

Control Of Book Termites Using Solid Attractants At The Central Library Of Universitas Sumatera Utara (USU)

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Abstract: It has been identified the extent of damage due to the activity of *Captotermes* sp, *Microtermis* sp, *Formica* sp, *Araneus* sp and *Stegonium* sp on books in the USU Library. Furthermore, prevention of dominant pest attack on the book containing cellulose as the main food of termites, termites control (action term) control by Action Research method (action research, Kurt Lewin adoption) is done intensively from July to September 2017. used are of neem leaf (*Azadirachta indica*), tobacco leaf (*Nicotiana tabacum*), rubber cassava leaf (*Manihot glaziovii*), and betel nut (*Areca catechu*) which can be used as Termite Baiting System (TBS). This method includes three stages, in the form of planning (planning), activity and reflection (actuating and reflexion) and evaluation (evaluation). The results show the higher number of termites in $F_{1799.3} = 0.328^*$ with zero days after application. Based on the research recorded in sampling for 3 months with 4 treatments had a significant effect on the percentage of the number of termites that died and collected with the value of F is 86.27, $p < 0,000$ and the percentage of death is $F = 59.13$ ($p < 0,000$). Pearson correlation value recorded percentage of termite mortality ($r = 0.349^{**}$) and percentage of book affected ($r = -0,597^{**}$) showed a very significant relationship. Pinet pellet is the best attractant in controlling termite pests, followed by tobacco plants, poisonous yams, and neem. Optimal FFB techniques in its use can control termite colonies in an environmentally friendly manner.

Index Terms: termite control, book, solid, attractiveness, central library, TBS, USU.

1 INTRODUCTION

The second house for the librarian is the library and its contents. In general, termites are a type of insect that is very fond of library habitat because there are cellulose from the book as a source of food. Besides that, environmental conditions outside the library that support the survival of termites where temperatures warm with high humidity (characteristic of the tropics). As a result, damage to library buildings, bookshelves and library collections where in the material contains cellulosic material which is the main food for termites. This phenomenon is happening in the University Library of North Sumatra. If left unchecked it will lead to library buildings, bookshelves and collections the library is fragile, moldy, damaged and unusable. This incident gives meaning to the importance of library conservation activities. A method is needed to control, eradicate this termite interference, so that termite interference can be anticipated or sought the solution. The termite control or termite control is done so that the librarian knows the characteristics and anticipate, eradicating termites that become the library's disruption so that the library has a safe and comfortable condition and atmosphere.

This study aims to identify the types of termites, determine the strategic way of controlling and termite removal that can be done if the library is attacked by termites without causing damage to the building, disturbing users, and environmentally friendly activities. Termite is one type of social insect classified into 6 families namely: Mastotermitidae, Kalotermitidae, Hodotermitidae, Rhinotermitidae, Serritermitidae and Termitidae. The first five families are low-grade termites with digestive protozoan digestive symbols. Termitidae is a high-grade termite that has a gastrointestinal symbiotic organism in the form of bacteria [1]. According to [2], three termite families in Indonesia are Kalotermitidae, Rhinotermitidae and Termitidae. According [3], termites are polymorphisms that live in colony with a caste system. In one colony consisting of three castes, the caste plays a role in the formation and dispersal of colonies called the reproductive caste. This type of soldier caste is responsible for keeping the nest and its colonies from outside interference, when workers are in charge of making and maintaining nests, taking care of eggs and nymphs, and seeking feeding. The three castes have special characteristics, such as the laron is a 2-winged imago on the piston derived from the reproductive caste. Pale nymphs to white, non reproductive, small and non-winged body belong to termite worker caste. While termite caste warrior big stature, mandible reduced to form rostrum group. Based on their habitat, termites are divided into termite termites (wood dweller) and ground dweller. The woody termites are divided into two classes, namely damp-wood termites and dry-wood termites. While termites are divided into three classes: ground termites (sub-teranean termites), termites mound-nest (mound-nest) and carton nest [4]. There are more than 2,300 species of termites in the world and most live in the tropics, Termites do a lot of damage by eating tree wood and buildings [5]. According to [6], termites are classified into five types, based on the location of the main nest or residence, as following:

1. Termite termite is a type of termite that attacks trees. Wood termites live in nests and are not connected to the ground.

