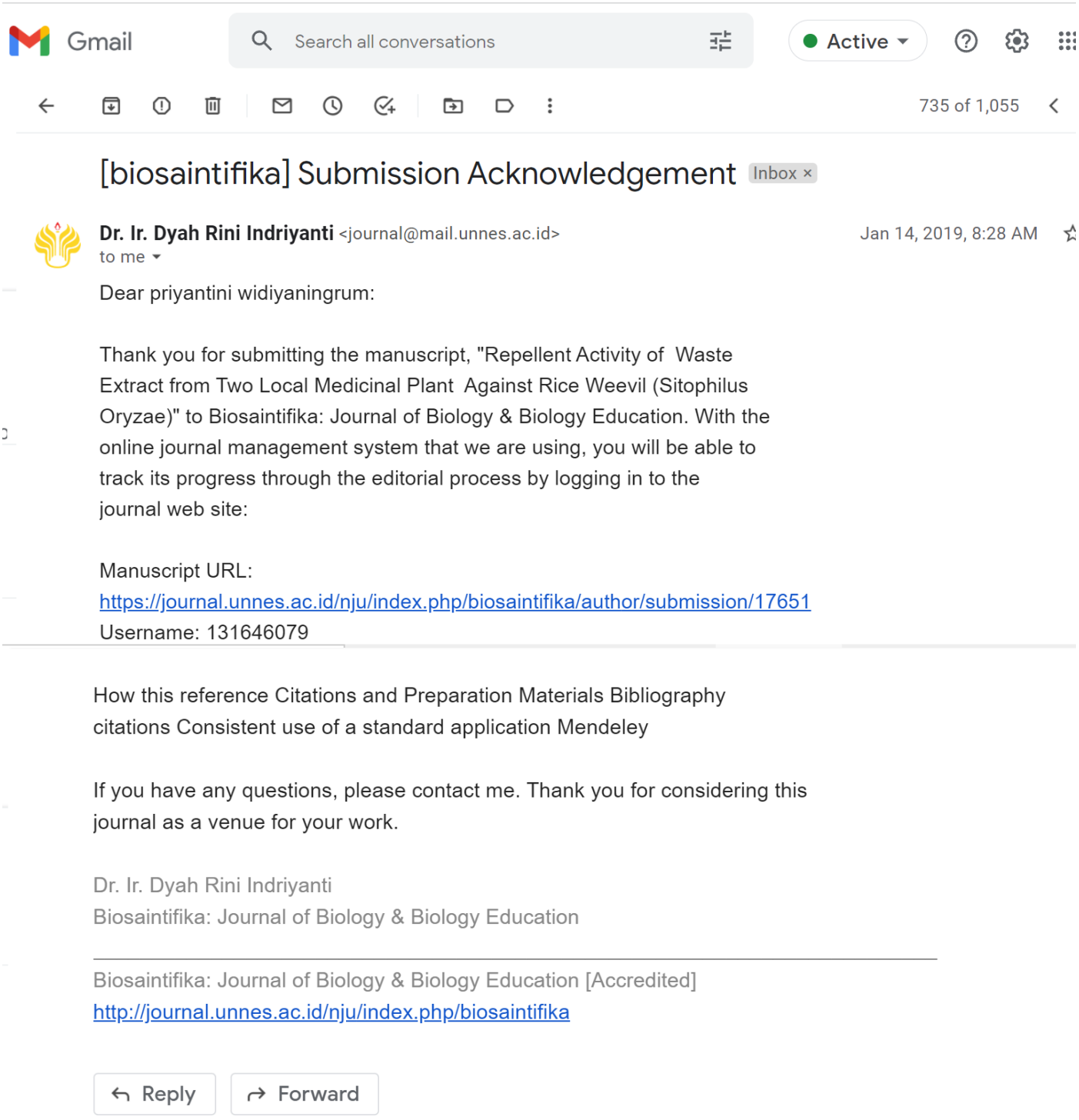
BUKTI KORESPONDENSI



Gmail Search all conversations Active

735 of 1,055

[biosaintifika] Submission Acknowledgement Inbox ×

Dr. Ir. Dyah Rini Indriyanti <journal@mail.unnes.ac.id> Jan 14, 2019, 8:28 AM
to me

Dear priyantini widiyaningrum:

Thank you for submitting the manuscript, "Repellent Activity of Waste Extract from Two Local Medicinal Plant Against Rice Weevil (Sitophilus Oryzae)" to Biosaintifika: Journal of Biology & Biology Education. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL:
https://journal.unnes.ac.id/nju/index.php/biosaintifika/author/submission/17651
Username: 131646079

How this reference Citations and Preparation Materials Bibliography citations Consistent use of a standard application Mendeley

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Dr. Ir. Dyah Rini Indriyanti
Biosaintifika: Journal of Biology & Biology Education

Biosaintifika: Journal of Biology & Biology Education [Accredited]
http://journal.unnes.ac.id/nju/index.php/biosaintifika

Reply Forward

#17651 Summary

SUMMARY | REVIEW | EDITING

Submission

Authors	Priyantini Widiyaningrum, Devy Candrawati, Dyah Rini Indriyanti, Bambang Priyono
Title	Repellent Activity of Waste Extract from Two Local Medicinal Plant Against Rice Weevil (Sitophilus Oryzae)
Original file	17651-42501-1-SM.DOCX 2019-01-14
Supp. files	None ADD A SUPPLEMENTARY FILE
Submitter	priyantini widiyaningrum
Date submitted	January 14, 2019 - 01:25 AM
Section	Articles
Editor	None assigned

