Field evaluation of subterranean termites palatability on treated pine wood in Alam Sinarsari Residence, West Java

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Abstract. Pine wood has been commonly utilized as bait wood in controlling termites by using a baiting system. This research aims to evaluate the palatability of subterranean termites against pine wood by boiled treatment, steamed, hot vapor pressured, and oven in Alam Sinarsari Residence, Bogor, West Java, Indonesia and analyze the distribution of termites and identity the termite species that attack bait wood. The size of bait wood refers to ASTM D 1758-06. There were four treatments of bait wood; steam treatment (100°C), boiling treatment (100°C), hot vapor pressure treatment (1 bar and 105°C) for five hours each and oven treatment (103 ± 2°C) for 48 hours. As a comparison, bait wood without treatment was prepared as a control. The result showed that bait wood using boiling treatment had more active subterranean termites than others. The identification result showed that there were 4 species of subterranean species (Macrotermes sp., Odontotermes sp., Microtermes sp., and Schedorhinotermes sp). The highest frequency of termites attack was in bait wood using oven treatment, and the highest damage intensity was in hot vapor pressure treatment. Based on the rating system the best treatment for bait wood treatment is hot vapor pressure treatment and boiling.

1. Introduction
Termites are wood destroying organisms such as furniture, frames, and building construction that cannot be ignored. The loss caused by termite attack is tremendous and even the amount continues to increase every year. The amount of economic loss in Indonesia caused by termite attacks according to Nandika et al. [1] reached 1.67 trillion in 1995, 2.79 trillion in 2000, 5.17 trillion in 2010, and 8.68 trillion in 2015. This significant economic loss cannot be overlooked; therefore, an efficient termite’s management is necessary. One way to control termites is to provide bait in the form of material preferred by termites, one of which is pine wood.

Pine wood is the most preferred wood by termite. According to Subekti [2] pine wood is one of the wood favored by termites, and it is also supported by Arinana et al. [3] which showed that termites preference towards pine wood is higher than other species that are investigated in the study, namely acacia wood (Acacia mangium), rubber wood (Hevea brasiliensis), and falcata wood (Falcatoria molucana). Pine is also an attractant for termites therefore it can be used as bait for termites. Attractant function can be obtained from various types of plants that have a distinctive aroma. Referring to the research of [4], pine wood is one of the food sources for termite thus, it is suitable to be used as bait for termite control.
Pine wood has been used commercially in Sentricon Colony Elimination System as termite bait [5]. Baiting system is an environmentally friendly method to termite control [6]. The feeding method is a method that applies slow action poisonous substances to bait wood and utilizes the termites trophallaxis. Trophallaxis is termite's behavior of feeding each other so that termites that have eaten the bait wood will spread the poisons contained in the bait wood into their colonies [1]. However, the utilization of pine wood as bait wood for subterranean termites apparently does not provide sufficient attraction for termites, therefore further efforts are needed to elevate termite preferability to pine wood.

Arinana et al. [7] has conducted research to increase C. curvignathus preference towards pine wood in laboratory scale by several treatments including steaming, boiling, and presto for 5 hours each. The results showed that the treatment has the potential to increase termite preference for pine wood with the highest percentage of weight loss increased by 20.32% in the presto treatment. However, further field scale is necessary to evaluate the effectiveness of this treatment. The suitable place to install the baiting stations is in the residence area. Therefore the research is conducted in Alam Sinarsari Residence, Bogor, West Java, Indonesia.

This study is expected to provide information about the termite species in Alam Sinarsari Residence, Bogor, West Java, and data regarding the preeminent treatment that can be established to the bait wood for subterranean termites to solidify the diversity of subterranean termites in the location.

2. Materials and Methods

2.1. Time and Location
This research was conducted from January to July 2019 in Alam Sinarsari Residence, Bogor, West Java, Indonesia. The position of the northern part wood sample was at coordinates of 6°34'45.90"S 106°43'58.26"E, western part at coordinates 6°34'53.87"S 106°43'49.11"E, southern part at coordinates of 6°35'10.02"S 106°43'51.15"E, and eastern part at coordinates of 6°35'3.17"S 106°43'57.40"E. Location and installed wood samples as shown in Figure 1. Sample preparation and identification of termites was conducted at the Laboratory of Wood Quality Improvement Technology, Department of Forest Products, Faculty of Forestry, IPB University. Soil analysis was carried out at the Indonesian Center for Biodiversity and Biotechnology (ICBB), Bogor.

