

The Effectiveness Cigarette Butts as Liquid Anti-Termite

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Abstract. The main food of termites is cellulose. Wooden home furniture is often eaten by termites. Even termites can damage building construction. We can find cigarette butts around us that it becomes a waste that pollutes the environment. Nicotine alkaloid substances can paralyze the nerves and it's really effective to control insects including termites. This study aims to determine the effectiveness of tobacco content liquid anti-termite to control termites. The method is used as a wood-decoy technique that is smearing and soaking with liquid anti-termites of each tobacco mass containing 1 gr, 2 gr, 3 gr, 4 gr, 5 gr, and 6 gr. Observations are conducted once in every 3 hours for 24 hours. The results of this study show that the most effective liquid anti-termite to control termites is liquid anti-termite with a mass content of 6 grams of tobacco, the percentage of mortality at 12 hours of observation reaches 100% and the mass of wood does not decrease.

Keywords: Cigarette butts, liquid anti-termites

1 Introduction

Termites are detritivores, consuming dead plants at any level of decomposition. They also play a vital role in the ecosystem by recycling waste material such as dead wood, feces and plants[1]. Termites largely feed on cellulose and lignocellulose, and they are known to process 50–100% of dead plant and decaying biomass in the tropical areas[2]. Base food of termites are cellulose, so that termites like to eat away our furniture which made from wood, our documents. Even, termites destroyed building construction, this threatens human safety. Termites illustrate this situation, as they can cause significant economic damage in urban and rural areas[3].

Active smokers in Indonesia donate cigarette butts waste in our environment. Cigarette butts is a waste that is ignored by humans. If cigarette butts thrown directly into the ground could pollute the soil or can pollute environment because the process of slow degradation of cigarette butts in the environment take 1 – 5 years to decompose naturally [4]. Processing cigarette butts is still rarely done by the people especially in our environment. Even though the components of cigarette likes tobacco leaves could develop to restrain insect.

Tobacco (*Nicotiana* spp.) is commonly known as a material the making of cigarette. Actually this plant can be used as a vegetable pesticide and also potential ti controlling pets and insect. After several studies, it turns out that in the tobacco stem there are several typical

compounds of nicotine such as those found in leaves and other bioactive compounds. Nicotine can affect the central nerve in insect and cause death. Nicotine can also be a poison for insect [5].

Cigarette waste in the form of cigarette butts has the same content as whole cigarettes, there are ; nicotine, phenol and eugenol. Nicotine can be toxic to organism [6]. Tobacco plant contains alkaloid nicotine, a type of neurotoxin that is very effective when used as the main ingredient in insecticides. Nicotine is a material that has a strong pharmacological work on the body. Small doses can be stimulating, but large doses cripple all nerves activated by acetylcholine, a special chemical that emits nerve impulse [7]. Nicotine is naturally found in the plants belonging to the Solanaceae family [8], such as tomatoes, potatoes, eggplants and green pepper at levels that are very small compared to tobacco. Nicotine is an alkaloid substance that exist in tobacco plants and also tobacco in cigarette butts. Nicotine in tobacco is able to paralyze insect including termites.

The higher concentration of nicotine sulfate, speed up the effect on insect mortality, both cockroaches and ants with the average time of death of cockroach under 21 minutes and the effect on the death of 10 from 20 ants with an average time of 6 minutes [9]. Its means, the higher content of nicotine will accelerate the death of insect, and also termites.

This research will make the liquid anti-termite with different content of the tobacco mass from cigarette butts, to determine the most effective content of tobacco mass for controlling termites in a simple way. In several studies, processing tobacco with the process extraction such as maceration, this process can't be done by wider people. So that, utilization of cigarette butts can be done by every people to decrease cigarette butts waste in our environment.