Status

Status	Awaiting assignment
Initiated	2019-01-14
Last modified	2019-01-14

Gmail Search all conversations Active

725 of 1,055

(no subject) Inbox ×

Jurnal Biosaintifika <biosaintifika@mail.unnes.ac.id> Feb 15, 2019, 7:36 PM
to me

yth bu Wiwit ini hasil review mhn disesuaikan dengan saran terima kasih

Nationally Accredited by Ministry of Research, Technology and Higher Education, Number 2/E/KPT/2015

Biosaintifika: Journal of Biology & Biology Education [p-ISSN (Print) 2085-191X | e-ISSN (Online) 2338-7610**]** published scientific papers on the results of biological research and education covering the fields of biology including botany, zoology, environmental, and biotechnology. Editor accepts the article has not been published in other media with the writing format as listed on page manuscript writing guidelines. Manuscripts will be reviewed by an expert editor and managing editor. The journal has been indexed in Google Scholar, DOAJ, DOI Crossref, EBSCO, CABI and published three times a year, on April, August & December.

https://journal.unnes.ac.id/nju/index.php/biosaintifika/index

6. Widianingrum (w...

Gmail Search all conversations Active UNNE

720 of 1,055

(no subject) Inbox ×

Jurnal Biosaintifika <biosaintifika@mail.unnes.ac.id> Wed, Mar 6, 2019, 4:57 PM
to me

yth ibu Wiwit bersama ini km krm hsl review bhs inggris ,silahkan dicek kembali yg terbaik terima kasih

Nationally Accredited by Ministry of Research, Technology and Higher Education, Number 2/E/KPT/2015

Biosaintifika: Journal of Biology & Biology Education [p-ISSN (Print) 2085-191X | e-ISSN (Online) 2338-7610] published scientific papers on the results of biological research and education covering the fields of biology including botany, zoology, environmental, and biotechnology. Editor accepts the article has not been published in other media with the writing format as listed on page manuscript writing guidelines. Manuscripts will be reviewed by an expert editor and managing editor. The journal has been indexed in Google Scholar, DOAJ, DOI Crossref, EBSCO, CABI and published three times a year, on April, August & December.

https://journal.unnes.ac.id/nju/index.php/biosaintifika/index

2 Attachments

Gmail Search all conversations Active UNN

713 of 1,055

Jurnal Biosaintifika <biosaintifika@mail.unnes.ac.id> Wed, Apr 24, 2019, 7:03 AM
to me

Kepada Yth Bapak Ibu penulis naskah Jurnal Biosaintifika

Bersama ini kami kirim naskah Bpk ibu yg sudah kami layout, mohon segera dicek sekali lagi apakah ada tulisan, Tabel, Gambar , Referensi dan lain lain yang kurang sempurna. File yg kami kirim berbentuk PDF, apabila ada koreksi, bagian yang akan dikoreksi mohon diberi warna kuning. Lalu dituliskan pada lembar "Word" apa yang seharusnya ditulis. Waktu revisi, kami beri 1 minggu mulai dari email ini dikirim. Jika dalam waktu 1 minggu tidak ada respon, maka kami anggap naskah bpk ibu "tidak revisi". Setelah resmi diterbitkan nanti tidak ada revisi susulan lagi. Untuk selanjutnya mohon dicek perkembangan di website jurnal Biosaintifika. Terima kasih

PDF 10 Priyantini Widiy...

Repellent Activity of Waste Extract from Two Local Medicinal Plant Against Rice Weevil (*Sitophilus Oryzae* L.)

Priyantini Widiyaningrum, Devy Candrawati, Dyah Rini Indriyanti, Bambang Priyono
Department of Biology, Faculty of Mathematics and Natural Sciences
Universitas Negeri Semarang, Indonesia
*) Correspondence Email: wiwiedeka@mail.unnes.ac.id

ABSTRACT

In order to find natural and ~~cheaper~~ inexpensive bioinsecticides, the active ~~components~~ compound of waste extract from two medicinal plants were analyzed. Ethanolic ~~plant~~ extracts of *Amomum cardamomum* and *Zingiber zerumbet* were evaluated under laboratory conditions for their repellency~~t~~ against rice weevil (*Sitophilus oryzae*, L.). Four extracts ~~solution~~ concentration were tested in this research, i.e: 25, 50, 75 and 100%. Efficacy was measured based on the response of rice weevil in preference tests using Y Olfactometer Tube, then the results were converted into the P~~p~~ercentage ~~of r~~Repellency (PR) and Preference Index (PI). The ~~percentage of repellency~~PR data were analyzed using ANOVA, whereas ~~preference index~~PI values were analyzed descriptively. The result showed that the ~~percentage of repellency~~PR were significantly (LSD test; $\alpha > 0.05$)~~,~~ and revealed that waste extracts repel the rice weevil at 100% solution. The highest ~~percentage of repellency~~PR was found at 100% solution in both extracts, however, statistically the repellency of ~~extracting *Amomum* *A. cardamomum*~~ waste extract was higher than *Z. ~~ingiber~~ zerumbet* ~~'s waste~~. Likewise, the ~~preference index~~PI of both extracts showed negative value at 75 and 100% ~~solution~~concentration. This study concluded that extract of *A. cardamomum* ~~Amomum cardamomum~~ and *Z. ~~ingiber~~ zerumbet* wastes have repellen~~cy~~t effect against rice weevil and~~, but~~ *A. cardamomum* repellency ~~cardamom waste~~ is better than *Z. zerumbet*.~~Z. Zerumbet.~~ The findings of this study can provide a useful information for development of a rice weevil repellent extracted from waste product of medicinal plants that is more economically~~The findings of this study can be positive information for people, to develop a newer anti-rice weevil repellent from herbal waste based product, as an alternative repellent that is cheaper~~ and environmentally friendly~~eco-friendly~~ than synthetic insect repellents.

