International Journal of Health, Economics, and Social Sciences (IJHESS)
Vol. 7, No. 3, July 2025, pp. 1365~1370
DOI: 10.56338/ijhess.v7i3.8312
Website: https://jurnal.unismuhpalu.ac.id/index.php/IJHESS

# Test the Effectiveness of Reed Diffuser Fragrant Pandan Leaf Extract as a Vector Repellent of House Flies (Musca domestica)

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**Article Info**

***Article history:***

Received 24 May, 2024
Revised 07 Jul, 2024
Accepted 25 Jul, 2025

***Keywords:***

Fragrant Pandan, House Flies, Reed Diffuser

**ABSTRACT**

Flies play a big role in public health problems because they serve as vectors for disease transmission. Diseases transmitted by flies include typhus abdominalis, salmonellosis, cholera, and dysentery. The use of natural insecticides is a safe control alternative, one of which is by utilizing plants that are easy to grow, obtain, process, and beneficial for health such as fragrant pandan leaves. The purpose of the study was to test the effectiveness of the fragrant pandan leaf extract reed diffuser as a vector repellent of the house fly (Musca domestica). This type of research is experimental with a Quasi Experimental design using a Group Random Design (RAK). The study sample was 120 adult house flies randomly taken from the environment and used for 3 repetitions. Data were analyzed using the One Way Anova test with an error rate (α) = 0.05 The results showed that the average mortality of house flies killed at concentrations of 15%, 20%, and 25% with a fragrant pandan leaf extract diffuser was 5 (50%), 7 (70%), and 9 (90%) respectively. There is a significant difference with (p-value = 0.003). It is recommended for future researchers to use time variations to look at the mortality of house flies (Musca domestica).

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## INTRODUCTION

Flies are a type of Arthropda that belongs to the order diptera. Several species of flies are the species that play the most role in public health problems, namely as vectors of disease transmission. Flies act as mechanical vectors because they carry disease seeds on their feet, body and mouth (Hidayat, 2021). Flies transfer disease agents by contaminating the food they come across, through vomit, feces, or simply moving germs on the surface of their bodies. Flies can carry about 100 types of bacteria that are pathogenic to humans and animals. Most of the pathogens on the body of flies are bacteria, fungi, viruses, and worm parasites. Diseases caused by fly vectors include abdominalis typhus, salmonellosis, cholera, and dysentery. Flies develop and eat animal carcasses, human excrement, garbage and various decaying organic matter (Porusia, 2019).

House flies (Musca domestica) are one of the most abundant insects of the order Diptera in the world (Surahmaida, 2022). According to the Minister of Health Regulation Number 374 of 2010 concerning Vector Control, it is an action aimed at reducing the vector population as low as possible so that the situation is no longer at risk for disease transmission in an area or avoiding community contact with vectors so that disease transmission can be carried out through several methods, including physical, biological and chemical control (Gustina Mely et al., 2021).

According to (Maksum (2024), chemical control can be done by spraying insecticide residues (residual spraying), where this spraying is carried out on the surface of the place where flies usually infest, so that contact between flies and insecticides can last for a long time. The continuous use of synthetic insecticides can cause many new problems, including environmental pollution, relatively expensive use costs

and resistance (Maksum et al., 2023). The use of natural insecticides as an alternative to synthetic insecticides provides the advantage of being biodegradable so that the level of safety is higher and relatively safe for humans and the environment. Natural insecticides have a low residue and can be produced or grown by the community themselves. So it is relatively cheaper compared to synthetic insecticides. In addition, natural insecticides do not cause negative impacts on useful insects.

Natural insecticides that can be used can take advantage of plants that are easy to grow, obtain, process and beneficial to human health, for example using fragrant pandan leaves, because this plant is not only used as a natural dye and aroma enhancer in food, but can also be used as a natural insecticide. It is known that fragrant pandan leaves have the effectiveness to control and even kill flies because fragrant pandan leaves have active ingredients such as saponins, flavonoids, alkaloids and essential oils. According to Aseptianova (2017), alkaloids are able to inhibit the work of the nervous system and damage cell membranes. This group will generally inhibit the enzyme acetylcholinesterase, so acetylcholine will be deposited at synapses. The effect will inhibit the process of nerve transmission.

