

# **Efficacy of Botanical Extracts Against Storage Insect Pests *Tribolium confusum* (confused flour beetle) and *Sitophilus oryzae* (Rice Weevil)**

**B.G.B. Hemantha Piris<sup>1</sup>, Kandiah Pakeerathan<sup>2,\*</sup> and Sairam Sayanthan<sup>1</sup>,**

<sup>1</sup>Department of Biosystem Technology, Faculty of Technology, University of Jaffna, Sri Lanka

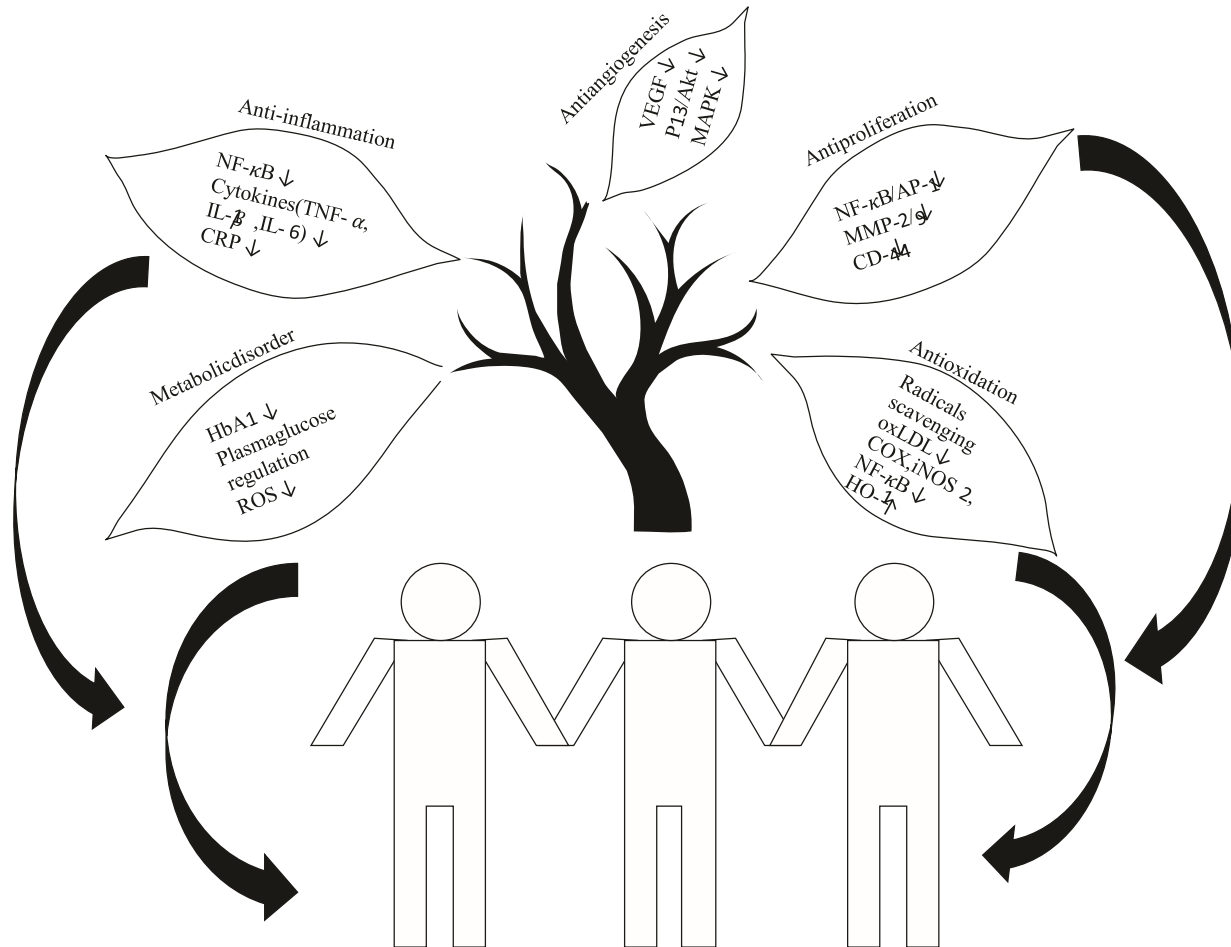
<sup>2</sup>Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka

**\*Correspondence: [pakeerathank@univ.jfn.ac.lk](mailto:pakeerathank@univ.jfn.ac.lk); Tel.: +94-077-696-9511**

# INTRODUCTION

- The storage pests are the architects.
- Current major solution for storage pest is “Fumigation”.
- Synthetic chemicals are toxic to humans and are creating deleterious impacts on biodiversity.
- Hi-tech preventive and curative methods such as electronic nose, near-infrared spectroscopy, nanoparticle-based inert dust, acoustic technology are being practiced in commercial level storage pest control
- Plant based extracts proved to be eco-friendly and affordable mean to manage stored product pests

- Phytochemicals are one of alternate for synthetic pesticides.





- Rice weevils and Flour beetles are the major Storage pests in Sri Lanka.
- Yellow oleander, Neem, Gliricidia, Thulasi are some of plants that rich in phytochemicals.



- Taberz (2017), have proved the Antimicrobial activity of Yellow oleander.
- thevetin A, thevetin B, Oleandrin, Neriifolin - due to Veronika bandara(2010)

# Objectives

To evaluate Efficacy of Botanical Extracts Against  
Storage Insect Pests *Tribolium confusum* and  
*Sitophilus oryzae*

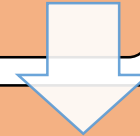
# **MATERIALS & METHODOLOGY**

# Experimental setup

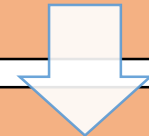
Treatment Number	Treatment-Set 1
T1	<i>Cascabela thevetia</i> Dried flower
T2	<i>Cascabela thevetia</i> Dried Leaf
T3	<i>Cascabela thevetia</i> Dried seed
T4	<i>Cascabela thevetia</i> fresh leaf
T5	<i>Cascabela thevetia</i> Fresh seed
T6	<i>Ocimum tenuiflorum</i> Fresh Leaf
T7	<i>Azadirachta indica</i> Fresh Leaf
T8	<i>Gliricidia sepium</i> Fresh Leaf
T9	Non treated (Control)

# Extraction of Botanicals

**Disease free fresh plants collected and dried**



**Washed and surface sterilized 3% NaOCl and dried**

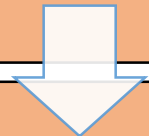


**Made into powder using electric grinder**



**Water based solvent extraction and filtration**

**[Mihaylova and Lante, 2019]**



**100% (10g/100mL) concentration extracts stored at 4 °C**



# *In-vitro* assay to calculate mortality

Selection of uniform size and weight 100 Nos weevils/per container and beetles/per container



Topical application of botanical extracts (100%) rate 500 L/Ha



CRD design with four replication and non-treated control



Counting dead insects after 30 seconds, 1 minute, 5-minute, 10-minute, 1 hour, 2 hours, and 24 hours after treatment administration

# Assessment and Calculations

The insect mortality percentage and repellency percentage were calculated using the formula below

$$\text{Mortality \%} = \frac{\text{Number of death insects}}{\text{Total number of insects released}} \times 100 \%$$