Keywords: *Amomum cardamomum*, *Zingiber zerumbet, Sitophilus oryzae, waste extract, repellent~~,~~*

INTRODUCTION

~~The rice~~Rice weevil (~~-~~*Sitophilus oryzae* L.) is the main pest that causes damage to rice in storage. Adult rice weevil consumes and causes the damage ~~of~~ to rice from the outside, while the larva eats away nutrients from the inner grain of rice. Generally, control of rice weevil and other insects in the storage is performed using the synthetic insecticides such as methyl bromide, phosphine, or sulfuryl fluoride by means of fumigation. Synthetic insecticide is effective because ~~it is~~its toxicity and able to quickly kill~~s~~ the target pest. However, the application of synthetic pesticides has led to some problems including its toxicity and residual effects, environmental pollution, and resistance in insects. The use of

Commented [Mi1]: Rewrite in more appropriate structure to provide a clear and correct information

Formatted: Font: Italic

Formatted: Font: Italic

chemical insecticides has a disadvantage because continuous use will adversely affect the ecosystem and human health (Arif, 2015). The synthetic insecticide leaves a residue that could potentially enter the body through inhalation, dermal exposure, and digestion. In line with government policy regarding organic farming systems that are stipulated in ISO 6729 (BSN, 2016), the use of synthetic insecticides is currently encouraged to be ~~reduced~~ replaced or reduced. One of alternatives is the use of bioinsecticide that has the potential to develop is utilization the botanical insecticides.

Naturally, the plant contains an active component which acts as protection from insect pests. through various methods, including repellent, attracting, antifeedant, and toxicant (Hikal ~~, *et al*~~et al., 2017). According to ~~(~~Guswenrivo ~~*et al*~~et al.~~,~~ ~~(~~2013), ~~an~~ active components such as saponins, alkaloids, flavonoids, triterpenoids and glycosides ~~giving~~ are able to provide the insecticidal effect. Plants that are potential~~ly~~ as ~~a~~ sources of bioinsecticide (Hendrival & Melinda, 2017) are generally comes~~, among others are~~ ~~,~~ from the ~~herbal~~ medicinal plants. Ethnobotany~~–~~ studies in many places of Java ~~it~~ has been revealed that Zingiberaceae was found in many rural communities because this traditional ~~herbal medicine~~medicinal plant ~~has~~ still ~~played~~ plays an important role in treatment of illnesses (Shanthi ~~*et al*~~et al., 2014; (Malini ~~*et al*~~et al., 2017). Most medicinal plants are from ~~The~~ Zingiberaceae Family~~—~~ ~~,contributes to the highest number of medicinal plants, because probably be~~ due to their high ~~–~~compositions of secondary metabolites~~,~~ such as alkaloid, saponin, tannin, and flavonoid (Hartanto~~,~~ ~~*et al*~~et al., 2014).

~~*Amomum cardamomum* and *Zingiber zerumbet* are two of the thousands of plants in the family Zingiberaceae.~~According to the study by ~~(~~Afrina ~~*et al*~~et al.~~,~~ ~~(~~2016) and Wahyuni ~~*et al*~~et al.~~,~~ (2013)~~, stated~~ that *Amomum cardamomum* and *Zingiber zerumbet* contain the active compounds ~~which are~~that can be used as insecticidal. Both of them are from Zingiberaceae family and have became~~me~~ the main commodities of ~~seasoning~~ fragrance materials~~ and~~ in ~~the~~ pharmaceutical industry. That condition makes them economically unprofitable ~~, so economically it's not profitable~~ as a bioinsecticide material.

Most bioinsecticides or insect repellents products are generally produced using natural essential oils. In the harvest period, stems and leaves of both *A. cardamomum* and *Z. zerumbet* ~~plants~~ are often just thrown away, rarely used. ~~–~~Meanwhile, the stem and leaves (postharvest waste) are ~~of the plants~~ also known to contain the insecticidal compounds although only at low levels. ~~This is characterized~~It is indicated by the same ~~aroma~~smell, for example, essential oils. The "essential" term is used because e~~E~~ssential oil represents the smell of the original plant (Mulyani, 2010). ~~(~~Silalahi~~,~~ (2018) found that essential oils of galangal plant (*Alpinia galanga* L.) are ~~found~~ not only in the rhizome but in all organs of plants with varying concentrations. The results of the phytochemical analysis of various plants from Zingiberaceae ~~plants~~ showed the presence of essential oil content, flavonoids, alkaloids, steroids/terpenoids, and saponins in all organs (Tarigan ~~*et al*~~et al., 2016). In an

Commented [Mi2]: Rewrite in more appropriate structure to provide a clear and correct idea

Commented [Mi3]: This should be placed in the end of sentence

Field Code Changed

Field Code Changed

Commented [Mi4]: Rewrite in more appropriate structure to provide a clear and correct information. Make sure you show the idea clearly so that the reader will easily understand.