According to (Putri, 2019), the use of repellent generally does not directly kill insects, but rather functions to repel the presence of insects, especially due to its pungent odor. Repellent that is widely used by the community to repel insects is synthetic repellent which is a synthetic product in the laboratory.

Reed diffuser is an innovative product of aromatherapy that uses reed or sticks to absorb fragrance liquids in bottles without using electricity (Wulandari, 2022). The use of a reed diffuser is very practical and easy to use, different from other air fresheners. The advantages of reed diffuser include having effective essential oils, can emit a refreshing aroma in the room as well as relaxing, and is friendly to the environment.

## RESEARCH METHODS

### Research Location and Time

The location in the manufacture of fragrant pandan leaf extract was carried out at the Mathematics and Natural Sciences Laboratory, Gorontalo State University, and the research time was carried out in March 2025.

### Research Design

This research is an experimental research, the design of this study is Quasi Experimental (pseudo-experiment) using the Group Random Design (RAK) approach, where the treatment is carried out completely randomly to 3 treatments, namely fragrant pandan leaf extract with 3 repetitions each in each experiment for 24 hours.

### Population and Sample

The population in this study is adult house flies (Musca domestica) which are randomly taken in the environment around the building or habitat and the sample of this study is 120 adult house flies.

## RESULTS

In this study, the data obtained was in the form of the number of deaths of house flies (Musca domestica) after being treated for 1×24 hours with 3 repetitions. The results of the research can be seen in the following table.

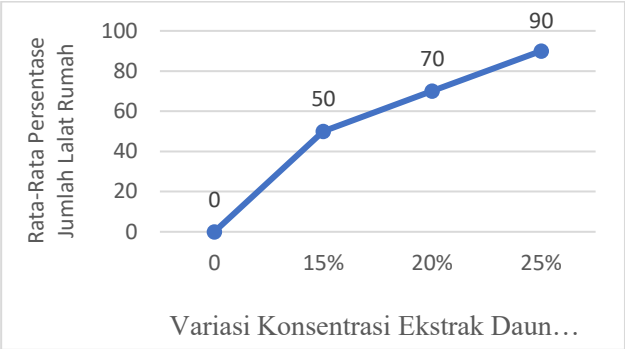
Table 1 Mortality of house flies (Musca domestica) using scented pandan leaf extract reed diffuser

| Extract | Concentration (%) | Number of House Flies (Tails) | Number of Mortality of House Flies *(Musca domestica)* (Tail) | | | Average Mortality of House Flies (Tail) | |
|---|---|---|---|---|---|---|---|
| | | | PI | P II | P III | n | % |
| Fragrant Pandan Leaves | Kontrol (0) | 10 | 0 | 0 | 0 | 0 | 0 |
| | 15 | 10 | 5 | 3 | 5 | 5 | 50 |
| | 20 | 10 | 8 | 7 | 7 | 7 | 70 |
| | 25 | 10 | 9 | 8 | 10 | 9 | 90 |

Source : Primary Data, 2025

Based on table 1, it is known that after being given a reed diffuser treatment of fragrant pandan leaf extract with concentrations of 15%, 20%, and 25% within an observation time of 1×24 hours with 3 repetitions, the most effective as a repellent of house flies (Musca domestica) is at a concentration of 25%

with a mortality of 9 house flies (90%) while the least effective mortality rate of the average number of flies houses are found at a concentration of 15% with a mortality of 5 house flies (50%).




Data Source : Primary Data, 2025

Figure 1 Mortality Graph of House Flies (Musca domestica)

Based on Figure 1 shows that the average percentage of the number of house flies (Musca domestica) killed observed for 1×24 hours with 3 repetitions, that the 25% concentration is the most effective on the mortality of house flies (Musca domestica). This is because the high number of house flies killed is influenced by the concentration level used. The higher the concentration used, the higher the active compounds contained in it.

**Analysis of the effectiveness of reed diffuser of fragrant pandan leaf extract as a vegetable insecticide against the mortality of house flies (Musca domestica).**

Table 2 Data Normality Test

| Variabel | *p-value* |
|---|---|
| Concentrations of 15%, 20%, and 25% in *fragrant pandan leaf extract* diffuser reed | 0,789 |

Source: Data Primer 2025

Based on table 2, the results of the normality test of the concentration of reed diffuser concentration of scented pandan leaf extract using the Shapiro-Wilk test obtained a p-value = 0.789 > 0.05 which means that the data is distributed normally. So the statistical test used is the One-Way Anova test.