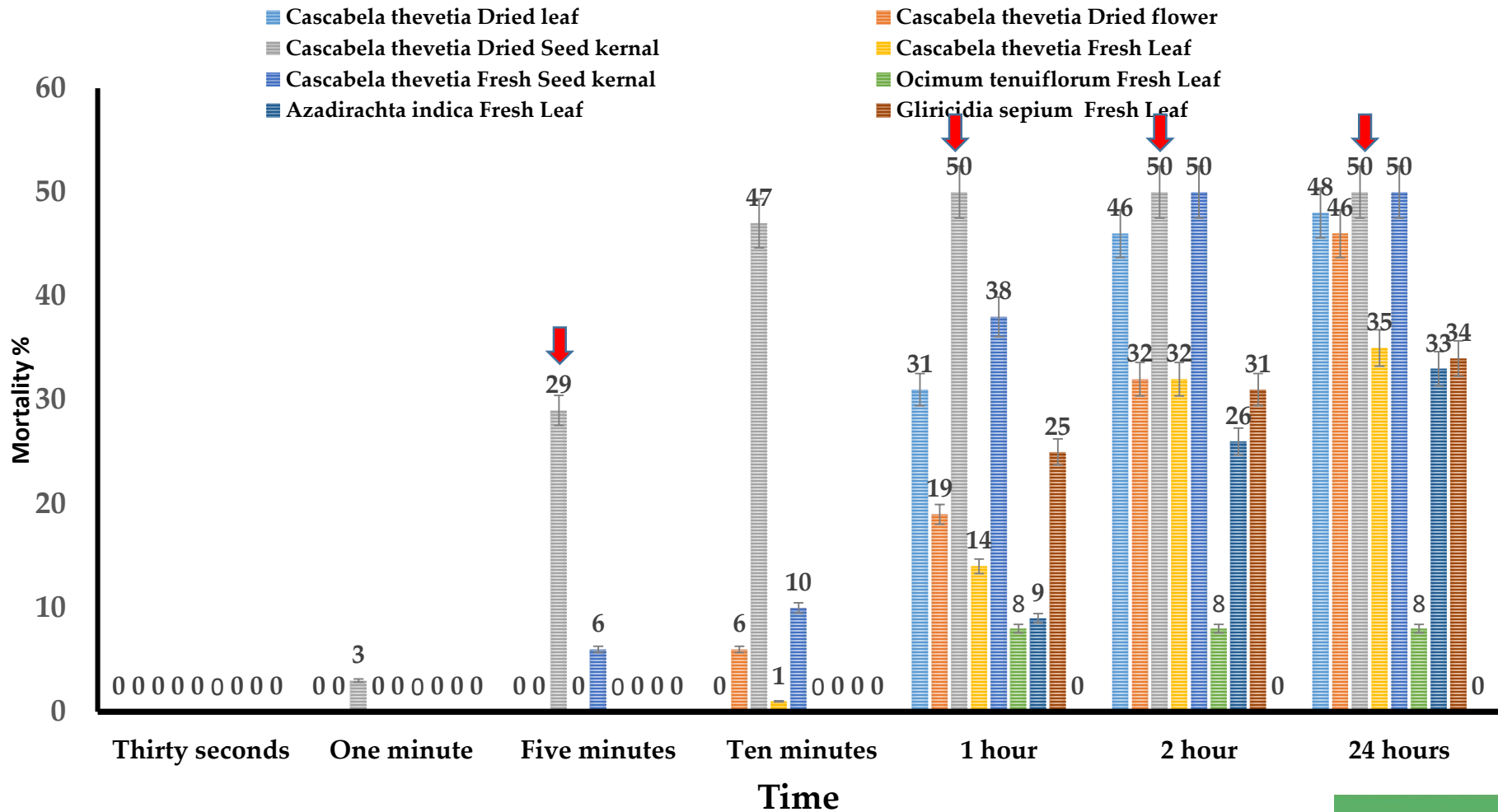
$$\text{Repellency \%} = \frac{\text{\# of insects in un - treated samples} - \text{\# of insects in treated samples}}{\text{\# of insects in un - treated samples}} \times 100 \%$$

# Statistical Analysis

- Data collected in the whole study was analyzed by Microsoft Excel 2013 and SAS software (9.1 version).
- Tukey's HSD multiple comparison test was performed to identify the best treatment at  $P < 0.05$  using the same software.

