

UNDERGRADUATE THESIS

**EVALUATION OF INSECTICIDE AND NANOINSECTICIDE
EFFICACY AGAINST MEALWORM (*Tenebrio molitor*) AND
SUPERWORM (*Zophobas morio*) IN VITRO**



**M. Akbar Satriawan
05081182025018**

**PLANT PROTECTION STUDY PROGRAM
DEPARTMENT OF PESTS AND PLANT DISEASES
FACULTY OF AGRICULTURE
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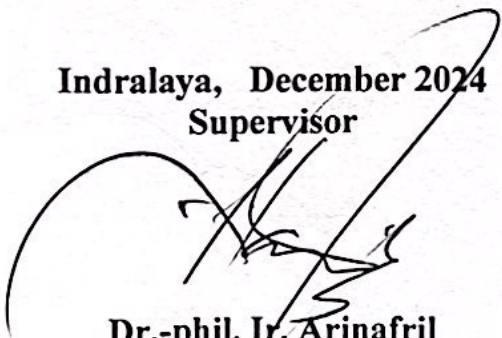
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UNDERGRADUATE THESIS

As One of The Requirements To Get A Bachelor's Degree In Agriculture At The
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Prepared by
M. Akbar Satriawan
05081182025018

Indralaya, December 2024
Supervisor


Dr.-phil. Ir. Arinafril
NIP. 196504061990031003

Approved by,
Dean of Faculty of Agriculture
Sriwijaya University



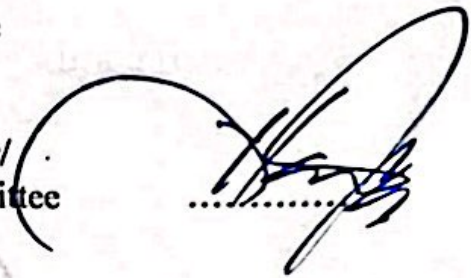
Prof. Dr. Ir. Ahmad Muslim. M, Agr.
NIP. 196412291990011001

Undergraduate Thesis with the title "Evaluation of Insecticide and Nanoinsecticide Efficacy Against Mealworm (*Tenebrio molitor*) and Superworm (*Zophobas morio*) in Vitro" by M. Akbar Satriawan has been defended before the Thesis Examination Committee of the Faculty of Agriculture, Sriwijaya University on December 06, 2024 and has been revised according to the suggestions and input of the examiners.

Examination Committee

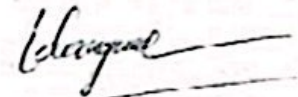
1. Dr. -phil. Ir. Arinafril
NIP 196504061990031003

First Supervisor/
Head of the Committee



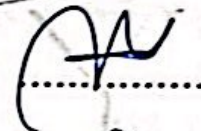
2. Assoc. Prof. Dr. Lê Đăng
Quang

Second Supervisor



3. Arsi, S. P., M. Si.
NIP 1985101172015105101

Secretary of the
Committee



4. Weri Herlin S.P, M.Si, Ph.D.
NIP 198312192012122004

Head of Examiner

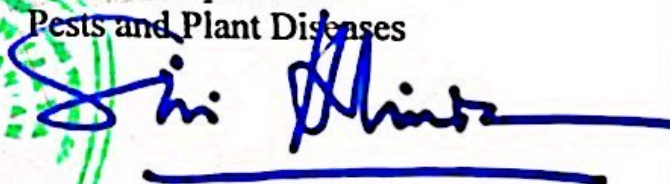


5. Prof. Morio Tsukada

Examiner Member



Indralaya, December 2024
Head of Department
Pests and Plant Diseases



Prof. Dr. Ir. Siti Herlinda, M.Si.
NIP 196510201992032001

INTEGRITY STATEMENT

The undersigned hereby:

Name : M. Akbar Satriawan

NIM : 05081182025018

Title : Evaluation of Insecticide and Nanoinsecticide Efficacy Againsts Mealworm (*Tenebrio molitor*) and Superworm (*Zophobas morio*) in Vitro

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M. Akbar Satriawan
05081182025018

UNDERGRADUATE THESIS

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M. Akbar Satriawan
05081182025018

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2024**

SUMMARY

M. AKBAR SATRIAWAN, Evaluation of Insecticide and Nanoinsecticide Efficacy Against Mealworm (*Tenebrio molitor*) and Superworm (*Zophobas morio*) in Vitro (Supervised by **ARINAFRIL**).