effort to find the source of ~~cheap~~ affordable bioinsecticides for the control of ~~-~~ rice weevil, this research was conducted to analyze the active compound contained in ~~from waste~~ extracts of *A. ~~momum~~ cardamomum* and *Z. ~~ingiber~~ zerumbet* postharvest waste. This study will provide the information regarding the ability of *A. cardamomum* and *Z. zerumbet* to be used repellents against rice weevil. ~~The findings of this study will inform to farmers that waste extract herbal can be used as the simple repellent on the rice weevil.~~

METHODS

The study was conducted in January - April 2018. *A. Cardamomum* and *Z. zerumbet* ~~plant~~ wastes were obtained from Temukencono herbal garden, Gunungpati, Semarang. Adult rice weevils were obtained from traditional markets. Then, they were~~, then~~ cultured and tested in the laboratory of Biology, Universitas Negeri Semarang.

Insect Preparation

The rice weevil, *Sitophilus~~S.~~ oryzae* L. (Coleoptera: Curculionidae) were used to determine repellent activities of ~~waste extract from~~ *A. Cardamomum* and *Z. Zerumbet* waste extract. Adults rice weevils were reared on the rice in the laboratory at 28 ± 2ºC, and 75±5% of humidity. Breeding (rearing) ~~is~~ was done by ~~investing~~ putting 100 adults of male and female rice weevil into 10 jars, ~~each~~ every ~~of~~ jar ~~which is~~ was filled with rice as a medium for rice weevils maintenance. Every six days, rice was transferred to another jar, with the aim that the eggs left behind will hatch and obtained a relatively homogeneous with the same age range. The first generation of rice weevil was used for experiments.

Commented [Mi5]: Rewrite in more appropriate structure to provide a clear information

Extract Preparation

Material samples from the post-harvest waste of *A. cardamomum* and *Z. zerumbet* (stem and leaves) in a ratio of 1: 1 were washed, cut into pieces and dried ~~in~~ under the shade. Dried samples were milled mechanically and stored in an airtight container. This powder was macerated in 96% ethanol with a ratio of 1: 1 to obtain 100% extract, and then the ~~extract~~ 100% extract was stored in a dark glass bottle. Some extracts were taken to be evaporated and analyzed for ~~its~~ their active compounds contents ~~of the active compounds~~ using Gas Chromatography-Mass Spectroscopy (GC-MS).

Commented [Mi6]: Spectrometry?

Phytochemical Analysis

Phytochemical analysis of extracts was conducted using GC-MS Perkin Elmer method to determine the active compounds contained in the extract quantitatively (Guswenrivo et al., 2013). Active components obtained are shown in Tables and graphs.

Formatted: Font: Not Italic

Repellent Bioassay

Repellent bioassay of *S. ~~itophilus~~ oryzae* adults was studied using Y tube olfactometer (Figure 1) which consists of three glass tubes as arms (10 cm length; 2 cm diameter). The end

Commented [Mi7]: Figure 1 is not appropriate with this sentence. Correct it.

Commented [Mi8]: Provide the image of the Y tube olfactometer installation used in this study

of each ~~glass~~ arm was fitted with a glass vial (3.5 cm length, 2 cm diameter). Arm A was as control, arm B was as treatment and arm C was as the entrance of the insect test. Concentrations of 25, 50, 75 and 100% of the ~~waste~~ extract were applied onto filter paper strips (2 cm diameter) and were allowed to dry for five minutes. The filter paper strips were then placed ~~onto~~ in the inner surface of the glass vials which were attached to the arms B of the olfactometer. Filter paper strip ~~which receives~~with ~~-~~ethanol ~~only~~ was served as control (arm B). After the attachment of the glass vials to the arms of the olfactometer, twenty five adults ~~of~~ rice weevil were ~~introduced~~ entered into the olfactometer via arm A. After 1 hour of treatment, orientation of the direction ~~is~~ was observed with the assumption that rice weevil will choose a safe passage for them, not disturbed by the sharp aroma of waste extracted placed in one of the glass vials. The number of insects that persist in arm A and B was counted. Each treatment was repeated five times. The number of adults found in each glass vial was recorded. The~~–~~ Preference~~–~~ Index~~–~~ (PI)~~–~~ and Percentage of Repellency (PR) were calculated using the formula of Seenivasagan ~~*et al*~~et al., (2014); (Aryani & Auamcharoen, 2016).

$$PI = \frac{Nt-Nc}{Nt+Nc} \qquad PR = \frac{Nc}{Nc+Nt} \; x \; 100\%$$

Nt: number of insects trapped in the crude extract or powder test chamber
Nc: number of insects trapped in the control test chamber

Data of PI is presented in the form of a graph and is analyzed descriptively. If the PI value is negative, it means there is a repellent effect to insect (Jayakumar ~~*et al*~~et al., 2017). The PR is presented in the table of PR ± SD averages. Data of PR was ~~and~~ analyzed using the analysis of variance ~~of~~ (ANOVA) and continued with ~~further~~ LSD test ($\alpha < 0.05$). The percentage of repellency was also converted into criteria according to (Rinaldi ~~*et al*~~et al., 2016) namely :

1. PR value <20% ; no repellent
2. 20% ≤ PR <40% ; low repellent
3. 40% ≤ PR <60% ; medium repellent
4. 60% ≤ PR <80% ; high repellent
5. PR ≥ 80 %: very high repellent

RESULTS AND DISCUSSION

Identification of active compounds using GC-MS showed that waste extract of *A. cardamomum* plant contained 4 major components, i.e. essential oils, fatty acids, saponins, and flavonoids. While, in the extract of *Z. zerumbet* plant, it was found the active compounds of essential oils, fatty acids, flavonoids, and alkaloids. All of them The graphs of the

Commented [Mi9]: Rewrite in more appropriate structure to provide a clear and correct information

Formatted: Justified, Indent: Left: 0.69", Line spacing: single

chromatograms of both extracts are shown in Figure 1 and Figure 2. These components are anti-insecticidal compounds according to ~~(~~Hikal ~~*et al*~~et al.~~, (2017).

