



UNIVERSITI PUTRA MALAYSIA

**TOXICITY OF NANOEMULSION FORMULATIONS OF NEEM OIL
AGAINST *Spodoptera litura* (F.)**

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The logo of Universiti Putra Malaysia (UPM) is a shield-shaped emblem. It features a red and white color scheme. At the top left, the letters 'UPM' are written in white on a red background. In the center, there is a stylized white book with red pages. Below the book, there are several vertical white lines of varying heights. The shield is set against a light gray background.

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**TOXICITY OF NANOEMULSION FORMULATION OF NEEM OIL
AGAINST *Spodoptera litura* (F.)**

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A project report submitted to the Faculty of Agriculture,

Universiti Putra Malaysia,

in fulfillment of the requirements of PRT 4999 (Final Year Project)

for the award of the degree of Bachelor of Agriculture Science.

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LIST OF ABBREVIATION

<i>S.litura</i>	<i>Spodoptera litura</i>
mm	Millimeter
km	Kilometer
cm ²	Centimeter square for area
ppm	Part per million
LC ₅₀	Lethal concentration that give 50% mortality
ANOVA	Analysis of variance

ABSTRACT

Spodoptera litura (Lepidoptera :Noctuidae) commonly known as armyworm, is one of the most important insect pests of agricultural crops in the Asian tropics. This noctuid is widely distributed throughout tropical and temperate Asia, Australia and the Pacific Islands. Their larvae are polyphagous defoliators as well as may damage tubers and roots. The extensive damage on crops has given tremendous economic impact on agricultural industry and reduces farmer's income. Insecticides application is a popular method to solve this problem. Neem oil is one of the environmental-friendly insecticides. Thus, this research was conducted to investigate the effect of formulated neem extracts on mortality of *S.litura* and to determine the feeding consumption of *S.litura* after being treated with neem formulations. The leaf dipping method was used with minimum of five treatments including control. Each treatment was replicated five times and a minimum of five third instar larvae were used for each treatment. Mortality of larva was recorded at 24, 48 and 72 hour after treatment (HAT) and the data were subjected to ANOVA by using SARS program. The LC₅₀ value was obtained by probit analysis. For determination of antifeedant activity of larvae, it was recorded at 24 HAT and the data were subjected to ANOVA by using SARS program. Nanoemulsion formulation 2 was the best formulation because it caused high mortality of third instar larvae of *S.litura* at all treatments. It also has high antifeedant activity towards *S.litura* compared to other formulations.

ABSTRAK

Spodoptera litura (Lepidopteran:Noctuidae) biasanya dikenali dengan ulat ratus merupakan salah satu serangga perosak yang paling penting dalam tanaman pertanian di kawasan asia tropika. Serangga ini tersebar meluas keseluruh kawasan asia tropik, negara bersuhu sederhana, Australia dan Pulau Pasifik. Larva-larvanya bukan sahaja pemakan daun tetapi mungkin juga memusnahkan batang dan akar tumbuhan. Kerosakan teruk terhadap tanaman telah memberi kesan ekonomi yang besar kepada industri pertanian. Oleh itu, secara tidak langsung ia akan mengurangkan pendapatan petani. Pengaplikasian racun serangga adalah salah satu langkah yang terkenal untuk menyelesaikan masalah ini. Minyak semambu tidak memberikan kesan buruk kepada persekitaran. Oleh itu, kajian ini dilaksanakan untuk mengkaji kesan formulasi ekstrak semambu terhadap kadar kematian serangga *S.litura* dan untuk menentukan pengambilan pemakanan *S.litura* selepas dirawat dengan formulasi semambu. Kaedah celup daun telah digunakan dengan lima rawatan termasuk kawalan. Setiap rawatan di replikasi lima kali dan 5 ekor larva pada instar ketiga telah digunakan untuk setiap rawatan. Kadar kematian larva telah dicatat pada 24, 48 dan 72 jam selepas rawatan and data tersebut akan digunakan dalam analisis ANOVA menggunakan program SARS. Penentuan nilai LC₅₀ dilakukan dengan menggunakan analisis probit. Bagi penentuan aktiviti penghalang makan, data dicatat 24 jam selepas rawatan dan data tersebut akan digunakan dalam ANOVA menggunakan program SARS. Formulasi nano 2 adalah formulasi yang paling baik kerana ia menyebabkan kematian yang tinggi kepada larva instar ketiga *S.litura* pada semua rawatan. Ia juga mempunyai aktiviti penghalang makan yang tinggi terhadap *S.litura* berbanding formulasi lain.

CHAPTER 1

INTRODUCTION

Spodoptera litura (F.) commonly known as the tobacco caterpillar is generalist herbivore infesting more than 290 species of plants both under nursery and field conditions. Their larvae are polyphagous defoliators may also damage tubers and roots. In the nursery the young larvae of *S. litura* feed gregariously on leaves in the early stage and first instar larvae scrap the epidermal layer causing papery leaves. The third and fourth instar larvae are particularly voracious feeders which are migrate to other seedlings as they grow in size and become solitary. In case of serious infestation, larvae completely destroy the seedlings and leaves and causing death to the plant.

The life cycle of of *S. litura* has four distinct life stages; egg, larva, pupa and adult. It takes about twenty five days to complete one cycle and a few generations can occur during the cropping period causing damage to the crop, which may results in economic losses to the farmer. So, to avoid this problem becomes more critical, many actions need to be taken by using variety of method such as chemical, biological and host plant resistance.

A popular way to control insect pest is by using synthetic insecticides. Synthetic insecticides are widely used in most developing countries to control insect pest on food crops. However, synthetic insecticides have negative impact on the crops and natural environment (Van,2000). The massive quantity of the useful of synthetic insecticides over the last few decades has develop critical environmental

and health problems. (Ahmed *et al*, 1983; Georgiou and Taylor, 1977; Pimental, 1977).

Therefore, many researchers nowadays are focusing on another alternative to develop environmental friendly pesticides formulation from plant species that possess insecticidal properties which is called botanical insecticides. (Schmutterer, 1990; Del bene, *at al.*, 2000) . According to Vijay Kumar (1987), about 16% from 800 plant extracts have been found to have insecticidal activity. Besides, the use of plant pesticides has been recommended as a very suitable alternative of plant protection with minimum negative risks (Isman, 2006; Pavela, 2007) and they are widely used for the control of insect pests (Curzio *et al.*, 2009; Abdullah *et al.*, 2011).

The use of extract of *Azadirachta indica*, neem oil was suggested as pest control. Swaminathan (1983) claims that neem has the potential to control pest and this was supported by Jacobson (1986) with proven the details of its insecticidal activity. Besides, nowadays the potential benefit of nanotechnology application was important and using of nanoemulsion formulation is proven very effective in controlling insects and pest. Therefore, the present study was carried out with the view of investigating the efficacy of nanoemulsion formulation of neem oil on mortality and antifeedant activity of *Spodoptera litura*.

OBJECTIVE

The objectives in this research were to determine the effect of nano emulsion formulations of neem oil on mortality of *Spodoptera litura* and to determine the antifeedant activity of nanoemulsion formulation of neem oil against *Spodoptera litura*.



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