![Figure 1](image.png)

**Figure 1.** Location and installed wood samples in Alam Sinarsari Residence, Bogor, West Java

2.2. Materials and Equipment
The material used in this study was pine (*Pinus merkusii*) logs from Ciampea, Bogor with a diameter of ±40 cm. The log was then sawed into boards and turned into wood samples (stakes) in accordance to the
American Standard Testing and Materials (ASTM) D 1758-06 [8], with the dimension of 2 x 2 x 46 cm. The wood part that was utilized in this research was sapwood. Another material that was employed in this study is water for the boiling and steaming process, alcohol 70%, and oil paint (red color). The equipment used in this research includes Global Positioning System (GPS), bottles for termite collection, brushes, a digital camera, sandpaper, a stereo microscope, using LCD Digital Temperature Humidity Data Recording Logger Meter, transparent plastic, and a soil driller.

2.3. Methods

2.3.1. Sample test preparation
The wood samples (stakes) were sanded to remove the residual fibers after the cutting process. Treatment for the wood sample consisted of boiling, hot vapor pressure treatment using an autoclave, and oven. The arrangement for boiled and steamed treatment were 5 hours at 100°C. Hot vapor pressure treatment was carried out for 5 hours with a pressure of 1 bar and a temperature of 105°C. Meanwhile, the oven treatment was carried out for 2 x 24 hours with a temperature of 100 ± 2°C. As a control, untreated pine wood was prepared. After treatment, the wood sample was air dried until the moisture content was < 20%. The dry wood samples were then sanded to remove resin that sticks to the surface. After that, the tip of each wood sample was marked by paint and markers so each wood sample can be easily distinguished. The marking of the wood sample was done based on the following manners: K (steamed treatment), R (boiled treatment), A (hot vapor pressure treatment), O (oven treatment), and C (control). Furthermore, the wood sample was conditioned to air dry and weighed to find out the initial weight (W₁) before being exposed at the research site.

2.3.2. Field test and wood sample baiting
The wood sample was installed in Alam Sinarsari Residence, Bogor, West Java. The stakes were installed around the house and outdoor structures on the property in areas that were not covered by concrete or other artificial barriers. Some stakes were also installed in outdoor community areas such as playgrounds, gardens, etc. Stakes amounted to as many as 285 pieces, spread around the housing areas in Alam Sinarsari Residence. Stakes were installed vertically into the soil so that half was below the soil surface [8], as shown in Figure 2. The coordinates of all stakes were determined by using GPS. Stakes were being installed for three months and observation was performed every month. After three months, the stakes were removed, cleaned, conditioned until air dry weighed to find out the initial weight (W₂), then the attack frequency and the damage intensity of stakes was calculated.

Figure 2. Installation of stakes
2.3.3. Soil characteristic analysis
Soil sampling was conducted at five points: four points in the cardinal directions (Eastern, Western, Southern, Northern part) and one point in the middle of the field test location. The soil sample was taken at least 1 kg at each point with 0-25 cm depth and then put in transparent plastic. All soil samples were analyzed at the ICBB Laboratory, Bogor (an ISO/IEC17025 certified laboratory) to measure the soil pH, C-organic content, and texture.

2.3.4. Temperature and humidity measurement
The temperature and humidity measurement were performed using LCD Digital Temperature Humidity Data Recording Logger Meter. The device was placed in one of the houses of the resident. Measurement of temperature and humidity was conducted for three months with data collection for every five minutes at the observed area.

2.3.5. Identification of termites species
Termites on the attacked samples were taken and put into specimen bottles that already contained alcohol 70%. The species of the soldier termites were than identified based on literature and key identification [1,10]. The collected termites were photographed and observed by microscope under 10x magnification for the entire termite body shape.