Commented [Mi10]: Rewrite in more appropriate structure to provide a clear and correct information

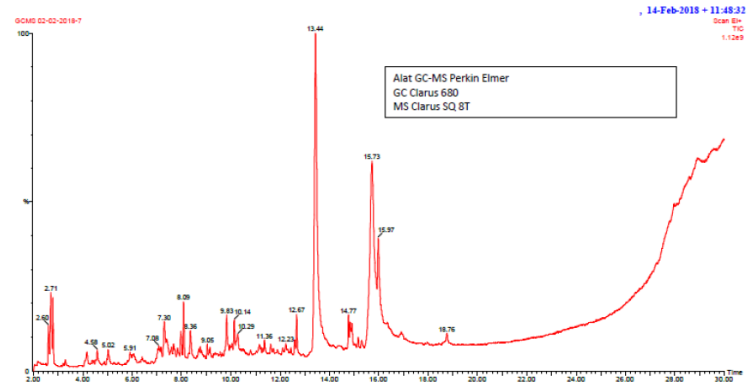


Fig 1. Chromatogram of waste extract from *A. cardamomum* plant

Commented [Mi11]: Do provide a better figure if possible

Both solutions ~~are~~ were dark brown and each of them released a sharp odor like the aroma of *A. cardamomum* seeds and *Z. zerumbet* rhizome.

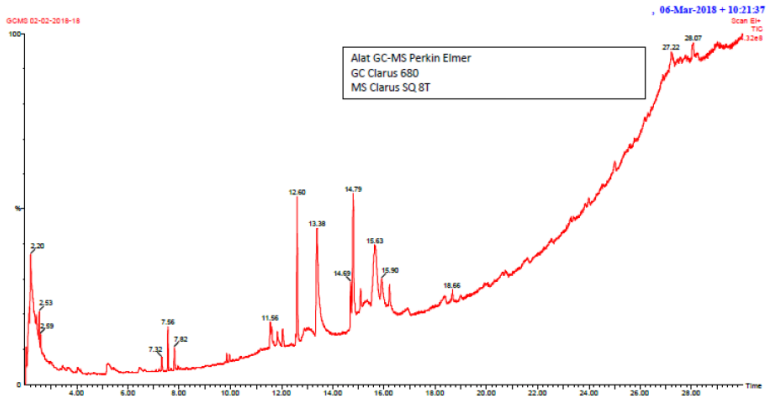


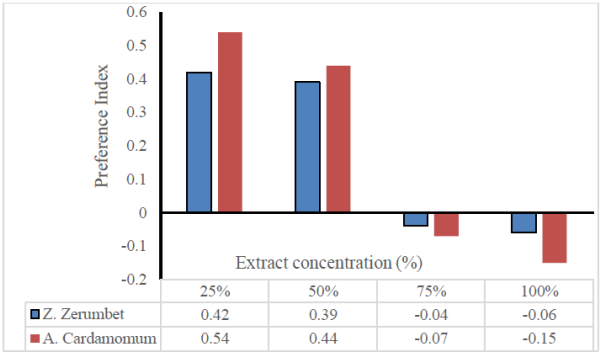
Fig 2. Chromatogram of waste extract from *Z. zerumbet* plant

Commented [Mi12]: Do provide a better figure if possible

Preference Index

~~Two different waste~~Waste extract from *A. cardamomum* and *Z. Zerumbet* ~~plant was~~ were tested for their repellent activity against adults ~~of~~ rice weevil at concentrations of ~~-~~25, 50, 75 and 100% ~~for repellent activity~~. ~~—~~In general, repellency increases with increase in

concentration used in the treatment. The result of this study indicated variation among sources of extract and concentration. The preference index ranged from 23.20 to -0.15 (Fig. 3). ~~Preference index~~PI expresses polarity of the directional/orientation choice. Negative values indicate the repellent activity of extract against rice weevil.



	25%	50%	75%	100%
Z. Zerumbet	0.42	0.39	-0.04	-0.06
A. Cardamomum	0.54	0.44	-0.07	-0.15

Figure 1. Mean value of Preference Index of ~~waste extract from~~ *Z. Zerumbet* and *A. cardamomum* waste extract ~~plant~~

~~This is due to the directional orientation of rice~~Rice weevil preferred to ~~more~~ go to arm B (control) ~~compared~~ than to arm C (treatment), so that, the ~~preference index~~PI value becomes negative. Similarly sources the extract used also influenced the response of rice weevil. (Figure 1). This condition is~~is~~ clearly related to the concentration of the active compound and the aromatic compound that comes out from the extract. The results of GC-MS analysis (Table 1) show the number of active components of essential oils, one of which is a compound of 1.8 Cineol which has been proven to be a repellent compound for various insects (Sainz ~~*et al*~~et al., 2012); (Jemaa, 2014); (Niroumand ~~*et al*~~et al., 2016).