Table 3 Data Homogeneity Test

| Variabel | *p-value* |
|---|---|
| Concentrations of 15%, 20%, and 25% in *fragrant pandan leaf extract* diffuser reed | 0,471 |

Source: Data Primer 2025

Based on table 3, the results of the homogeneity test of the concentration of reed diffuser concentration of fragrant pandan leaf extract obtained a value of p – value = 0.471 > 0.05 which means that the data has the same or homogeneous variant.

Table 4 Anova One Way Test

| Variabel | *p-value* |
|---|---|
| Concentrations of 15%, 20%, and 25% in *fragrant pandan leaf extract* diffuser reed | 0,003 |

Source:D ata Primer 2025

Based on table 4, the results of the statistical test of the reed diffuser of fragrant pandan leaf extract using the One Way ANOVA test, p-value = 0.003 < 0.05 were obtained, which means that there is a difference in the variation in the concentration of reed diffuser of fragrant pandan leaf extract to the mortality of house flies (Musca domestica).

Table 5 Post Hoc Test (LSD Test)

| Concentration Variations | *p-value* |
|---|---|
| A concentration of 15% is different from a concentration of 20% | 0,008 |
| A concentration of 15% is different from a concentration of 25% | 0,001 |

Source : Primary Data, 2025

Based on table 5 above, it is known that the results of the Post Hoc test using the LSD test are that the concentration of 15% is different from the concentration of 20% in killing house flies (p-value = 0.008<0.05). The concentration of 15% is different from the concentration of 25% in killing house flies (p-value = 0.001<0.05).

## DISCUSSION

### Percentage of House Flies Killed at 15%, 20% and 25% Concentrations with Fragrant Pandan Leaf Extract Reed Diffuser

This study was conducted to test the effectiveness of the fragrant pandan leaf extract reed diffuser with concentrations of 15%, 20% and 25%. In the control group, there were no house flies that died because they were not given a reed diffuser of fragrant pandan leaf extract. After treatment at a concentration of 15% reed diffuser of fragrant pandan leaf extract, the average result of house fly mortality was 5 (50%), at a concentration of 20% reed diffuser of fragrant pandan leaf extract, the average result of the number of house fly mortality was 7 (70%), and at a concentration of 25% of reed diffuser Fragrant pandan leaf extract obtained the average result of house fly mortality, which is 9 (90%). It can be seen that the mortality percentage of house flies is directly proportional to the concentration, namely the higher the concentration of the extract, the higher the percentage of deaths.

Based on the results of the study, a higher concentration of 25% has the highest level of effectiveness against the mortality of house flies (Musca domestica). As for the factors that can affect the number of house fly deaths each concentration of reed diffuser fragrant pandan leaf extract, namely the distinctive aroma that comes from fragrant pandan leaf extract which can interfere with sensory nerves in flies, reed diffuser that produces strong fragrant pandan leaf extract vapor causing rapid death in flies. In addition, the death of house flies after being given a reed diffuser of fragrant pandan leaf extract is due to the content of active compounds in fragrant pandan leaves which has a negative effect on house flies so that it causes death.

According to Rahayu et al., (2024) that the compounds found in fragrant pandan leaves function as antibacterial. The way it works is as stomach poisioning or stomach poison which can cause digestive system disorders in flies so that the breeding of flies is disrupted and dies.

A similar study was conducted by Putra (2022) that the observation of fragrant pandan leaf extract for 24 hours was the highest in killing house flies at a concentration of 30% with an average mortality rate of 88%, showing that in this study the concentration of 30% had a higher level of effectiveness than the concentrations below it, which were 10% and 20%. This is in line with research conducted by Fadhal (2021) which shows that fragrant pandan leaf extract at a concentration of 15% has a higher level of effectiveness in repelling house flies with an average of 82.93% compared to concentrations of 5% and 10%, this is because fragrant pandan leaves have an odorless aroma and house flies that do not like the pungent smell of fragrant pandan.