2.3.6. The attack frequency of the subterranean termites on the stakes
Attack frequency is the ratio between the number of attacked samples and the total wood samples in the Alam Sinarsari Residence, expressed in percent. According to Cookson and Trajstman [11], the attack frequency data are classified into six classes that then modified as shown in Table 1.

| No | Frequency (%) | Category |
|----|---------------|----------|
| 1  | 0             | None (Uninfested) |
| 2  | 01-10         | Very low |
| 3  | 11-20         | Low      |
| 4  | 12-30         | Moderate |
| 5  | 31-40         | High     |
| 6  | > 40          | Very high |

2.3.7. The damage intensity of the stakes
Damage intensity of the stakes consists of three data, namely weight loss, wood damage percentage of stakes, and wood damage grading system. Weight loss is the ratio between the weight of stakes (before and after baited in Alam Sinarsari Residence) and the initial weight of the stake, expressed in percent. The weight loss value is calculated using this following equation:

$$WL = \frac{(W_1 - W_2)}{W_1} \times 100$$

where:
WL: Weight Loss (%)
W1: Weight of air-dried stake before baiting(g)
W2: Weight of air-dried stake after baiting(g)

The wood damage percentage of stakes is the ratio between the length of cross-sectional damage on the attacked sample with the initial width or thickness expressed in percent. The damage percentage is classified into seven classes: uninfested to more than 70% of cross-sectional damage [8].
The wood damage grading system are classified based on the percent loss of cross-section to attacking subterranean termite [8]. The grading system of stakes attacked by subterranean termite can be seen in Table 2.

**Table 2.** The grading system of stakes attacked by subterranean termite [8]

| Grade no. | Description of condition                        |
|-----------|------------------------------------------------|
| 10        | No attack, 1 to 2 small nibbles permitted       |
| 9         | Nibbles to 3% cross section                     |
| 8         | Penetration 3 to 10% of cross-section            |
| 7         | Penetration 10 to 30% cross-section              |
| 6         | Penetration 30 to 50% cross-section              |
| 4         | Penetration 50 to 75% cross-section              |
| 0         | Failure                                         |

2.4. Data analysis
The qualitative data was presented in pictures or graphics and then was explained descriptively, while quantitative data were delivered using means values that were regenerated using Microsoft Excel 2016. The preeminent treatment was determined based on the highest total score (1-5) of the infestation frequency of subterranean termites and the damage intensity of the stakes.

3. Results and Discussion

3.1. Soil characteristic analysis
The results showed that the C-organic content in Alam Sinarsari Residence ranged between 0.69-1.78%. Mahaney et al. [12] states that subterranean termites have a role in increasing the content of organic matter in the soil, which is also supported by the research of Lee and Wood [13] that the land in which there is termite activity has a high content of organic matter. The C-organic content at subterranean termites *Odontotermes* sp. tunnel was 0.576%, and the C-organic content of the surrounding soil was 0.536% [13]. Meanwhile, the research result of Arinana et al. [14] showed that the average C-organic content in residential areas in DKI Jakarta Province was 2.02%. The C-organic content in the study site is lower from the results of Arinana et al. [14] located in DKI Jakarta Province.

The results showed that the soil pH at the study site was 5.49-6.85. Soil pH values are included in the slightly acidic group. Kaschuk et al. [15] states that aside from living in the soil that has a neutral pH, subterranean termite are also able to live in the soil has a slightly acidic pH, which is between 4.23-5.46, so the soil pH is at the research location is still suitable to support termite life.

Meanwhile, the soil texture at the research location is classified as a clay type. In general, termites dislike sandy soils and chooses clay-rich soils [13]. Based on these results, the Alam Sinarsari Residence environment is a habitat that is suitable for supporting termite life. Soil characteristics in Alam Sinarsari Residence can be seen in Table 3.

**Table 3.** Soil characteristic in five points in Alam Sinarsari Residence, Bogor, West Java

| Soil characteristic | Measurement points |
|---------------------|--------------------|
|                     | Center | South | North | West  | East  |
| C-Organic (%)       | 1.78   | 1.43  | 1.34  | 0.69  | 1.70  |
| pH                  | 6.40   | 6.29  | 6.28  | 6.85  | 5.49  |
| Sand (%)            | 14     | 19    | 11    | 14    | 11    |
| Silt (%)            | 15     | 20    | 14    | 9     | 14    |
| Clay (%)            | 71     | 60    | 75    | 77    | 74    |
| Soil Texture        | Clay   | Clay  | Clay  | Clay  | Clay  |
3.2. Temperature and humidity

The results showed that the temperature and humidity in Alam Sinarsari Residence are very suitable for the development of termites. The highest temperature recorded at the research location was 35.8°C and the lowest temperature was 23.2°C. Meanwhile the highest humidity is 94.6% and the lowest humidity is 56%. Some data of temperature and humidity fluctuations in Alam Sinarsari Residence can be seen in Figure 3.

