CHAPTER I

INTRODUCTION

1.1 Background

Indonesia is the only country that was dubbed "the equatorial countries' cause this country has a tropical climate in almost all regions. This makes several disease-carrying vectors grow and develop well, one of which is mosquitoes. Mosquitoes are a type of ectoparasite that can harm and endanger humans, animals and the environment (Wahyu, 2017). Mosquito *Aedes sp.* is a vector of Dengue Hemorrhagic Fever (DHF). DHF in Indonesia alone has reached 49,563 cases on April 27, 2020. In fact, up to 50 million cases of infection by *Aedes sp.* in more than 100 countries every year (Aprianto, 2014). According to WHO (World Health Organization), Indonesia has the highest rate of Vector infection *Aedes sp..* with cases reaching 95% in children under 15 years (Aprianto, 2014). Also reported from the Darussalam Medical Center (DMC) at the University of Darussalam Gontor, Mantingan in October 2020, 3 cases of female students contracted the symptoms of dengue fever were found.

Control of the *Aedes sp.* mosquito vector is not optimal. The vector control is one of the most effective ways, either chemical, biological vector control or directly eradicating mosquito nests (Ministry of Health, 2012). The most commonly used vector control is chemical control, including using a larvicide exterminator. Larvicide preparations commonly used in Indonesia are synthetic organophosphate such as Abate, which has the active ingredient Temephos. This type of synthetic insecticide is a type of synthetic poison (organic phosphate) that works to inhibit the acetylcholinesterase enzyme, causing chaos in impulses of the central nerve which results in the death of insects. However, its use is also toxic to the environment and other natural organisms and disrupts the balance of the ecosystem and this preparation is less selective and causes mosquito resistance to larvicide products if it exceeds 20 years of use (Hubullah, 2015). Base on Widiarti (2003) research it was found that there was a poisoning in human individuals with a decrease in acetylcholinesterase enzyme activity

in 19 individuals in the Yogyakarta area, and mild poisoning symptoms such as nausea, vomiting, headache, weakness, etc.

One of the countermeasures is the use of natural insecticides or more commonly called as larvicides which are more environmentally friendly. Biolarvicides are natural larvicides from active plant compounds that are toxic to insects (mosquito larvae) and are easily decomposed by sunlight so they don't leave residues in water, soil and air, and are safe for human individuals and do not cause air pollution (Rakhmany,2013). Considering that Indonesia is a tropical country with many diverse plants and there have been many studies on bioactive compounds derived from plants as natural insecticides, for example from plant chemical components such as volatiles, alkaloids, saponins, flavonoids, tannins and quinones (Mulyana, 2002).

One plant that has the potential and effectiveness as a biolarvicide is teak wood *(Tectona grandis)* which is included in the family *Lamiaceae*. It has been reviewed in several previous studies by Fendi (2016) and Takahasi (2009) regarding the content of Teak Wood *(Tectona grandis)* such as flavonoids, alkaloids, saponins, gallate tannins, catekal tannins, steroids / triterpenoids and quinones which are effective insects and safe in human individuals. Currently, the waste from teak sawmills (*Tectona grandis),* that is sawdust has not been used optimally. Much of it is wasted and one of the uses of sawdust is as an material for making mosquito coils. Given the use of mosquito coils is less effective and not too good for breathing, especially for children because of the smoke (Nugraha, 2011). In the rules of *Fiqh* it has been written دَفعُ أَولى مِنَ الرَفعِ which means «Prevention is better than cure». And in the verse of the Qur›an Surah Al Baqarah: *185* which reads يُرِيدُ اللَّه بِكُمُ اليُسرَ وَلاَ يُرِيدُ بِكُمُ العُسرَ which means «Allah SWT always wants convenience for you and does not want for you a difficulty», from this it can be concluded that *mafsadat* or badness is better to be prevented from the benefit that is formed in the future.

Realizing the lack of potential plant waste treatment and the realization of biolarvicide products, direct combustion of plant waste will not last long, is less effective and cannot be used at any time. For this reason, it is necessary to make a biolarvicide formulation that is more

innovative, efficient, affordable, safe and environmentally friendly. In previous research, the manufacture of plant extracts as larvicides was carried out along with a descriptive study of public acceptance (Pratiwi, 2013). In this study, biolarvicide was made in the form of liquid extract from lemongrass (*Andropogon nardus)*. However, the application and storage are less effective and efficient. Therefore, this research will provide an innovative granule form of biolarvicide formulation or coarse powder, because granule is a type of formulation that is stable, easy to wet and has a uniform size (Lannie, 2013). Granules in the form of fine grains made from a mixture of active ingredients and additives. The method to be used in the manufacture of this formulation is a wet granulation method in which the additives are in the form of a crushing agent and a filling agent. This form will make it easier to use and store.

As far as the literature search has been carried out, there has been no research on the formulation of granule formulations from sawdust teak wood powder extract as biolarvicide. In previous studies, on the effectiveness of teak sawdust powder extract, giving the extract level of 5 µg / ml can cause the death of mosquito larvae *Aedes aegypti* and the mortality rate will increase along with the increase in extract levels. Mortality reaches 100% with extract levels of 15 µg/ml within 24 hours in 24.5 ml of distilled water (Nugraha, 2011). In a study conducted by Sudheer (2017) in the form of an LDtoxicity $test_{50}$ in albino rats (25-35 grams), it was stated that the toxicity level of Teak powder extract at 1250 mg / kg and a tolerant dose at 1000 mg / kg.

1.2 Problem Formulation

Formulation of the problem raised in this study is as follows:

1. Does The extract of teak wood *(Tectona grandis)* be formulated into sand granules biolarvicide?
2. What are the results of the physical evaluation test for sand granules biolarvicide from sawdust teak wood extract *(Tectona grandis)?*
3. Which formulation of sand granules of teak wood powder extract *(Tectona grandis)* is the most active as a biolarvicide based on the mortality of *Aedes sp.* mosquito larvae?

4. Which concentration and time of acute toxicity of Teak Wood *(Tectona grandis)* powder extract on sand granules for *Aedes sp.* larvae that produced the LC_{50} and LT_{50}?

1.3 Research Objectives

The Objectives of this study are as follows:

1. To determine the formulation sand granules of biolarvicide from sawdust teak wood extract *(Tectona grandis)*
2. To determine the results of the physical evaluation test of biolarvicide formulations from sawdust teak wood extract *(Tectona grandis)*
3. To determine the formulation of sand granules of the extract of teak wood powder *(Tectona grandis)* which is the most active as a biolarvicide based on the number of mortality of larvae of *Aedes sp.*
4. To determine the concentration and time of acute toxicity of teak wood *(Tectona grandis)* powder extract in sand granules preparation against mosquito larvae based on the LC_{50} and LT_{50} values

1.4 Research Benefits

1.4.1 Theoretical Benefits

The results of this study can be used as reference material for further research and theoretically, this study is useful for providing scientific information about the potential for sand granules from sawdust teak wood extract *(Tectona grandis)* as biolarvicide.

1.4.2 Practical Benefits Practically

This research can provide benefits for the pharmaceutical industry in the manufacture of environmentally friendly larvicide products with minimal side effects. This vegetable larvicide formulation can also provide practical benefits for the general public, especially those at the University of Darussalam Gontor by providing sand granules from sawdust teak wood extract *(Tectona grandis)* as a biolarvicide that can eradicate larvae of Mosquitoes *Aedes sp.* and can be used as a reference for the manufacture of biolarvicide formulations for sand granules sawdust teak wood powder extract.