The increase in global population has also increased the need for food. The fulfillment of food needs certainly cannot be separated from the agricultural sector. Unfortunately, in recent years, the increase in population growth in Indonesia has not been in line with the increase in agricultural production. Pest attacks are a big problem that will have an impact on the fulfillment of food needs. The attack of a pest species cannot be underestimated and left alone, but needs to be controlled. The most common control currently carried out in controlling pest attacks is chemically using synthetic insecticides. Chemical control using synthetic insecticides is favored by farmers because synthetic insecticides are considered effective in controlling pests. Another factor that supports chemical insecticides to be favored by the public is the relatively low cost when compared to other controls, especially if they have to be applied to a large area. nanoformulations increase the efficiency of insecticide work. Increased efficiency in nanoformulations will reduce the amount that must be used so that it can reduce costs in control. Nanoformulation allows active ingredients to be released under controlled circumstances, even in unfavorable environments.

This research was conducted at the Center for Development and Application of Environmental Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam. The implementation time of this research began in November 2023 and ended in January 2024. This research was conducted by observing the number of deaths of *Tenebrio molitor* and *Zophobas morio* test insects in vitro. The data that has been obtained then the data is presented in a structured form and analyzed using the SPSS Statistics data processing program. Mortality data that has been obtained after the application of active compounds, abamectin and emamectin in tabulated form. The data was then processed using microsoft excel and spss statistics.

Based on the data obtained, the mortality percentage of the active compound emamectin is much higher than the active compound abamectin, even at each dose. This can occur because nano insecticides have a smaller particle size when compared to regular insecticides. The smaller particle size allows deeper penetration into the insect cuticle. This can certainly increase the efficacy of nano insecticides. Based on tables 1 and 2, abamectin in the first observation or 12 hours there is no value of LD₅₀. This is because in the first observation, there was no mortality. then in table 3 it decreased by 30.12mg, and in table 4 it decreased by 88.44mg. The decreasing LD₅₀ value indicates that to kill 50% of the population faster, the more insecticides are needed. It can also be seen from table 5, table 6, table 7, and table 8 that the LT₅₀ values of the 20mg dose, 40mg dose, 60mg dose, and 80mg dose have decreased. This decreasing LT₅₀ value provides information that the higher the dose used, the faster the time used to kill 50% of the test insect population, and vice versa, namely the lower the dose used, the longer the time used to kill 50% of the test insect population.

LIFE HISTORY

The author was born on December 19, 2002 in Palembang, which is the 5th child of 5 siblings. The author started his education at Fatimah 6 Kindergarten, then continued to SD Negeri 32 Talang Kelapa, then SMP Negeri 51 Palembang, and continued to study at SMA Negeri 21 Palembang. The author was accepted as a student of the Plant Protection Study Program, Faculty of Agriculture, Sriwijaya University in 2020 through the SNMPTN route.

The author is a member of the Plant Protection Student Association (HIMAPRO) 2021 and is an expert staff of Media and Information for the 2022/2023 period. The author is also a Daily Executive Board in the Faculty of Agriculture Student Executive Board (BEM FP) for the 2022/2023 period in the field of Media and Information and the 2023/2024 period in the field of Advocacy and Student Welfare. The author became one of the enforcement cabinets of the IAAS LC UNSRI organization and became the head of HRD in the organization. During college, the author achieved several achievements such as, 3rd place in the Pantun Reply Competition in the framework of the Anniversary of the Faculty of Agriculture, 3rd runner-up in the Indonesian Student Debate Competition at the Faculty of Agriculture level, 1st place in the National Photography Competition at the Plant Protection Day event held at Padjajaran University, Favorite Champion in the National Photography Competition at the Plant Protection Day event held by Padjajaran University, 2nd place in the National Photography Competition at the Plant Protector Festival held at Hasanudin University, 3rd place in the National Photography Competition at the Plant Protection Competition held at Lampung University, and 2nd place in the National Photography Competition at the Haryono Semangun Award held at Gadjah Mada University. During his studies, the author actively participated in seminars, such as the In Country Seminar held by Cargill in 2022 and also an international seminar, the Global Leadership Seminar in 2023 held by Cargill. The author was also a scholarship recipient of The Cargill Global Scholars Program (CGSP) Cohort 10.

