

CHAPTER 1

INTRODUCTION

1.1 Background

Mosquitoes are common names for each insect in the family Culicidae. They are characterized by two wings, scaly, slim body, and six inches long; (varies between species) but rarely exceeds 15 mm. In the female mosquito, the mouth parts form a long proboscis to pierce the skin of mammals (or in some cases the birds or even reptiles and amphibians) to suck blood. There are more than 2700 species of mosquitoes and out of these only a few species actually act as vectors to transport a myriad of diseases such as dengue, filariasis and malaria (Gubler et. al., 2014).

Mosquito-borne diseases are something that many people are worried about when they see mosquitoes in their homes. Most mosquitoes are capable of transmitting diseases such as malaria, filarial diseases such as elephantiasis, and congenital diseases such as yellow fever virus, dengue fever, encephalitis, and West Nile virus. Mosquitoes can live almost anywhere except in the Antarctic region and some islands with polar or subpolar climate (Gubler et. al., 2014).

In Indonesia, the *Aedes aegypti* mosquito is generally found around residential neighborhoods, where there are many stagnant bodies of water in tubs or jars. The *A. aegypti* mosquito is normally diurnal or active in the morning until noon. Transmission of the disease is carried out by female mosquitoes because only the

female mosquitoes suck blood. This is done to obtain a sufficient protein intake needed to produce eggs. Male mosquitoes do not require blood, and obtain energy from the nectar of flowers or plants. This type of mosquito also enjoys dark areas and objects that are black or red. Dengue fever often affects children because children tend to sit in the classroom during the morning until noon, and their legs that are hidden under the table become an easy target for these type of mosquitoes (Jamison et. al., 2006).

According to the 200RISKESDAS data for the Southern Sumatra region, the prevalence for dengue fever, which is spread by the *A. aegypti* mosquitoes, is at 0.4% for a 12 month period. Generally it frequently occurs during the rainy seasons that lead to the *Aedes aegypti* mosquitoes having plenty of still water to reproduce (RISKESDAS, 2009).

There are several solutions to overcome diseases transmitted by insect vectors. Insecticides are one of the most useful ways to prevent the spread of this disease. In this case, there many natural substances that can act as insecticides. Mosquito repellents usually contain active ingredients such as N,N-Diethyl-meta-Toluamide (DEET) that are harmful to nature (Sanborn et. al., 2007).

Along with the understanding of the dangers of chemicals, the general public are now more selective in choosing the type of insecticide to be used. They prefer insecticides that are safe, cheap and environmentally friendly. Active substances in natural insecticides that are derived from plants are increasingly considered as a viable alternative. Such an example is the use of certain types of plants like the clove

plant (*Syzygium aromaticum*) as a repellent or insect repellent. According to the Food and Drug Administration (FDA), the clove plant has been well recognized as a safe form of insecticide/repellant. Cloves have been long known only as a spice in food, although its use is actually very widespread in the field of dental health. Cloves are often and are still used by some dentists to overcome sore gums and also as an anesthetic and an anti-bacterial. Clove is also used as a gargle medicine to eliminate sore throat. Clove oil is also used as an anti-diarrhea medicine and to relieve vomiting (Phasomkusolsil & Soonwera, 2011).

The oil produced from clove buds are known to be the most expensive and sought after product made using cloves. Clove bud oils are rich in compounds such as eugenol (90%), eugenol acetate (7%), and caryophyllene β (3%) which are known as aromatic compounds. As clove bud oil extract primarily contains eugenol, its characteristic spicy, pungent smell is due to the presence of eugenol (Alma et. al., 2007).

In a recent research task, researchers have proven that the natural oils contained within clove extract can function as insecticides to anopheles mosquitoes. In addition, the researchers also discovered that a 10% concentration of clove extract was all that was needed in order for it to be used as insecticide and that the duration effect of clove extract was long enough for it to be applied as repellant (Phasomkusolsil & Soonwera, 2011).

Similarly, another research was carried to determine which of ten different natural oils, including clove oil, possesses larvicidal effects on the larvae of *Aedes*

aegypti mosquito. It was found that clove oil was highly effective in killing the *Aedes aegypti* larvae at 125mg of extract per Liter of water with a mean of 15 dead larvae out of 20 in 24 hours. These results mean that clove oil extract could possibly be of use as an insecticide against adult *Aedes aegypti* mosquitoes as well (Tennyson et. al., 2013)

So far, no prior research has been done to show the insecticidal effects of clove extract on adult *Aedes aegypti* mosquitoes. Therefore, this study aims to prove that clove extract does possess insecticidal effects against adult *Aedes aegypti* mosquitoes.

1.2 Problem formulation

Is there an insecticidal effect of clove (*Syzygium aromaticum*) extract towards *Aedes aegypti* mosquitoes?

1.3 Purpose of the research

1.3.1 General purpose

To investigate the insecticidal effect of clove (*Syzygium aromaticum*) extract against *Aedes aegypti* mosquitoes.

1.3.2 Specific purpose

To analyse the correlation between the concentrations of clove (*Syzygium aromaticum*) extract and its effect as a natural insecticide when used against *Aedes aegypti* mosquitoes.

1.4 Benefits of research

1.4.1 Academic benefit

1. Able to prove the efficacy of clove (*Syzygium aromaticum*) extract when used as an insecticide towards *Aedes aegypti*.
2. To provide the information on the effect clove extract towards *Aedes aegypti*.

1.4.2 Practical benefit

1. To reduce the number of *Aedes aegypti* in houses in Indonesia using clove extract.
2. To enable a more detailed experiment to be conducted in order to produce a new insecticide substance that is cost effective and safe for usage in agriculture sectors.