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Examples of these termites are *Neotermes tectonae* (Family Kalotermitidae) which is a pest of teak

2. Termite Wood, attacking dead and damp wood, lodged in wood and not connected to the ground. Examples of this type are the *Glyptotermes* spp (Family Kalotermitidae).
3. Dry wood termites as living in dead dry timber and unrelated to soil. These pests generally get at home and furniture, such as tables, chairs, bookshelves, and so on. The sign of their attack is the presence of small brownish excrements or grains that fall on the floor or around the wood being attacked. For example *Cryptotermes* spp (Family Kalotermitidae).
4. Subterranean termites generally live on soils containing a lot of dead or decayed wood. *Coptotermes* spp and *Schedo rhinotermes* are a kind of damaging underground termite. This species can live even if the nest is not connected to the ground, but sometimes it receives moist, for example, water droplets from the roof.
5. Termite in Indonesia is Termitidae family type. They live in nest land, especially near organic materials containing cellulose, such as wood, wood powder and humus. *Macrotermes* spp (especially *M.gilvus*), *Odontotermes* spp

Microtermes are the most common types of Termitidae termites attacking buildings. However, most preferred termite habitats are part of the construction. This termite takes its target up to 200 meters from their nest. They can even penetrate a wall that is several centimeters thick with the help of enzymes removed from their mouth to reach their target. Termites have three phases of life: eggs, before adulthood and adult stage. There are three main types of members of the adult colony: reproduction, workers and soldiers. Termites always live organized and organized. One of their characteristics is to hide themselves. Cellulose is the main food of termites: books, paper, furniture, and wooden buildings but the most similar termite habitats are part of the construction. In addition, termites are the most destructive animals harmful to the existence of collections and library buildings. Termites destroy and finish their food in no time. According to [7], their target of attack because of various things, namely:

- a. It was directly related to the ground
- b. Termites build a protection pipe (shelter tube) from the ground to the attack object.
- c. Through a small gap, cracks (at least 0, 4 mm) example: foundations of buildings and walls.
- d. Penetrating object obstacles (plastic and thin metal)

A method is needed to control, prevent and eradicate termite interference safely and comfortably known as the termite control. Various methods termite control, such as:

1. Method of conventional method by spraying and injection of Termitide or Chemical Barrier System (CBS).
2. The method of elimination is the method with the active ingredient Hexa flakon or called Termite Baiting System (TBS).

Termite control is intended to eliminate problems without building damage, disrupt users, activities and environmentally friendly. Procedure on the Chemical Barrier System (CBS) by spraying and injecting Termitidae with the active ingredient in termite tunnels around the building of the attacking library and their nest. A variety of techniques have been used in the

Termite Baiting System (TBS), one of them known as Sentricon. Sentricon system that has been developed in the United States since 1989 [10] and [21]. Started with a study from the University of Florida that entomologically concluded that the best active ingredient hexa flakon is the best material for use in the Termite Baiting System. After going through a thorough research process in 1995 Sentricon Termite Baiting System began to be marketed to companies in the United States (one of the largest Terminix International USA), and grew up to now. Sentricon Indonesia system entered since 2000 and until now has proved effective in overcoming the cruellest termites of the soil type in Indonesia namely *Coptotermes* spp. The research was to find alternative of attractant materials to control termites by using 4 test plants, namely neem leaves (*Azadirachta indica*), tobacco leaf (*Nicotiana tabacum*), rubber cassava leaf (*Manihot glaziovii*), and betel nut (*Areca catechu*) which can be made as an environmentally friendly Termite Baiting System (TBS) at the Central Library of Universitas Sumatra Sumatera, Indonesia.

II RESEARCH METHODS

2.1. Research Methodology

This research uses Action Research method or action research. According [8], [11] that action research is an attempt to test ideas in practice to improve or change something in order to receive a real impact on the situation Researchers use action methods that adopt the Kurt Lewin model. This model is based on the concept of an action research subject that has three main components that show the following steps:

1. Planning, planning phase is an activity during the beginning of research activities.
2. Actuating and Reflection is the stage that explains the action plan and observation.
3. Evaluating is paying close attention to what happens after the restoration phase is completed and then it must be composed by a modification actualized in the form of a series of actions, observations and more.