At low concentrations (25% and 50%), the ~~preference index~~PI values of the two types of extract di~~d~~ not provide a repellent effect. In this treatment, the ~~aroma~~ smell of extracts ~~has~~ have not disturbed the olfactory system of test insects. On the other hand, at a concentration of 75% and 100%, the PI value ~~is~~ was negative, indicating that the sensory organs of rice ~~tick~~ weevils detect any ~~aroma~~ odor that disturbs them or that they dislike~~s it~~. According to (Jayakumar ~~*et al*~~et al., 2017), ~~the negative on preference index value is an indicator that insects respond to the odor of aromatic other active compounds detected by their sensory organs.~~ Previous researchers have also proven that essential oils of various member of Zingiberaceae ~~plants~~ including *A. Cardamomum* and *Z. zerumbet* have anti-insect effects (Abbasipour ~~*et al*~~et al., 2011); (Amiri~~, *et al*~~et al., 2016); (Korina & Habiyaremye, 2017); (Gopal & Benny, 2018). Thus, the two ~~waste~~ types of extracts had a

Commented [Mi13]: Complete this sentence

Commented [Mi14]: Rewrite in more appropriate structure to provide a clear and correct information

Formatted: Indent: First line: 0.49"

Commented [Mi15]: Rewrite in more appropriate structure to provide a clear and correct information.

Commented [Mi16]: Rewrite in more appropriate structure to provide a clear and correct information.

Commented [Mi17]: Just a repetition of the information

repellent effect at a ~~treatment~~ concentration of 75% and 100%, ~~but~~ with ~~an~~ the effect of *A. cardamomum* waste extract was greater than *Z. zerumbet*.

Percentage Repellency

Based on statistical analysis, it turns out that the difference in concentration has a significant effect on the percentage ~~of~~ repellency (PR) of rice weevil (α <0.05). In contrast, differences in the source of ~~waste extract~~extract did not significantly influence the ~~percentage of repellency~~PR. The results of the analysis also showed no interaction between the ~~extracted source~~source and concentration of extract ~~and extract concentration~~ (Table 1). The data obtained were then further analyzed using LSD ~~further~~ test, the results are shown in Table 2.

Table 1. The result of Two-way ANOVA test

Source of diversity	Number of squares	df	Middle Squares	F count	Sig.
SE	1.600	1	1.600	0.062 ^{ns}	0.806
CE	7049.600	3	2349.867	90.379 *	0.000
Interaction S E x Extract	155.200	3	51.733	1.990 ^{ns}	0.135
Error	832.000	32	26.000		
Total	8038.400	39			

Notes:
* = significant, based on the LSD test at a significance level of 5%.
ns = not significantly different; SE = Source of Extract; CE = Concentration of Extract;

Formatted: Font: 10 pt

Formatted: Font: 10 pt

Table 2. ~~Further~~ Results of LSD ~~testing~~ test of ~~LSD~~ on the percentage ~~of~~ repellency ~~on~~ of extracts against rice weevil
(mean ± standard deviation)

Extract concentration (%)	Source of extract	
	A.Cardamomum	*Z. zerumbet*
25	23.20 ± 5.93^{a}	28.80 ± 7.69^{a}
50	28.00 ± 2.82^{a}	30.40 ± 4.56^{a}
75	53.60 ± 4.56^{b}	52.00 ± 5.67^{b}
100	57.60 ± 4.56^{b}	52.80 ± 3.34^{b}
Average	40.60 ± 16.11^{ns}	41.00 ± 12.77^{ns}

Notes:
-The means followed by a different letter in the same column are ~~-~~significantly different (LSD; α < 0.05)
-The means followed by a different letter in the average row are significantly according to student t-test (α < 0.05).

Commented [Mi18]: Replace with more informative sentence. If the data is average percentage repellency then it should be stated as

Average repellency (%)

The average ~~percentage of repellency~~PR of *A. cardamomum* and *Z. Zerumbet* extracts ~~rice weevil~~ against rice weevil ~~extracts of *A. cardamomum* and *Z. Zerumbet* waste~~

is presented in Table 2. Based on the repellency ~~rejection~~ criteria according to (Rinaldi ~~*et al*~~et al., 2016), extracts ~~waste~~ of *A. Cardamomum* and *Z. zerumbet* ~~plant~~ at concentrations of 25% and 50% ~~gave~~ showed a low repellency ~~rejection~~ effect ~~(because they were at a percentage of~~ less than 50%~~)~~. At 75% and 100% extract concentrations, the percentage ~~of~~ repellency increased to more than 50% and was in the medium category. This increase occurred due to the change in orientation of the way leading toward increased control, particularly at concentrations of extracts 75% and 100%.

In contrast, at low concentrations (25% and 50%), the number of rice weevil into the treatment less than 50%. Based on LSD- test (α <0.05) ~~each~~ source and concentration of extract had a significant effect on the ~~percentage of~~ repellency~~, with the concentration of extract showing significant differences with~~ T~~t~~he highest percentage repellency~~of rejection.~~ is at a concentration of 100%, both in *A. cardamomum* and *Z. zerumbet* extracts. The concentrations of 75% and 100% is not different. Thus, extracts with a concentration of 75% are the most ~~optimum~~ effective to be used in this study.