2 Methods

To obtain data, in this research use experimental quantitative with make liquid anti-termites from cigarette butts. This research used wood-decoy technique that is smearing and soaking wood-decoy with liquid anti-termite of each tobacco mass containing 1 gr, 2 gr, 3 gr, 4 gr, 5 gr, and 6 gr. Sample of termites in this research taken from the environment in Dema'aan Village Jepara Central Java Indonesia. Termites are taken shortly before the experiment. A total of 20 land termites genus *Coptotermes* sp. worker caste for each treatment, put into observation units that have been given feeding-wood. Observation rooms was conditioned dark by covered observation rooms with black fabric. Termites don't like bright room [10]. This test refers to Bläske dan Hertel [11] method by utilizing the toxic nature of tobacco trough direct contact of termites with wood-decoy smeared and soaked with liquid anti-termites with feed technique. Because when we spray liquid anti-termites on wall or hole of termites nest, it will increase humidity. Wood bait is inserted into a PVC pipe (observation room) which is modified by closing one of the pipe holes using clear-colored mica plastic which aims to facilitate observation. Pipes of observation space number 7 for K0, K1, K2, K3, K4 K5 K6. A total of 20 land termites genus *Coptotermes* sp. worker caste for each treatment, put into observation units that have been given wood bait. After the termites are inserted into the observation room that has been feed and arranged according to treatment, the observation unit is covered with black fabric. The observation unit is conditioned in a humid manner, giving water to the cloth and putting a cardboard box containing an observation unit above a bucket filled with water. Subterranean termites most commonly live in the soil where they can avoid temperature extremes and obtain the moisture essential to their existence [12]. In this

research have done three times experiment for every treatment. Data collection was carried out by observing and calculating the percentage of termite mortality and the percentage change in mass of wood-decoy. Before the experiment wood bait was weighed to find out the initial mass of wood bait. Then after experiment wood bait was weighed again and calculated the percentage decreasing of the mass using the formula Sornuwat, et al. in Zulkahfi [11] as follows:

$$\text{Decreasing wood mass (\%)} = \frac{W_1 - W_2}{W_1} \times 100 \% \dots\dots\dots(1)$$

Information :

W₁ = mass of wooden bait before the experiment (gram)

W₂ = mass of wooden bait after the experiment (gram)

Termite mortality is calculated using the formula Sornuwat, et al. in Arbaiatusholeha [5] that is:

$$M(\%) = \frac{N_1 - N_2}{N_1} \times 100 \% \dots\dots\dots(2)$$

Information :

M = Termite mortality in percent (%)

N₁ = Number of initial termites (tails)

N₂ = Number of live termites after feeding (tail)

3 Result and Discussion

To find out the effectiveness of the termite liquid composition, the following tests were carried out:

3.1 Decreasing Wood Bait Mass

Decreasing wood bait mass by calculating changes of wood mass. Calculation percentage of decreasing wood bait mass was carried out after the treatment for 24 hours. The average results of the mass calculation of wood bait are presented on table 1.

Table 1. Percentage of Decreasing wood bait mass

| Experiment | Initial Mass (gram) | Final Mass (gram) | Difference (gram) | Average (%) |
|----------------|---------------------|-------------------|-------------------|-------------|
| K ₀ | 7.66 | 6.9 | 0.76 | 9.92 % |
| K ₁ | 6.97 | 6.97 | 0 | 0 % |
| K ₂ | 6.3 | 6.3 | 0 | 0 % |
| K ₃ | 6.98 | 6.98 | 0 | 0 % |
| K ₄ | 6.7 | 6.7 | 0 | 0 % |
| K ₅ | 6.98 | 6.98 | 0 | 0 % |
| K ₆ | 6.7 | 6.7 | 0 | 0 % |

Based on Table 1 shows that when the wood bait was not smeared with anti-termite liquid (K₀), there was a mass loss of wood bait at 9.92% within 24 hours of observation. Whereas

for wood bait that is smeared and soaked in anti termite liquid (K_1 , K_2 , K_3 , K_4 , K_5 , and K_6), percentage of decreasing wood bait are 0%, this is because the wood bait with liquid anti-termite makes the termites tested die before 24 hours so that there is no change of the wood bait mass which soaked in liquid anti-termite made termites does not reduce the mass. This result shows that nicotine content from tobacco which is contained in wood bait causes termites to be unable to eat the wood. It is because toxicity of nicotine.

3.2 Termites Mortality

The percentage of termite mortality after treatment is one indicator to determine the effect of tobacco cigarette contents on termites. Termites mortality are count every 3 hours. The result of termites mortality after 24 hour are presented on table 2.

