

# Repellent Effects of Dried and Powder of Citrus Limon, Capsicum Annum, Cinnamomun Zeylanicum and Menthe Piparita on Rice Weevils Sitophilus Oryzae in Rice Products

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## ABSTRACT

Lemon (*Citrus limon*), dried chili (*Capsicum annum*), cinnamon (*Cinnamomun zeylanicum*), and dried mint leaves (*Menthe piperita*) in the form of powder and dried were tested for repellent activity against adults of the rice weevil, *Sitophilus oryzae*. Modified cup-bioassay technique was used to determine the repellent effect of the dried and powder of the plants. The findings demonstrated that *C. zeylanicum* and *C. annum* have the highest significant repellency effect on *Sitophilus oryzae* after six hours exposure. The *C. zeylanicum* powder showed strongest effect on the number of rice weevils repelled since the correlation coefficient, *r* value is +0.977 compared to dried *C. zeylanicum* (*r* = +0.933) and *C. annum* (*r* = +0.821). Regarding to the findings is seemed that the potential of these plants in the powder and dried form act as repellent of rice weevil.

**KEYWORDS:** Repellent, Dried Powder, Rice Weevil *Sitophilus Oryzae*, Correlation.

## INTRODUCTION

Rice weevils *Sitophilus oryzae* L. is one of the major destructive pest of rice and its products [9]. There are lots of attempts of using insecticides to control this pest but the safety of the insecticide to human is doubted. Synthetic chemicals can cause residual pollution on the environment, grain and toxic to consumer [7]. According to [15] reported that 75% farmer in Sabak Bernam, Selangor experienced at least one pesticide exposure symptoms. Nowadays, researchers have focused on the search of natural products derived from plant as natural insecticide which is safer instead of conventional synthetic insecticides and fumigants is highly desirable [8]. The use of the extraction oil from the plant had been used widely in many studies but the oil based treatment can affect the condition of the rice. Therefore the farmers used powder plant material for factory stored material. This powder plant put as barrier around the stored grain [16]. In [6] also found that plant powder of *Mentha viridis* (Lamiacea) and *Cinnamomum verum* (Larvacea) contain high repellency. Therefore, this study was initiated to find the other plant in dried and powder can act as an insecticide against the rice weevil.

## MATERIAL AND METHODS

### Insect and Test Material

The rice weevils were collected from rice section at a local market area. The insect were reared on clean and disinfested rice grain. Fifty adult rice weevils were released into one kg of untreated rice grains which were covered and held with rubber band for passage of air at 25±10°C, 65-75% humidity. Only adult rice weevils were selected for the experiments. The rearing and experiment was conducted at the Biology Laboratory in UiTM Perlis, Malaysia on 2015. *C. limon*, *C. annum*, *C. zeylanicum* and *M. piperita* dried under sun for six days. Fifteen grams of dried plants were ground as powders with mechanical grinder. Another half amount of these dried plants were cut. Both dried and powder plants were placed inside different airtight containers. The rice grains were disinfested by keeping them in freezer at -18°C for 24 hours before kept it at room temperature. Modified cup-bioassay technique was used to determine the repellent effect of the dried and powder of the plants [13]. A hundred gram of uninfested rice grains were mixed with 1%, 2%, 3%, 4% and 5% of dried and powder of *C. limon*, *C. annum*, *C. zeylanicum* and *M. piperita* respectively in separate plastics containers, whereas the control container did not receive any plant powder or dried. Each container was perforated to make 50 holes by using thick needle. These holes were made to allow the beetles to escape from the container when repelled by the plants. Twenty pairs of adult *S. oryzae* were introduced

into each container. These containers were placed inside a larger container to trap the rice weevils that escaped through the perforations. The number of rice weevils escaped in the large container was counted at 1, 3 and 6 hours after introduction to the plants.