### Analysis of Differences in Concentration Variation (15%, 20%, and 25%) Reed Diffuser Fragrant Pandan Leaf Extract in Killing House Flies (Musca domestica)

Based on the results of the study, there was a difference in the concentration of 15%, 20%, and 25% reed diffuser of fragrant pandan leaf extract on house fly mortality. Where the results of the examination show that the concentration of 25% has been proven to be effective in killing house flies (Musca domestica).

Based on the results of statistical tests, the concentration of 15% is different from the concentration of 20% (p-value = 0.008). The use of high concentrations of fragrant pandan leaf extract can cause mortality to house flies. This is due to the chemical compounds contained in fragrant pandan leaf extract.

A comparison of the concentration of 15% with 25% reed diffuser of fragrant pandan leaf extract showed a significant difference (p-value = 0.001). An increase in concentration from 15% to 25% has a great effect on the mortality of house flies (Musca domestica). A concentration of 25% showed a higher effect in killing house flies (Musca domestica). So that the concentration of 25% is the most effective compared to 15% and 20%. This is because the administration of different pandan leaf extracts in each concentration is 15% of 15% of pandan leaf extract as much as 7.5 ml, 20% of pandan leaf extract as much as 10 ml, and 25%

of pandan leaf extract as much as 12.5 ml. In addition to the level of concentration that affects the mortality of house flies, the length of exposure also affects the death of house flies (Musca domestica), meaning that the higher the concentration and the length of time exposed, the higher the effective rate of house fly death. This study is in line with Orianes (2018) explaining that there is a relationship between increased concentration and the length of time observed by the spray-on of fragrant pandan leaf extract with Knockdown Time, where the higher the concentration of fragrant pandan leaf extract, the faster the knockdown time of the extract.

A similar study was conducted by Selviana et al., (2023) which showed that the use of fragrant pandan leaf extract with a dose variation of 15%, 10%, and 15% with the results of the One Way Anova statistical test, obtained a significant value (p-value = 0.000 < 0.05) meaning that there was a significant difference in the number of fly perches on the bait before and after being treated with a variation in the concentration of the concentration of the combination of fragrant pandan leaves and basil leaves.

Based on the results of the statistical test, the concentration of 20% showed no difference with the concentration of 25% (p-value = 0.074>0.05). This is because the concentration of 20% and 25% of fragrant pandan leaf extract has reached the maximum effectiveness threshold that is able to kill house flies. The percentage of mortality of house flies is 20% 7 (70%) and 25% 9 (90%) respectively. This means that increasing the concentration from 20% to 25% does not significantly increase the toxic effect because it has reached maximum effectiveness to produce the same house fly deaths. According to Putri (2018), the percentage of insect mortality ≥ 50% after the application of plant insecticides, indicating that plant-based insecticides are effectively used for pest control. So that the concentration of 20% and 25% is maximum in killing house flies (Musca domestica) with percentages of 70% and 90%.

According to Muin (2017) that fragrant pandan plants contain chemical compounds which include phenolic compounds that act as toxins that can interfere with the metabolism and activity of house flies, flavonoids act as contact toxins that can interfere with the respiratory system and nervous system causing weakness, fainting, and death, saponins function to inhibit larval growth and damage cell membranes to cause death, Tannins can interfere with the digestive system of house flies by inhibiting digestive enzymes such as amylase and protease so that they inhibit food absorption, interfere with cell metabolism and physiology, and cause house fly rejection of ingredients containing tannins, essential oils contain compounds such as geraniol which have a pungent odor effective in repelling house flies. As is known, these chemical compounds are toxic to insects and vectors but safe for humans.

## CONCLUSION

The mortality percentage of house flies (Musca domestica) killed at concentrations of 15%, 20% and 25% with a fragrant pandan leaf extract diffuser reed was 5 (50%), 7 (70%) and 9 (90%) respectively.

There was a difference in concentration variation of 15%, 20, and 25% on house fly mortality with (p-value = 0.003). The data was analyzed using Anova's One Way statistical test.

## SUGGESTION

It is hoped that the community can cultivate and utilize fragrant pandanus plants in controlling the population of house flies (Musca domestica) by applying them to house fly nesting sites (Musca domestica).

For the next researcher, to be able to use time variations to be able to see the number of house fly mortals in addition to using variations in concentration in using fragrant pandan plants as a plant-based insecticide against house fly mortality (Musca domestica).

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