![Figure 3. Data of temperature and humidity fluctuations in Alam Sinarsari Residence, Bogor](image)

The optimal temperature for termites is between 28-32°C, and the optimal humidity is 75-90% [1,16]. Meanwhile, the research by Arinana et al. [16] showed that the average temperature in the tunnel of the Coptotermes curvignathus range is between 29.4-33.8°C. Environmental factors that can influence the development of subterranean termite population are temperature, humidity, rainfall, and food availability. These factors interacting as well as influencing each other. Temperature and humidity are strong factors that influencing termite’s activity [17]. Areas with temperature and humidity that are relatively high are very suitable for the growth and development of wood destroying organisms like termites [18].

3.3. Termite identification

The results showed that not all damaged stakes were found an active subterranean termite in the stakes. The number of stakes with boiled treatment is the highest amount of active subterranean termite found in wood bait that is 19 units followed by stakes with hot vapor pressure treatment and oven with the same amount, each with 14 units. Meanwhile, the number of control stakes was found in 11 units and 9 units of steamed treatment. Based on the identification of species of subterranean termite that attacked the stakes in Alam Sinarsari Residence there were four species namely Macrotermes sp., Odontotermes sp., Microtermes sp., and Schedorhinotermes sp.

![Figure 4. Subterranean termites found on the infested stakes in 10X magnification: (a) Macrotermes sp., (b) Odontotermes sp., (c) Microtermes sp., dan (d) Schedorhinotermes sp.](image)

The body shape morphological of the subterranean termites are presented in Figure 4. Species of Macrotermes sp., Odontotermes sp., and Microtermes sp. members of Termitidae family. Species
belonging to the Termitidae family are commonly found in Asia. Termites *Schedorhinotermes* sp. Members of Rhinotermitidae family commonly found in the tropics region.

All species (four species) of active subterranean termite were found to attack stakes with boiled treatment. This suggests that wood bait with boiled treatment is preferred by all subterranean termite at the research location. Meanwhile, stakes with oven treatment found three species of active subterranean termites. Not founded *Odontotermes* sp. attack the stakes with oven treatment. Hot vapor pressure treatment, steamed treatment, and control each found two active subterranean termite species namely *Microtermes* sp. and *Schedorhinotermes* sp. Both species of termite are found in all stakes. The number of stakes found by active subterranean termite and species of subterranean termite attacking each treatment can be seen in Table 4.

**Table 4.** Amount of stakes found that found active termites and termites species attacked stakes species in each treatment

| Treatments              | Number of stakes with active termites | Subterranean termites species          |
|-------------------------|--------------------------------------|----------------------------------------|
| Control                 | 11                                   | *Schedorhinotermes* sp. (5)            |
|                         |                                      | *Microtermes* sp. (6)                  |
| Steamed                 | 9                                    | *Schedorhinotermes* sp. (4)            |
|                         |                                      | *Microtermes* sp. (5)                  |
| Oven                    | 14                                   | *Macrotermes* sp. (1)                  |
|                         |                                      | *Schedorhinotermes* sp. (3)            |
|                         |                                      | *Microtermes* sp. (10)                 |
| Boiled                  | 19                                   | *Macrotermes* sp. (1)                  |
|                         |                                      | *Odontotermes* sp. (1)                 |
|                         |                                      | *Schedorhinotermes* sp. (4)            |
|                         |                                      | *Microtermes* sp. (13)                 |
| Hot vapor pressure      | 14                                   | *Schedorhinotermes* sp. (5)            |
|                         |                                      | *Microtermes* sp. (9)                  |

Note: The number in parentheses is the amount of stakes that found active termites

The species of subterranean termite were found unevenly distributed at the research location. The northern part is dominated by *Microtermes* sp. and the southern part is dominated by *Schedorhinotermes* sp. *Macrotermes* sp. were found attacking two stakes while *Odontotermes* sp. found attacking one stake. In general, the most dominant termite species attacking stakes is *Microtermes* sp. Subsequently followed by *Schedorhinotermes* sp., *Macrotermes* sp., and *Odontotermes* sp. Distribution of subterranean termite species found attacking stakes in the research location can be seen in Figure 5. The research on the diversity of subterranean termite in residential locations has been done in DKI Jakarta Province [14], Taman Darmaga Permai I Ciampea, Bogor [19], and Bumi Bekasi Baru National Housing, Rawalumbu, Bekasi [20]. Arinana *et al.* [14] stated that found four species of subterranean termites were *Coptotermes curvignathus*, *Microtermes insperatus*, *Macrotermes gilvus*, and *Schedorhinotermes javanicus*. Meanwhile Arinana *et al.* [19] stated that found subterranean termite of *Macrotermes gilvus*, *Odontotermes javanicus*, *Coptotermes curvignathus*, *Schedorhinotermes javanicus*, and *Schedorhinotermes sarawakensis* at the research location, while Arinana *et al.* [20] found subterranean termite species of *Schedorhinotermes* sp. and *Coptotermes* sp. at the research location. Different from the three results of the research, in the three residence locations species found in the subterranean termite of *Coptotermes* sp. which was not found in this research. However, it has similarities that in each research location *Schedorhinotermes* sp.
3.4. The attack frequency of the subterranean termites on stakes