### Statistical Analysis

The percentage repellency table is adapted from [6] and classified as shown in Table 1. The data are submitted to Pearson's correlation coefficient,  $r$  and the significance result at  $p < 0.05$  using the IBM SPSS statistical package version 20. The formula is derived from a study done [11] and applied to calculate the percentage repellency of insect pests is:

$$= \frac{\text{Number of escaping insect pests}}{\text{Initial number of insect pests}} \times 100\% \quad (1)$$

Table 1: Classification of percentage repellency of insect pests

Activity	Percentage Repellency	Symbol
Very strong	> 80%	++++
Strong	61-80%	+++
Moderate	41-60%	++
Weak	20-40%	+
Little or no activity	< 20%	-

## FINDINGS AND DISCUSSION

In this study, four type of plants in dried and powder form were tested for repellency effect against adult of *S. oryzae*. Data for the repellency tests of four samples are used in this study has shown in Table 2. The *C. annum* powder showed the highest repellent activity for *S. oryzae* with 95% repellency. It followed by dried *C. limon* with 90% repellency. The lowest repellency effects against rice weevils are *C. limon* powder and dried *M. piperita*. Both have 25% repellency respectively.

Table 2: Percentage of repellency, Pearson Correlation Coefficient  $r$ , significance result of plant in powder and dried forms

Plant Types	Plant form	Percentage Repellency (%)	Pearson Correlation Coefficient, $r$	P value
Citrus limon	Dried	90	+0.723	0.084
	Powder	25	-0.722	0.063
Mentha piperita	Dried	25	-0.622	0.131
	Powder	60	+0.294	0.316
Cinnamomum zeylanicum	Dried	55	+0.933	0.01*
	Powder	75	+0.977	0.002*
Capsicum annum	Dried	60	+0.362	0.275
	Powder	95	+0.821	0.044*

\* Correlation is significant at the 0.05 level (2- tailed)

The Pearson correlation coefficient ( $r$ ) demonstrated that only two plants have significant correlation between percentage of treatment and repellency effect where  $P < 0.05$ , which are *C. zeylanicum* and *C. annum*. The highest positive correlation showed by *C. zeylanicum* in powder form,  $r = +0.977$  and followed by dried *C. zeylanicum*,  $r = +0.933$ . While for *C. annum* only powder form showed a significant result with correlation of  $r = +0.821$ . Other type of plants neither dried nor powder forms did not show any significant result,  $p > 0.05$ .

The present study found that *C. zeylanicum* in dried and powder forms and *C. annum* powder had pronounced repellency effects on rice weevil, *Sitophilus oryzae*. A possible explanation for this finding might be due to limonene in the cinnamon oil, which is one of the main compositions in *C. zeylanicum* that responsible for repellent activity [4, 5]. Others constituent of cinnamon bark are Cinnamaldehyde, (*Z*)-cinnamyl acetate, eugenol, monoterpenes, phenyl propanoids and sesquiterpenes [14]. In [1] reported that essential oil from cinnamon leaf is effective to repel mosquito larvae. Another study conducted by [3] found that out of 20 plant extracts, cinnamon extract is one of the most effective repellent against the adults of the malaria vector *Anopheles gambiae* mosquito. In [10] demonstrated that *C. zeylanicum* has a positive repellency against the bean weevil, *Acanthoscelides obtectus* in

small storage units. Based on these previous studies, it was apparent that *C. zeylanicum* has a potential for repellent activity. *C. annum* also has demonstrated as insect repellents and insecticides. It is probably due to the activity of capsaicin in *C. annum* to repel insects [17]. *C. annum* has ability to repel mites and whiteflies for up to two months without damaging surrounding objects [2]. Dried chili traditionally known to repel mosquitoes [12].

## CONCLUSION

*C. zeylanicum* and *C. annum* showed the highest significant repellency effect on *S. oryzae* after six hours exposure. The *C. zeylanicum* powder showed strongest effect on the number of rice weevils repelled compared to dried *C. zeylanicum* and *C. annum*. Thus, the results of this study had shown the potential of *C. zeylanicum* and *C. annum* in powder and dried form without undergoes to extraction process to repel *S. oryzae*.

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