Phytochemical compounds contained in extract~~s~~ of each ~~waste~~ plant species have a ~~rejection~~ repellency effect in accordance with the concentration level given. The more concentrated the extract ~~was~~, the higher the percentage repellency~~of rejection~~. This is in line with the results of the study ~~of~~ by Abdelgaleil ~~*et al*~~et al. (2016) which ~~states~~ stated that phytochemical compounds have an insecticidal effect depending on the dose given. Essential oils contained in *A. cardamomum* ~~cardamom~~ extract provide a repellency ~~rejection~~ effect on rice ~~mites~~ weevils that are more dominant than other compounds. In line with the previous research states that essential oils have a repellent effect on *Tribolium castaneum* rice infestation. Fatty acids are also included in insecticidal compounds (Hikal ~~*et al*~~et al., 2017). In this study, fatty acids are one of the dominant elements in the extract, so it is suspected that fatty acids also contribute ~~to~~ in providing a repellent activity ~~on~~ against rice weevil. In this study, the concentration of 100% waste extract between 52.8% and 57.6% so that can say the repellent effect is in the medium category (Rinaldi ~~*et al*~~et al., 2016). According to the standards of the Indonesian Pesticide Commission, repellent can be said to be effective if the average protection power reaches 90% (Korneliani, 2011). Therefore, there is possibility to increase the effectiveness of the extract~~, it is still very possible to increase it~~ by increasing the concentration level more concentrated or increasing the dose. The findings of this study can ~~be positive~~provide a useful information ~~for people, to develop~~for development of a newer ~~anti~~ rice weevil repellent extracted from ~~herbal waste based product~~waste product of medicinal plants. This repellent can be~~, as~~ an alternative ~~repellent~~ that is more ~~cheaper and eco-friendly~~economically and environmentally friendly than synthetic insect repellents.

CONCLUSION

Commented [Mi19]: Rewrite in more appropriate structure to provide a clear and correct information

Commented [Mi20]: Rewrite in more appropriate structure to provide a clear and correct information

Formatted: Font: Italic

Formatted: Font: Italic

Commented [Mi21]: Rewrite in more appropriate structure to provide a clear and correct information

Commented [Mi22]: Rewrite in more appropriate structure to provide a clear and correct information.

Provide the citation

Commented [Mi23]: Rewrite in more appropriate structure to provide a clear and correct information

This study concluded that ~~extracts of~~ *A. cardamomum* and *Z. zerumbet* waste~~s~~ extracts have repellent activity against rice weevil~~, but the r~~Repellency of ~~extracting~~ *A. cardamomum* ~~waste~~ was higher than Z. zerumbet ~~waste~~. ~~The findings of this study can be positive information, that waste extracts of A. cardamomum potentially as a repellent to rice weevil that is cheaper and easily applied.~~

ACKNOWLEDGMENT

The author would like to thank Semarang State University for funding this research, through the 2018 UNNES DIPA fund with Number: SP DIPA-042.01.2.400899 / 2018.

REFERENCES

Abbasipour, H., Mahmoudvand, M., Rastegar, F.~~,~~ & Hosseinpour, M.H. (2011). Fumigant toxicity and oviposition deterrence of the essential oil from cardamom, *Elettaria cardamomum*, against three stored–product insects. *Journal of insect science (online)*, *11*(165), 1-10. doi: 10.1673/031.011.16501.

Abdelgaleil, S.A.M., Mohamed, M.I.E., Shawir, M.S. ~~&~~ Abou-taleb, H.K. (2016). Chemical composition, insecticidal and biochemical effects of essential oils of different plant species from northern Egypt on the rice weevil, *Sitophilus oryzae* L. *journal of pest science*, *89*(1), 219–229. doi: 10.1007/s10340-015-0665-z.

Afrina, Santi, C. & Aulia, C.R.P. (2016). Konsentrasi hambat dan bunuh minimum ekstrak buah kapulaga (*Amomum compactum*) terhadap *Aggregatibacter actinomycetemcomitans*. *J. Syiah Kuala dent. soc.*, *1*(2),192-200.

Malini, D. M., Madihah, Kusmoro, J., Kamilawati, F., & Iskandar, J. (2017). Ethnobotanical Study of Medicinal Plants in Karangwangi, District of Cianjur, *West Java. Journal of Biology & Biology Education*, *9*(2), 345-356. doi: 10.15294/biosaintifika.v9i2.5756.

Amiri, R., Pakyari, H. & Arbab, A. (2016). Repellency of three plants extraction against O*ryzaephilus surinamensis* and O*ryzaephilus Mercator* (Coleoptera : Silvanidae). *Journal of Entomology and zoology studies*. *4*(6), 864–867.

Arif, A. (2015). Pengaruh bahan kimia terhadap penggunaan pestisida lingkungan. *JF FIK*. *3*(4), 134–143. doi: 10.1007/s10826-010-9390-7.

Aryani, D.S. & Auamcharoen, W. (2016). Repellency and contact toxicity of crude extracts from three Thai plants (Zingiberaceae) against maize grain weevil, *Sitophilus zeamais* (motschlusky) (Coleoptera: Curculionidae). *J~~.~~ biopest.*, *9*(1), 52–62.

[BSN] Badan Standarisasi Nasional. (2016). Sistem Pertanian Organik. *SNI*, 6729.

Gopal, A. & Benny, P.J. (2018). Selective comparison of repellent activity with contact toxicity of certain essential oils against different insect orders. *Int. J. of Life Sciences*, *6*(2), 615–625.

