

UNDERGRADUATE THESIS

**EFFECTS OF EUCALYPTUS PLANT (*Melaleuca cajuputi*)
BOTANICAL INSECTICIDE APPLICATION OF
ARTHROPODS DIVERSITY ON BOTTLE GOURD PLANT
(*Lagenaria siceraria*) IN THAI NGUYEN, VIETNAM.**



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DEPARTMENT OF PESTS AND PLANT DISEASES
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SUMMARY

LUSI RAHMAWATI. Effects Of Eucalyptus Plant (*Melaleuca cajuputi*) Botanical Insecticide Application of Arthropods Diversity On Bottle Gourd Plant (*Lagenaria siceraria*) In Thai Nguyen, Vietnam (Supervised by **ARINAFRIL** and **ARSI**).

Indonesia is a country with a high diversity of biological resources that is often referred to as a country with megabiodiversity. This encourages public awareness of the need to make efforts to use natural resources in a sustainable manner, and equitable benefit sharing. Eucalyptus plant tree is one of the swamp plants that has potential as a Bio insecticide, because its high toxicity can kill several insect pests with a mortality rate of 65-90%. Control using eucalyptus plant plants (*Melaleuca cajuputi*) can be an alternative solution to control pests is to use Bio insecticides such as eucalyptus plant plant leaves. The objectives of this study is to assess the effects of botanical insecticide from eucalyptus plant (*M. cajuputi*) on the diversity of arthropods inhabiting bottle gourd plants (*L. siceraria*) in Thai Nguyen, Vietnam. This study uses 3 treatments and 3 replicates. The treatments used in this study are as follows water as control, 25% *M.cajuputi* Botanical insecticide, 0.02% *Emmamectin benzoate*. The observation results showed that the number of insects counted and identified amounted to 524 individuals. The most numerous insects found came from the order Formicidae, which was 209 individuals. The next largest number comes from the Order Braconidae, which is 201 individuals, Chrysomelidae 25 individuals, Coccinelidae 21 individuals, Pentatomidae 22 individuals, Lymantriidae 11 individuals. Coreidae 9 individuals. Crambidae 6 individuals. Muscidae 5 individuals, Halictidae 3 individuals, Tephritidae 2 individuals, Arctiidae 1 individual, Alydidae 1 individual, Dolichopodidae 1 individual, Corinnidae 1 individual.

The highest Arthropod dominance at (0-T2) 0.8 showed there are types that dominate. The highest richness index value at (0-T2) 2.7 showed the richness of arthropod species is low. The Highest Arthropod Evenness Index Calculation Results at (3-T1) 0.9 showed the evenness is close to high. The highest Diversity Arthropod at (0-T2) 2 showed there are medium diversity.

Keywords: Highest, Species, Treatments, Botanical Pesticide.

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As One Of The Requirements To Get A Bachelor's Degree In Agriculture At The
Faculty of Agriculture, Universitas Sriwijaya



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LIFE HISTORY

The author full name is Lusi Rahmawati. The author was born in Air Sugihan, on February 19, 2003. The author was born to Sugandi M.Z A.Md and Yuniartiningsih S.Pd and is the youngest of three children, Dewi Ratna Febriana S.Pd and Rizal Ramli S.kom.

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FOREWORD

Alhamdulillahirobbil'alamin. There is nothing more appropriate than to thank Allah SWT who has poured out His grace and guidance so that the author can complete this undergraduate thesis "Effects Of Eucalyptus Plant (*Melaleuca cajuputi*) Botanical Insecticide Application Of Arthropods Diversity On Bottle Gourd Plant (*Lagenaria siceraria*) In Thai Nguyen, Vietnam" This thesis was prepared to fulfill one of the requirements to obtain a Bachelor of Agriculture degree in the Department of Plant Pests and Diseases at Sriwijaya University.