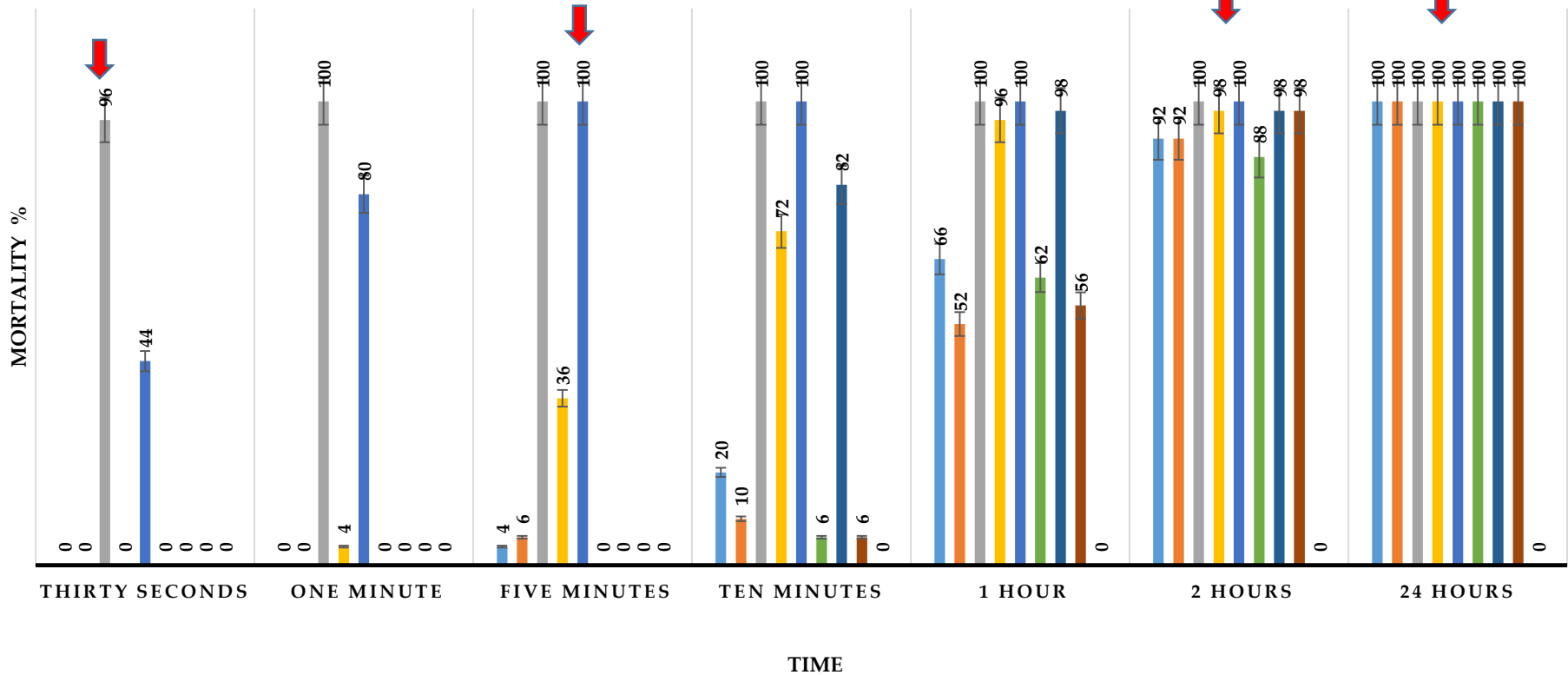
# **RESULTS & DISCUSSION**

# Mortality % of rice weevil to different plant extracts



# Mortality % of red flour beetle to different plant extracts

- Cascabela thevetia Dried flower
- Cascabela thevetia Dried leaf
- Cascabela thevetia Dried Seed kernal
- Cascabela thevetia Fresh Leaf
- Cascabela thevetia Fresh Seed kernal
- Ocimum tenuiflorum Fresh Leaf
- Azadirachta indica Fresh Leaf
- Gliricidia sepium Fresh Leaf
- Control