The number of stakes installed at the study site was 285 units. After three months, the stakes were taken out. A total of 84 samples were missing and the number of stakes found in which frequency of attacks and damage intensity are observable and assessable was 201 samples. From the total of 201 stakes, 63 stakes were not infested by subterranean termites so that the frequency of attacks on the overall stakes was 68.5% and stakes damaged by subterranean termite attack but have no active subterranean termite inside of it are as many as 71 samples. According to the classification of Cookson and Trajstman [11] in Table 1, the frequency of termite attacks at the research site can be classified as very high. Compared with the research result of [14] in DKI Jakarta Province, the frequency of termite attacks on bait wood at this research site is greater. In DKI Jakarta Province the frequency of attacks is only 20.7%.

Meanwhile, the attack frequency of termites on stakes for each treatment ranged from 11.4% to 15.4%. The attack frequency of the termites on the stakes by oven treatment has the highest frequency of 15.4%, followed by boiled treatment with 14.4% which is then followed by control with 13.9%. The attack frequency that was found in stakes with hot vapor pressure and steam treatment is below the control sample, consecutively 13.4% and 11.4%. This shows that oven and steam treatment can increase the palatability of termites as it has a higher attack frequency than the control. Complete data on the attack frequency of subterranean termites on stakes are presented in Table 5.

| Treatments     | Amount of initial stakes | Amount of missing stakes | Amount of uninfested stakes | Amount of infested stakes | Attack frequency (%) |
|----------------|--------------------------|--------------------------|----------------------------|----------------------------|----------------------|
| Control        | 57                       | 16                       | 13                         | 28                         | 13.9                 |
| Steamed        | 57                       | 19                       | 15                         | 23                         | 11.4                 |
| Oven           | 57                       | 16                       | 10                         | 31                         | 15.4                 |
| Boiled         | 57                       | 14                       | 14                         | 29                         | 14.4                 |
| Hot vapor pressure | 57                  | 19                       | 11                         | 27                         | 13.4                 |
| **Total**      | **285**                  | **84**                   | **63**                     | **138**                    | **68.5**             |
3.5. The damage intensity of the stakes
The results showed that the percentage of weight loss of stakes due to termite attack ranged between 18.58-24.64%. The highest weight loss was found in the control sample (24.64%), followed by hot vapor pressure, oven, boiled, and steam treatments, consecutively 22.15%, 20.10%, 19.85%, and 18.58%. The weight loss of all treatments was lower than the control sample. The complete data can be seen in Figure 6. This shows that all the treatments are not able to increase the palatability of subterranean termites towards stakes. The higher the value of wood weight loss, the higher the attack occurred in the bait wood. Subterranean termites have extraordinary destructive speed, depending on the size of their colonies [21].

![Figure 6. Weight loss of stakes with various treatments](image)

The highest of wood damage percentage is the hot vapor pressure treatment about 65.77%, followed by boiled, control, and oven treatments sequentially about 65.67%, 65.03%, and 61.070%. The lowest wood damage percentage is steamed treatment which is 52.98%. The complete data can be seen in Figure 7. The wood damage percentage with hot vapor pressure and boiled treatments have greater values than control treatment. This shows the increment of hot vapor pressure and boiled treatments can increase the palatability of termites. Thus, it proves the subterranean termites prefer both of those stakes. Allegedly, the hot vapor pressure and boiled treatments make the resin production of wood higher and the wood becomes more malleable, so it rises the termite consumption rate. The hot vapor pressure and boiled treatments help wood releases the extractive substances excessively [22,23]. The termite consumption rate is supported by the mechanical characteristic of termite bite which prefer the malleable wood or plants [24].