The author realizes that as a human being, the author is not free from mistakes and limitations. This fact makes the author realize that without the help of various parties, this field practice would not have been completed. So on this occasion, sincere gratitude will be conveyed to Dr.-phil. Ir. Arinafril as the main supervisor for his attention, direction, insight in guiding, motivating the author to complete the research. Sincere thanks to Advanced Education Program (AEP) of Thai Nguyen University of Agriculture and Forestry (TUAF), Vietnam for providing facilities to conduct this study. The author would thanks to Dr. Đào Thị Thanh Huyền and Dr. Bùi Lan Anh who has helped and support the author in many ways from the implementation until finished research processes.

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Palembang, December 2024

Lusi Rahmawati

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CHAPTER 1

INTRODUCTION

1.1 Background

Indonesia is a country with a high diversity of biological resources that is often referred to as a country with megabiodiversity. This encourages public awareness of the need to make efforts to use natural resources in a sustainable manner, and equitable benefit sharing (Normasari, 2012). Indonesia is a major producer of eucalyptus oil, but the largest oil production is found in the Maluku Islands (Buru Island, Seram Island and Ambon Island) (Kartiko *et al.*, 2021). Eucalyptus plant tree is one of the swamp plants that has potential as a Bio insecticide, because its high toxicity can kill several insect pests with a mortality rate of 65-90%. Control using Eucalyptus plant (*Melaleuca cajuputi*) can be an alternative solution to control pests is to use Bio insecticides such as eucalyptus plant leaves. Eucalyptus plant have alkaloid compounds, polyphenols, quinones, flavonoids, saponins and essential oils (Taopik *et al.*, 2022). The type of eucalyptus plant is effective in controlling cabbage crop pests with 90.67% mortality. The high mortality caused by eucalyptus essential oil can be due to compounds contained in eucalyptus oil that can cause mortality, neurophysiological disorders and changes in locomotor behavior (Syaf *et al.*, 2024)

Arthropods are derived from the Greek words arthro meaning “segment” and podos meaning “leg”. So, arthropods means animals with legs. Organisms belonging to the phylum arthropods have legs with knuckles. This animal has a number of species that are currently known to be around 900,000 species (Setiawan & Fujianor, 2019). The body shape of arthropods is bilateral symmetry and has a chitinous exoskeleton that sloughs off and is periodically renewed. Arthropods have an open circulatory system with tubular blood vessels located on the dorsal side of the digestive tract with lateral holes in the abdominal region. For the excretory system, it is in the form of malphigi vessels where excreted materials are removed from the body through the anus. The nervous system consists of the anterior ganglion or brain, a pair of connecting and interconnecting ganglionized nerves (Safrida *et al.*, 2013).

The fruits of Bottle gourd have a variety of shapes: they can be huge and rounded, small and bottle-shaped, or slim and serpentine, and they can grow to be over a meter long. Rounder varieties are typically called calabash gourds (Saeed *et al.*, 2022). *Lagenaria siceraria* (lauki) belongs to the Cucurbitaceae family. It is also known as calabash or white flowered gourd and locally kado. Bottle gourd is an annual herbaceous plant with a prostrate type growth habit. The leaves are alternate and variable, and tendrils are almost present flowers of *L.siceraria* are monoecious in nature, male and female flowers are found on different plant axis of the same plant. So cross pollination is highly favorable Dioecious and andromonoecious sex form Bering hermaphrodite flowers also exist in wild or non-cultivated types (Mehboob *et al.*, 2022)

Melaleuca cajuputi Powell, which is commonly known as white samet or cajuputi, is a member of Melaleucae tribe, Myrtoideae family, which comprises of nearly 230 species all over the world (Craven & Lepschi, 1999). *M. cajuputi* is divided into 3 sub-species: subsp. *cajuputi*, subsp. *cumingiana* (Turcz) Barlow, and subsp. *platyphylla* Barlow. These species are usually medium to large trees, typically grow to 25 m and sometimes reach up to 40 m. They are well adapted plants; they are mainly distributed in marshy or periodically flooded soils, but sometimes they are found in dry and rocky soils or even in salt-water flooded soils (Turnbull, 1986). In Vietnam, only one species of the Melalauca genus, *M. cajuputi* Powell, is known and recorded. It is one of the most widespread species, extending from North to South Vietnam, but mainly growing in the southern region (Tran & Van, 2023).