Table 2. Termites Mortality

| Observation time (jam) | Amount sample of termites | Termites Mortality | | | | | | |
|------------------------|---------------------------|--------------------|--------|-------|-------|-------|-------|-------|
| | | K_0 | K_1 | K_2 | K_3 | K_4 | K_5 | K_6 |
| 3 | 20 | 0% | 13.29% | 18.3% | 25% | 21.7% | 40% | 55% |
| 6 | 20 | 1.75% | 25.6% | 31.7% | 43.3% | 60% | 71.7% | 78.3% |
| 9 | 20 | 1.75% | 60% | 65% | 76.7% | 80% | 85% | 91.7% |
| 12 | 20 | 9.16% | 91.7% | 81.7% | 85% | 91.7% | 96.7% | 100% |
| 15 | 20 | 9.16% | 93.3% | 90% | 96.7% | 100% | 100% | 100% |
| 18 | 20 | 15.5% | 98.3% | 100% | 100% | 100% | 100% | 100% |
| 21 | 20 | 17.65% | 100% | 100% | 100% | 100% | 100% | 100% |
| 24 | 20 | 22.55% | 100% | 100% | 100% | 100% | 100% | 100% |

On the observation of the first 3 hours of control wood feed (K_0), termite mortality was 0%, while for the next observation up to 24 hours termite mortality reached 22.55%. In the control wood feed (K_0), termites will make adjustments to the new environment provided so that at this stage there are several termites that die.

Whereas for K_6 wood bait in the first 3 hours the percentage of termite mortality was 55%, the mortality of K_6 wood termites reached 100% after 12 hours of observation. This shows that nicotine is the main alkaloid compound in cigarette butts which is active as an insecticide. Nicotine is a potential nerve poison and can be used as a raw material for various types of insecticides including termites[7]. So that the higher the content of tobacco in the termite liquid accelerates the death of termites (Figure 1). It means the greater the content mass of tobacco is the most effective to control termites with bait technique.

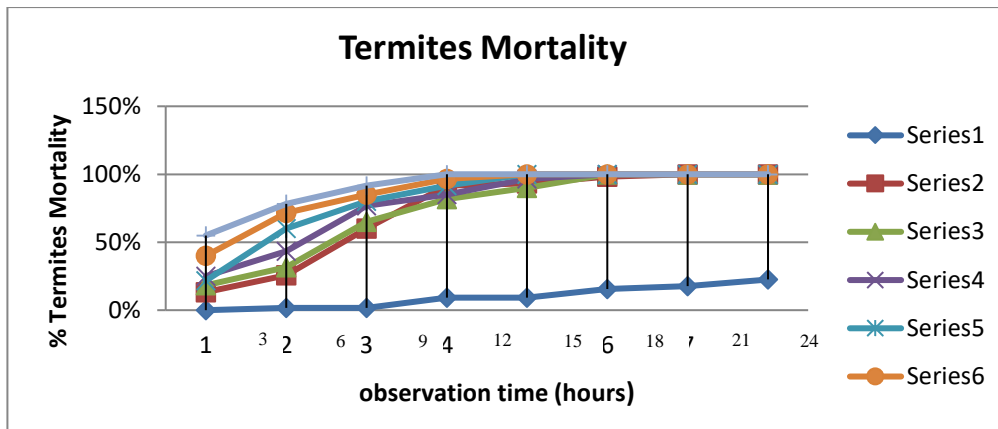


Figure 1. Percentage chart of termites mortality

Based on Figure 4 the increase in mortality along with the increase in tobacco mass occurred in all samples tested. The percentage of termite mortality indicates that the tobacco mass content in termite fluids increases along with termite mortality. The higher the nicotine concentration in the sample paper the higher the mortality of termites [13].

The difference between termites who eat wood bait without liquid anti-termite and termites that eat wood with liquid anti-termite can be seen from the color of their bodies. Termites that eat wood that have been smeared with liquid anti-termite are colored dark brown (Figure 2), compared to termites that eat wood without liquid anti-termite (Figure 3). The white body of termites is because their food are cellulose, so that when termites are eat wood that contain liquid anti-termite make their body turn into dark body.



Figure 2. Termites body change into dark color with liquid anti-termite



Figure 3. Termites body without liquid anti-termites

4. Conclusion

Tobacco butts can be used as an alternative to controlling termites because nicotine alkaloid substances are toxic to insects including termites. The use of wood-feeding techniques with liquid anti-termites is better than the direct spraying technique of liquid anti-termites into termite nest holes or the walls of the house. The anti-termite content that is most effective in controlling termites is an anti-termite liquid with a mass content of 6 grams because the percentage of termite mortality reaches 100% at 12 hours of observation for each repeat experiment.

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