**Table 1.** Repellency effect of botanicals on rice weevils

Aqueous extraction	After 24 hours	After 48 hours	After 5 days
<i>Cascabela thevetia</i> Dried flower	61.11 <sup>cd</sup>	66.67 <sup>b</sup>	59.15 <sup>b</sup>
<i>Cascabela thevetia</i> Dried Leaf	97.96 <sup>a</sup>	91.30 <sup>a</sup>	75.00 <sup>a</sup>
<i>Cascabela thevetia</i> Dried seed	71.79 <sup>bc</sup>	43.75 <sup>d</sup>	38.71 <sup>c</sup>
<i>Cascabela thevetia</i> fresh leaf	88.89 <sup>a</sup>	86.36 <sup>a</sup>	78.05 <sup>a</sup>
<i>Cascabela thevetia</i> Fresh seed	63.01 <sup>c</sup>	66.67 <sup>b</sup>	57.14 <sup>b</sup>
<i>Ocimum tenuiflorum</i> Fresh Leaf	70.13 <sup>c</sup>	63.01 <sup>b</sup>	70.13 <sup>ab</sup>
<i>Azadirachta indica</i> Fresh Leaf	78.05 <sup>b</sup>	64.86 <sup>b</sup>	64.86 <sup>ab</sup>
<i>Gliricidia sepium</i> Fresh Leaf	61.11 <sup>cd</sup>	55.07 <sup>c</sup>	41.27 <sup>c</sup>
Non treated (Control)	36.16 <sup>e</sup>	10.37 <sup>e</sup>	0.00 <sup>d</sup>

Values with the same alphabets are not significantly different according to the Tukey's HSD at 95% confidence interval

**Table 2.** Repellency effect of botanicals on red flour beetle

Aqueous extraction	After 24 hours	After 48 hours	After 5 days
<i>Cascabela thevetia</i> Dried flower	75.00 <sup>bc</sup>	71.79 <sup>bc</sup>	50.75 <sup>bc</sup>
<i>Cascabela thevetia</i> Dried Leaf	96.91 <sup>a</sup>	91.30 <sup>a</sup>	66.67 <sup>b</sup>
<i>Cascabela thevetia</i> Dried seed	98.99 <sup>a</sup>	95.83 <sup>a</sup>	81.79 <sup>a</sup>
<i>Cascabela thevetia</i> fresh leaf	75.00 <sup>bc</sup>	71.79 <sup>bc</sup>	50.75 <sup>bc</sup>
<i>Cascabela thevetia</i> Fresh seed	79.52 <sup>bc</sup>	78.05 <sup>bc</sup>	43.75 <sup>cd</sup>
<i>Ocimum tenuiflorum</i> Fresh Leaf	85.06 <sup>b</sup>	85.06 <sup>b</sup>	59.15 <sup>bc</sup>
<i>Azadirachta indica</i> Fresh Leaf	82.35 <sup>b</sup>	79.52 <sup>bc</sup>	46.15 <sup>cd</sup>
<i>Gliricidia sepium</i> Fresh Leaf	61.11 <sup>d</sup>	52.94 <sup>d</sup>	46.15 <sup>cd</sup>
Non treated (Control)	15.00 <sup>e</sup>	0.00 <sup>e</sup>	0.00 <sup>e</sup>

Values with the same alphabets are not significantly different according to the Tukey's HSD at 95% confidence interval

# Conclusions

- This study found that dried *C. thevetia* seeds and leaf extracts cause highly significant mortality and repellent effect in both rice weevils and red flour beetles.
- *Cascabela thevetia* seeds and leaf are more potential source to prepare insect protectant.
- *Cascabela thevetia* seeds are more toxic to human, therefore, further study related to side effects assessment is recommended.

# Acknowledgments



Thank you