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CHAPTER 1

INTRODUCTION

1.1 Background

The increase in global population has also increased the need for food (Pudjiastuti et al., 2021). The fulfillment of food needs certainly cannot be separated from the agricultural sector. The agricultural sector is the sector that provides supplies to meet the need for food. Population growth is expected to continue to increase every year. This means that the amount of food production must also increase. If this cannot be realized, more and more of the world's people will be in hunger. Unfortunately, in recent years, the increase in population growth in Indonesia has not been in line with the increase in agricultural production.

Increasing crop production does not always go well. One of the problems that is often encountered in efforts to increase crop production is pest attacks (Ifgangani et al., 2019). Pest attacks are a big problem that will have an impact on the fulfillment of food needs. The attack of a pest species cannot be underestimated and left alone, but needs to be controlled. The most common control currently carried out in controlling pest attacks is chemically using synthetic insecticides (Effendy et al., 2020). Chemical control is the most favored way by the community, especially farmers to suppress the growth and development of a pest, not without a reason. According to Suryani et al (2020) chemical control using synthetic insecticides is favored by farmers because synthetic insecticides are considered effective in controlling pests.

Chemical control of insect pests has become the most common way to do it (Ismindarto et al., 2014). This happens because chemical control of insect pests using chemical insecticides has many advantages. According to Rani et al (2020) chemical insecticides have high effectiveness in controlling pests. This certainly helps in increasing crop productivity and the quality of food produced. In cases of very heavy pest infestation and in large areas, chemical insecticides can show quick and instant results (Enserink et al., 2013). Some of the active ingredients that have been widely used by the community are abamectin and emamectin. So that chemical insecticides

can solve the problem practically at the urgent time. Another factor that supports chemical insecticides to be favored by the public is the relatively low cost when compared to other controls, especially if they have to be applied to a large area (Situmorang et al., 2021).

At present, with the development and advancement of technology, environmentally friendly and more effective types of insecticides have been developed by various methods, one of which is nano insecticide. According to (Zhao et al., 2017) nanoformulations increase the efficiency of insecticide work. Increased efficiency in nanoformulations will reduce the amount that must be used so that it can reduce costs in control (Oliviera et al., 2014). Reducing the amount needed will also reduce the resulting environmental impact (Yan et al., 2020). Unfortunately, research on nano insecticides is still rare in Indonesia. According to Arianingsih (2016) Nano technology is growing rapidly in developed countries such as the United States, Australia, and the United Kingdom, even nano technology is also developing in other Southeast Asian countries such as Malaysia, Thailand, and Vietnam. Nanoformulation allows active ingredients to be released under controlled circumstances, even in unfavorable environments (Kumar et al., 2019). Reduced impact on non-target species can also be designed in, so that nanoinsecticides will have less effect on beneficial insects such as pollinators and natural enemies (Papanikolaou et al., 2018). With so many advantages that can be provided by the use of nano formulations, as well as the lack of information and research on nano insecticides in Indonesia, this research was conducted.

1.2 Problems

The problem formulations proposed in this study are as follows:

- 1) Which type of insecticide has the best results and at what dose.
- 2) At what dose is the lethal dose-50 of each type of insecticide.
- 3) At what dose is the lethal time-50 of each type of insecticide.

1.3 Objectives

The objectives of this research are as follows:

- 1) Knowing the type of insecticide that has the best results and at what dose
- 2) Knowing at what dose is the lethal dose-50 of each type of insecticide
- 3) Knowing at what dose is the lethal time-50 of each type of insecticide

1.4 Hypothesis

The hypotheses proposed in this study are as follows:

- 1) Emamectin 80mg dose is the type of insecticide with the best results.
- 2) Lethal dose-50 abamectin was achieved by administering at a dose of 80mg and Lethal dose-50 emamectin was achieved by administering at a dose of 40mg.
- 3) Lethal time-50 abamectin occurred within 48 hours and Lethal time-50 emamectin occurred within 24 hours

1.5 Benefits

The benefits of this research are to add information and increase knowledge about insecticides and nano insecticides along with toxicology tests of lethal dose-50 and lethal time-50.

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