The wood damage percentage with oven treatment is greater than the steamed treatment. In accordance with the research of Widyorini et al. [23], the oven treatment gives a greater response than steamed treatment. The malleable process is also done by boiling or cooking in hot vapor pressure treatment [25]. Based on the obtained results, the hot vapor pressure treatment for 5 hours gives greater result than the steamed, oven, and boiled treatments because of the pressure on the hot vapor pressure treatment will reduce the mechanical characteristic of wood, so the wood becomes more malleable. According to Sukatik [26], applying pressure on wood will reduce the mechanical characteristic of wood.
Figure 7. Wood damage percentage due to termite attack in Alam Sinarsari Residence, Bogor

The result shows the wood damage percentage of control wood is higher than the treatment woods by steamed and oven, but lower than the treatment woods by hot vapor pressure and boiled. This happens because the field test in a residential environment has a different environmental condition so the termite attack on wood bait is not certainty known. The influence of various environmental factors, such as predator, temperature, humidity, and the availability of litter on the land surface also influence the presence and growth of termites at the location [27]. The sample location is also being an attack factor for the wood bait. If the amount of termite consumption in the research location is already available in large quantities, that will be possibility termites will not attack while the supplies still exist [28].

3.6. Stakes grading score

The results showed that the stakes grading score was classified as a value of 4. The complete grading score can be seen in Table 6. There was no difference in the grade score rate, both in the control and treatment of wood. The results of the grade score rate classification analysis differ from the percentage of the stakes damage. Classification into the grading score that no treatment can increase the termite palatability of the stakes.

Table 6. Percentage and grade number of stakes

| Treatments              | Wood damage percentage | Grade Number |
|------------------------|------------------------|--------------|
| Control                | 65.03                  | 4            |
| Steamed                | 52.98                  | 4            |
| Oven                   | 61.70                  | 4            |
| Boiled                 | 65.67                  | 4            |
| Hot vapor pressure     | 65.77                  | 4            |

The form of a stakes grading system with various treatments after being installed for three months at the study site can be seen in Figure 8. Some stakes have lost their mass due to being eaten by subterranean termite. Not only does the termite make a chewed spot transversely, but they take up the entire transverse direction of stakes. Visual observation is known to be able to measure the level of wood damage by using calipers for the depth of attack. The higher the level of attack on stakes, also shows the higher level of termites' preference for wood.
Figure 8. Form of various treated stakes damages after baiting for three months period in Alam Sinarsari Residence, Bogor: failure (a), medium damage (b), no attack

3.7. Determination of the highest quality treatment

Based on the highest total score of the total number of active termites found in stakes, the frequency of termite attacks, and the intensity of stakes damage (weight loss, percentage of wood bait damage, wood grading score), the best treatment is boiled and hot vapor pressure (each with a score of 16). The recapitulation of the best treatment score can be seen in Table 7. Boiled treatment and hot vapor pressure are thought to reduce the resin and make the wood softer without changing the chemical components in the wood. The chemical structure of wood does not change until the temperature of 150°C, instead the wood begins to experience chemical structure changes starting at a temperature of 180°C [29].

Table 7. Recapitulation of the best treatment scores from various treatments

| Parameter                          | Treatment Score |
|-----------------------------------|-----------------|
|                                   | Control | Steamed | Oven | Boiled | Hot vapor pressure |
| Amount of stakes found that found active termites | 3       | 2       | 4    | 5      | 4 |
| Attack frequency                  | 3       | 1       | 5    | 4      | 2 |
| Damage intensity:                 |         |         |      |        |               |
| Weight loss                       | 5       | 1       | 3    | 2      | 4 |
| Damage Percentage                 | 3       | 1       | 2    | 4      | 5 |
| Grading score                     | 1       | 1       | 1    | 1      | 1 |
| Total skor                        | 15      | 6       | 15   | 16     | 16 |

Note: The score value is from 1 to 5. The higher the score shows that the treatment is the best treatment

4. Conclusions

Boiled treatment at 100°C for 5 hours and treatment with hot vapor pressure treatment (1 bar 105°C for 5 hours) using autoclave against pine wood has the potential to increase the palatability of subterranean termites. Both of these treatments are the best treatments in increasing the possibility of subterranean termite against pine wood. Subterranean termite are found in Alam Sinarsari Residence, Bogor, West Java are Macrotermes sp., Odontotermes sp., Microtermes sp., and Schedorhinoterms sp. Termite species are spread unevenly and dominated by Microtermes sp. (64.17%).
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