2.2. Object of Research

The object of this research in Central Library Universitas Sumatera Utara from July to September 2017 with technique of Termite Baiting System (TBS). Then the activities continued next year continuously by applying the technique of TBS. The Central Library Universitas Sumatera Utara was established in 1970 has an area of 6,090 square meters of 3 ha of land, consisting of 4 floors. The library serves more than 24,000 students and 1650 lecturers with 120,000 titles or 460,000 copies of printed material, with an annual increase of 15,000 copies. There are 9782 theses, 257 dissertations, 2956 scientific papers with a total of 12,995. The current collection of UPU USU Library includes books, theses, theses, dissertations, reference materials, magazine research reports, and audio-visual materials (Respiratory USU, 2017). This library material is served openly as a book, the possibility of human damage as a borrower of books is high enough. The extent of damage to the literature of the book is enlarged by the high frequency of borrowing, the age of the collection that has been too long, and the effort of countermeasures that have not been done perfectly.

III DATA ANALYSIS

This termite control activity is conducted by researchers, research assistants and USU library staffs. SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) is done to audit the condition of the library and its environment and the willingness of the budget. Furthermore, according to [12], [13], [15] and [26] doing three stages of process of termite control at Central Library of Universitas Sumatera Utara are:

3.1. Planning

At this stage, we must pay attention to questions about what to do in the next activity, what, why, who, where and how to do the activities.

- a. **What** to do: to get rid of termite problems in the library (building, shelf and book collection).
- b. **Why**: about eradication is termite control without destroying buildings, disrupt users, activities and environmentally friendly.
- c. **Who**: who is involved in this activity are the staff at the USU Library, namely: librarian, library honorary staff, Kasubag TU, administrative staff, research team and controller termites at Central library of USU.
- d. **Where**: Central library University Sumatra Utara.
- e. **How**: Through three stages of termite control process in University Library of North Sumatra.

3.2. Actuating and Reflection

According to [14], [16], and [17], there are three stages in the actuating and reflection stages:

- a. Pre-Termite Control Activities
 - 1) The first phase in actuating reflection and pre-activity termite control. Activities in this stage are: Survey, observation, research of termites and interviews with other relevant agencies regarding termite control activities.
 - 2) Observations and interviews with termite control researchers or termite control
 - 3) Create proposal of termite control or termite control
 - 4) Introduce and submit proposals of termite control activities to the USU Research Institute and Head of Research Institute for Forest Fiber Technology

b. Termite Control Activities

After the boss (Rector, Head of Research Institute) agrees to the proposal or proposal of termite control activities then this activity is ready to be done. Next step is to survey the termite attack to determine the type of attack and determine the solution to control. This activity has been carried out by the USU Research Team as one of the ways in termite control that disturbed at Central Library of USU.

3.3. Evaluation

Observation activities have been conducted in the stage of termite control activities aimed at identifying the dominant termite species, controlling and preventing termite attacks on books in the Central Library of USU. This activity was conducted intensively in July 2017 until September with the technique of Termite Baiting System (TBS). Then the activities continued every year on a continuous basis according to the budget managed from the University of North Sumatra. As a result, termites along with their colonies die and there is no termite interference in the library and surrounding areas.

IV. RESULTS AND DISCUSSIONS

4.1. Planning (Planning)

Table 1 describes the steps in answering the SWOT question.

Table 1. SWOT analysis in solving termite problem in Central library of USU.

What	Why	Who	Where	How
1. Sanitation room	Termite control	Librarian, librarian	Central Library	1. Planning
2. Maintain moisture	become	honorary staff,	Universitas Sumatera Utara	2. In the act of reflection
3. Samples and check books and shelves	easy to simulate, check	Kasubag TU, administrator		3. Evaluation
4. Penetration of light	environmental iron	research team		
5. Spray of fumigation and insecticide	friendly and	controller Termites Librarian USU		

The results of the survey and research conducted by the researchers in 2 rooms, namely space Deposit Thesis/ Dissertation (DTD) and Short Collection and Loan (SCL) yield data in Table 2 below.