Goswenrivo, I., Tarmadi, D. & Yusuf, S. (2013). Aktivitas insektisida ekstrak buah bintaro (*cerbera manghas*) terhadap kutu beras *sitophilus oryzae* (coleoptera : curculionidae). *jurnal ilmu dan teknologi kayu tropis*. *11*(1), 82–89. doi: doi 10.1016/j.cbpa.2008.04.155.

Hartanto, S., Fitmawati, & Nery S. (2014). Studi Etnobotani Famili Zingiberaceae dalam Kehidupan Masyarakat Lokal di Kecamatan Pangean Kabupaten Kuantan Singingi, Riau. *Biosaintifika: Journal of Biology & Biology Education*, *6*(2), 98-108.

Hendrival & Melinda, l. (2017) Pengaruh kepadatan populasi *Sitophilus oryzae* (l.) terhadap

Formatted: Font: Italic
Formatted: Indent: First line: 0.5"
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic

pertumbuhan populasi dan kerusakan beras. *Biospecies*, *10*(1), 17–24.

Hikal, W.M., Baeshen, R.S. & Said-Al Ahl, H.A.H. (2017). Botanical insecticide as simple extractives for pest control. *Cogent biology*. Cogent. *3*(1), 1–16. doi: 10.1080/23312025.2017.1404274.

Jayakumar, M., Arivoli, S., Raveen, R. & Tennyson, S. (2017). Repellent activity and fumigant toxicity of a few plant oils against the adult rice weevil *Sitophilus oryzae* Linnaeus 1763 (Coleoptera : Curculionidae). *Journal of entomology and zoology studies*, *5*(2), 324–335.

Jemaa, J.M.B. (2014). Essential oil as a source of bioactive constituents for the control of insect pests of economic importance in Tunisia. *Medicinal & aromatic plants*, *3*(2), 2-7. doi: 10.4172/2167-0412.1000158.

Korina, L.C. & Habiyaremye, A. (2017). Indigenous knowledge for sustainable livelihoods: lessons from ecological pest control and post-harvest techniques of Baduy (West Java) and Nguni (Southern Africa)'. *UNU-MERIT working paper series*, *20*(2), 1-36. doi: 10.1111/j.1467-629x.1980.tb00220.x.

Korneliani, K. (2011). Perbedaan daya proteksi berbagai ekstrak kulit jeruk (*Citrus sp.*) sebagai repelen terhadap kontak nyamuk *Aedes aegypti* dan *Aedes albopictus* dalam upaya perlindungan diri dari penyakit DBD 1. *Prosiding seminar nasional "peran kesehatan masyarakat dalam pencapaian NDG's di Indonesia"*. Bandung 12 April 2011. pp. 93–101.

Mulyani, S. (2010). Komponen dan anti-bakteri dari fraksi kristal minyak *Zingiber zerumbet*. *Media*, *21*(3), 178–184.

Niroumand, M.C., Farzaei, M.H., Raz- Kenari,E.E.K., Amin, G., Khanavi,M., Akbarzadeh, T. & Shams-Ardekani, M.R. (2016). An evidence-based review on medicinal plants used as insecticide and insect repellent in traditional Iranian medicine. *Iranian red crescent medical journal*, *18*(2). 3-8. doi: 10.5812/ircmj.22361.

Rinaldi, F.B., Rachmawati, J. & Udiarto, B. (2016). Pengaruh ekstrak bunga krisan *(Chrysanthemum cinerariaefolium* trev.), bunga saliara (*Lantana camara* linn.) dan bunga lavender (*Lavandula angustifolia* Mill.) terhadap repellency kutu Kebul (*Bemisia tabaci* Genn.). *Jurnal Pendidikan Biologi 4*(1), 1–9.

Shanthi, R.V., Jumari, & Munifatul I. (2014). Studi Etnobotani Pengobatan Tradisional untuk Perawatan Wanita di Masyarakat Keraton Surakarta Hadiningrat. *Biosaintifika: Journal of Biology & Biology Education*, *6*(2), 61-69.

Sainz, P., Sanz, J., Burillo, J., Gonzalez-Coloma, A., Maria Bailen., Martınez-Dıaz R.A. (2012) Essential oils for the control of reduviid insects, *Phytochemistry Reviews*, *11*(4), 361–369. doi: 10.1007/s11101-012-9261-5.

Seenivasagan, T., Guha, L., Parashar, B.D., Agrawal, O.P., & Sukumaran, D. (2014). Olfaction in Asian tiger mosquito *Aedes albopictus.* Flight orientation response to certain saturated carboxylic acids in human skin emanations. *Parasitology Research*, *113*(5), 1927–1932. doi: 10.1007/s00436-014-3840-x.

Silalahi, M. (2018). Botani dan Bioaktivitas Lempuyang. *Jurnal EduMatSains*, *2*(2), 147-160.

Tarigan, S.I., Dadang & Harahap, S.I. (2016). Toxicological and physiological effects of essential oils against *Tribolium castaneum* (Coleoptera: Tenebrionidae) and *Callosobruchus maculatus* (Coleoptera: Bruchidae)'. *Journal of Biopesticides*, *9*(2), 135–147.

Wahyuni, S.R.I., Bermawie, N. & Kristina, N. (2013). Morphological Characteristic, Yield Potential, and Major Rhizome Constituent of Nine Accession. *Journal Littri*, *19* September, 99–107.

Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Spanish (Spain)
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic
Formatted: Font: Italic