Biopesticides are pesticides whose active ingredients come from plants and have the ability to control pest attacks on plants. Bio pesticides do not leave harmful residual effects on plants or the environment. Bio pesticides are one of the pesticides that can be used to control pests and plant diseases. This type of Bio pesticide residue is easily biodegradable in nature and easily lost and can be made at a low cost so it does not pollute the environment (Pohan, 2014). The utilization of botanical insecticide is the content of secondary metabolites in plants. Plants can produce secondary metabolites (such as: quinones, flavonoids, tannins, and others) plants producing secondary metabolite compounds can be utilized as

insecticides. Eucalyptus plants (*Melaleuca cajuputi*) with the distinctive aroma of the oil produced and its benefits have a great opportunity to be further developed for treatment at this time. Efforts need to be made starting from the cultivation techniques applied to proper post-harvest handling (Asikin & Melhanah, 2020)

Eucalyptus plant (*Melaleuca cajuputi*) is belong to the Myrtaceae family which is one of the indicator plants of acid sulfate tidal marshlands, can be used as a botanical insecticide (Mansur *et al.*, 2022). Eucalyptus plant is known as *Melaleuca cajuputi* or sometimes *Melaleuca leucadendron*. Three subspecies within *Melaleuca cajuputi* subspecies *cajuputi* are distributed from northwest Australia and eastern Indonesia, *Melaleuca cajuputi* subspecies *cumingiana* is distributed from Vietnam to western Indonesia, and *Melaleuca cajuputi* subspecies *platyphylla* is distributed from northern Queensland, southwest Papua New Guinea and southeast Papua. These *Melaleuca* species have fast growth, adaptation to swamp environments (Fitriyani *et al.*, 2022).

M. cajuputi compound contents include terpinol, pinene and limonene in addition to cineol which causes eucalyptus oil to feel warm and fragrant (Kardianan, 2005). According to (Against *et al.*, 2020) the chemical content in eucalyptus leaves is cineol (22.45%) α -terpineol (12.45%); E-caryophyllene (6.95%); β -pinene (5.74%), α -humulene (4.70%), β -selinene (3.82%), β -myrcene (3.58%), α -selinene (2.9%); and α -terpenyl acetate. The cineol content is thought to be repellent because it has a pungent aroma. Cineol content and oil yield in yellow-bud eucalyptus plants are higher than in red-bud plants (Ariyanti, 2022). According to Duke (1991) galam leaves contains approximately 1.3% essential oil with a content of 14-27% cineol and aldehydes. Besides that, other components of its essential oil contain 1-limonene, dipentene, sesquiterpene, azulene, sesquiterpene alcohol, valeraldehyde and benzaldehyde. Galam leaf Botanical Insecticide contains secondary metabolite compounds that are toxic, including alkaloids, polyphenols, quinones, flavonoids, and saponins, which can be used as insecticides against pests. These compounds can cause antifertility, stomach poison, respiratory poison, appetite inhibitor (antifeedant). Currently, there is no research on the use of vegetable insecticides derived from galam leaves to control pests (Asikin & Lestari, 2021).

1.2 Problem

The problem in this study is how does the application of botanical insecticide from eucalyptus plant (*M. cajuputi*) affect the diversity on bottle-gourd plant (*L. siceraria*) in Thai Nguyen, Vietnam

1.3 The Objectives

The objectives of this study is to assess the effects of botanical insecticide from eucalyptus plant (*M. cajuputi*) on the diversity of arthropods inhabiting bottle gourd plants (*L. siceraria*) in Thai Nguyen, Vietnam.

1.4 Hypothesis

The hypothesis of this study is that the application of Eucalyptus Plant (*M. cajuputi*) Botanical insecticide will effectively reduce pest populations in bottle gourd (*L. siceraria*).

1.5 Benefit

The benefit of this study are expected to shares information about the effect of Eucalyptus Plant (*M. cajuputi*) Botanical insecticide. And can be used by farmers as a plant control to protect plant damage caused of arthropode as an alternative to chemical pesticides.

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