Table 2. Identification of type termites in Central library of USU

Identify the termites	Identify the nest	Identify the entry point	Identify of causes
Coptotermes spp dan Microtermes spp (Subterranean Termites)	In the surrounding soil surface libraries and within the foundations buildings and bookshelves	Library walls and library floor	Cellulose is the source termite food

4.2. Termite Baiting System

The Termite Baiting System (TBS) procedure is as follows of [18], [19], [20], [22], [23], [24] and [25] such as:

- a) Installation. All locations of the Termite Baiting System (TBS) are covered in In-Ground Station. The bait station is buried in the ground around the building or the library building every 6 meters. The feed station contains wooden bait to lure termites that are looking for food. Furthermore, Above-Ground Station, a feed station mounted directly to the building being attacked. Direct feed stations containing termites have a network of forms favored by termites.
- b) Monitoring or Monitoring. Regular monitoring or monitoring is carried out on both stations. Wood baits are

replaced by circuit II if other active attacks are found in wooden bait. Monitoring is also conducted on the Above-Ground Station to ensure that the feed has been ingested, and the amount of feed enough for further monitoring. At the time of monitoring, inspections were also conducted on the area around the station and other areas deemed important to anticipate a new termite attack.

- c) Elimination or deletion. Performed by routine inspection and replacement of In Ground Station and Above-Ground Station 2 networks every week until termite colonies are eliminated. The results showed after treatment of termite colonies was eradicated and did not reappear.
- d) Follow-up monitoring After the removal of the colony of this process is complete, termite investigators of the USU Library will continue to monitor Above-Ground Station and Circuit changes II at In Ground Station with WMD/wood feed back. They again check the station, building and surrounding bait every month to position, re-apply or refill the feed, if necessary.
- e) Post termite control activities
- f) The attractiveness materials used in this termite control activities are safe for users and residents of the library so that the activities at the University Library of North Sumatra can be done as usual and the termite control activities can achieve the expected target.

Furthermore, it is done by making the material of neem leaf (*Azadirachta indica*), tobacco leaf (*Nicotiana tabacum*), rubber cassava leaf (*Manihot glaziovii*), and betel nut (*Areca catechu*) in the following way. The areca nut used in the core of the endosperm of betel nut is washed with water and dried for 1 week to reduce the water content and then blend until it becomes powder and then filtered with flour sieve. The neem leaves, manihot leaves and tobacco in 1 week to reduce water content and then blend to a powder and filtered with a sieve of flour.

Table 3. The total termites dead during research in Central library of USU

Treatment	Termites death on the week-												Mean
	1	2	3	4	5	6	7	8	9	10	11	12	
Neem leaves	1	1	2	2	3	3	3	4	4	5	6	7	3.42
Tabacco leaves	2	3	3	4	5	5	6	7	7	8	9	1	5.58
Manihot leaves	1	2	2	3	3	4	4	5	5	6	7	8	4.16
Betle nut	3	4	5	6	7	8	9	1	1	1	1	1	8.83

3.3. Evaluation and Advice

To control the presence of termites in the University Library of North Sumatra, routine and periodic and continuous periodic control activities with the Termite Baiting System (TBS) method should be conducted every year as suggested in this study. Furthermore, in further research made the composition of extract and tool design in eradicating pests in the Central Library of Universitas Sumatera Utara.

IV CONCLUSIONS

Based on the results of research in the University Library of North Sumatra can be concluded that the results of surveys and research shows the type of termites that attack the Library The University of North Sumatra is a type of *Coptotermes* spp and *Microtermis* sp. The termite control or termite control has been done at the Central Library of Universitas Sumatera Utara using the technique of Termite Baiting System (TBS) is safe to use without damage to buildings, disrupt users, library and environmentally friendly activities. The results show the higher number of termites in $F_{1799,3}=0.328^*$ with zero days after application. Based on the research recorded in sampling for 3 months with 4 treatments had a significant effect on the percentage of the number of termites that died and collected with the value of F is 86.27, $p < 0,000$ and the percentage of death is $F = 59.13$ ($p < 0,000$). Pearson correlation value recorded percentage of termite mortality ($r = 0.349^{**}$) and percentage of book affected ($r = -0,597^{**}$) showed a very significant relationship. Betel nut pellet is the best attractant in controlling termite pests, followed by tobacco plants, poisonous yams, and neem. SWOT method with three stages, in the form of planning, activity and reflection (actuating and reflexion) and evaluation (evaluation) is the right step in controlling termites at Central Library of Universitas Sumatera Utara.

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