukri et al., (2011), evaluation of oil extracts from a few plant species show biopesticidal properties against larvae. Dubey (2010) state that recent research have demonstrated such compounds showing larvicidal and antifeedant activity (Gbolade, 2001; Larocque et al.,1999), capacity to delay development, adult emergence and fertility (Marimuth et al., 1997), deterrent effects on oviposition (Oyedele et al., 2000), and arrestant and repellent action (Landolt et al., 1999). Despite these most promising properties, problems related to their volatility, poor water solubility and aptitude for oxidation have to be resolved before they are used as an alternative pest for control (Moretti et al., 2002).

Lemon is also one of the essential oils for protection of plant from insect, (González-Molina et al., 2010). In recent years, oil in many citrus fruits containing limonene, linalool or crude oil extract has been recognized for insecticidal properties (Ibrahim et al., 2001). Limonene was evaluated for insecticidal, antifeedant and oviposition deterrent effects to insect pest (Kiran et al., 2006). Fan et al, (1983) reported limonene has insecticidal activity against second instar larvae of *Spodoptera litura*.

Insect pest has a huge impact on the economic and agronomical value of crops through crop damage and high cost of pest control. *Spodoptera litura* has become a huge threat to the commercial vegetable production. The insect attacks many plant species and many types of

vegetable crop (Khoo et al., 1991). *Spodoptera litura* is a polyphagous insect. Enormous losses have been caused by the larvae to many important cultivated crops which include 112 species of plants from 44 families such as cotton, soybean, groundnut, tobacco and vegetables (Qin et al., 2004).

Chemical insecticide have been used widely to overcome the pest problem and indiscriminately, making in a number of problem to arise, the development of insect resistance to insecticide. Knowing this problem, there are urgent needs to look for alternatives that are environmentally safe, ecologically sound and socially acceptable. Because of this, botanicals have been considered to provide eco-friendly alternatives (Dodia et al., 2008). Essential oil is also one of the natural sources of pesticide based on the botanical or known as biopesticide, (Tripathi et al, 2009).

1.1 Objective

The aim of this experiment was to evaluate the larvicidal activity of lemon oil extract and lemon crude extract against *Spodoptera litura*.

CHAPTER 6

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