Activities Test of Ethanol Extract to the three Varieties of Zingiber officinale Rosc Rhizomes to Coptotermes curvignathus Holmgren

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Abstract: Zingiber officinale Rosc rhizomes, is one of the plants from Zingiberaceae Familia which is contains terpenoids and have enough toxins to control Coptotermes curvignathus Holmgren. Besides from Zingiberaceae Familia it also known can control Siphophus zeamaats Monchbulsy and Tribolium castanum (Herbst) adult effectively. The activities test of ethanol extract to the 3 varieties of Zingiber officinale rhizomes to Coptotermes curvignathus Holmgren as a result IC₅₀ from the smallest to the largest continually Zingiber officinale var rubrum IC₅₀ 160 µg mL⁻¹, Zingiber officinale var amarum IC₅₀ 1659 µg mL⁻¹, Zingiber officinale var officinarum IC₅₀ 4210µ mL⁻¹. Toxicity test of Coptotermes curvignathus Holmgren was using JIS K571 method which has already modified. Fractionation from selected ethanol extract Zingiber officinale var rubrum rhizome were used eluhen n-hexane and ethyl acetate with ratio 10:0, 9:1, 8:2, 7:3, 6:4, 5:5, 4:6, 3:7, 2:8, 1:9, 0:10 continually. The results of fractions activity proved that the most effective fraction as Coptotermes curvignathus controller is n-hexane and ethyl acetate fraction (6:4) with IC₅₀ 2.45µg mL⁻¹.

Keyword: Zingiber officinale, Coptotermes curvignathus, activity

1. Introduction

Coptotermes curvignathus Holmgren termite are insect pests and wood destroyer for buildings that harmful for humans. Economic loss of termite attack in Indonesia is quite large such as in Bogor city reached more than 1 trillion rupiah [2].

Termite control recently is still based on the chemical control. A result of using of discretion chemical control has a negative impact such as the occurrence of pest resistance, non-target killing of the body, and the residual effects on the unfavorable environment.

Another alternative controlo to do is by biologically control such as the use of extractive substances gained from plants. One of the plants that can be used as a termite control is from Zingiberaceae Familia which is Zingiber officinalerhizome. This research will be use 3 different varieties which each variety we expected to know how it can control Coptotermes curvignathus

This research is expected to give some contribution to the development of science, especially in the field of management of healthy and friendly environmental agriculture.

2. Methods and Materials

Materials which used in this research are Z. officinale var rubrum, Z. officinale var officinarum and Z. officinale var amarum. For the anti termite test was used Coptotermes curvignathus. For process of extraction and fractionation was used silica gel GF254, silicagel 60 G, silica gel 70-230 Mesh ASTM, ethanol, n-hexane and ethyl acetate materials.

Termite Activity Test

Z. officinale var rubrum, Z. officinale var officinarum and Z. officinale var amarum rhizome extract activities are being tested to C. curvignathus termite with JIS K 571 methods [1] which has already modified. Wood which already weighed is tested with the size of 2x2x1 cm³. Wood that has been given the extract is placed on the glass test, and then allowed to take an appropriate place with the relative humidity environments. Wood used for the control without the addition of feed extract. In the case of against termites, wood that had been treated inserted into a plastic container. Each sample was given as 50 worker termites and 5 healthy soldier termites which have been conditioned. Closed cup test black netting and stored in a dark place for 3 weeks.

The result of fraction gained are being tested to C. Curvignathus termite with JIS K 571 methods [1] which has already modified. Fractionation that has been done to Zingiber officinale var rubrum rhizomewhich has lowest IC₅₀ were used eluent with ratio 10:0, 9:1, 8:2, 7:3, 6:4, 5:5, 4:6, 3:7, 2:8, 1:9, 0:10 continually.

3. Results and Discussion

Activity test of ethanol extract to the 3 varieties of Z. officinale against termite C. curvignathus showed that the lowest IC₅₀ of Z. officinale var rubrum is the most effective termite control capability between the two other varieties. Profile extract the three varieties can be seen in Figure 1.

To learn more about the most effective substances performed in fraction at ion of the ethanol extract of selected rhizome Z. officinale with the smallest IC₅₀ value. The result of fraction activity test gained as the most effective fraction.
to control subterranean termites *C. curvignathus* which are n-hexane and ethylacetate(6:4) with 2:45 IC$_{50}$µg/mL-1, fraction profiles can be seen in Figure2.

The ability of *Z. officinale* are effectively to control *C. curvignathus* because it contains sesquiterpene, it is like another member of the family Zingiberaceae rhizome of *Curcuma zedoaria* that contains 1,8-cineole (18.5%), o-and p-cymene (18.42%) and alpha-phellandrene (14.93%) its effective enough to kill termites *Odontotermes obesus* Ramb with 24 hours incubation period [4].

*Z. officinale* Rosc, known as an Acetylcholinesterase inhibitor [3] so it have potential function as one of the alternative that can be used to control subterranean termites. Acetylcholinesterase test to the inhibitor fractions of ethanol extract of the rhizome *Z. officinale* selected will be done in further research.

**Table 1: IC$_{50}$Three Varieties of Zingiber Officinale**

<table>
<thead>
<tr>
<th>Variety</th>
<th>IC$_{50}$ (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Z. officinale</em> var rubrum</td>
<td>160</td>
</tr>
<tr>
<td><em>Z. officinale</em> var officinarum</td>
<td>4210</td>
</tr>
<tr>
<td><em>Z. officinale</em> var amaranum</td>
<td>1659</td>
</tr>
</tbody>
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1. *Z. officinale* var rubrum  
2. *Z. officinale* var officinarum  
3. *Z. officinale* var amaranum

**Figure 1:** TLC ethanolextract Three Varietiesof *Zingiber Officinale* Rhizomes

**Figure 2:** TLC *Zingiber officinale* var *rubrum* Fraction (n-hexane:ethyl acetate =7:3)

4. Conclusion

*Zingiber officinale* var *rubrum* can control *C. Curvignathus* termites with IC$_{50}$ 160 µg/mL-1 effectively. The results of fractions activity proved that the most effective fraction as *C. curvignatus* controller is n-hexane and ethyl acetate fraction (6:4) with IC$_{50}$ 2.45 µg/mL-1.

**References**


