

Biocidal activities of some plant's powders against red flour beetle, *Tribolium castaneum* (Herbst,1797) (Coleoptera: Tenebrionidae)



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Introduction

Cereal is one of the main sources of carbohydrates and energy for people (Medugu, 2021). To maintain the global food supply, it is important to protect stored goods against pests (Soujanya et al., 2016). The red flour beetle, *Tribolium castaneum* (Herbst), is one of the main pests damaging goods, it appears to prefer milled grain products like flour as their primary host, grain, peas, beans, coconuts, dried fruits, and spices (Benhalima et al., 2004 and Sahaf et al., 2007). The infestation of insects reduces the stored grains' nutritional content and results in losses in their weight, quality, or economic value (Aboelhadid et al., 2021). Numerous plants have been found to have bioactive metabolites that are poisonous, repelling, and safe for both humans and the environment. (Islam, 2017).

Material and Method

3.1 Plant Materials Collection

The plant materials such as *Mentha sp. Myrtis communis* and *Thymus sp* were collected from different markets in Erbil City.

3.2 Insect collection

The adults *T. castaneum* were collected from infested flour & Rice purchased from the local market.



3.2.1 Insect culture

Culture of the red flour beetle, *Tribolium castaneum*, was reared in the laboratory under controlled conditions of temperature, humidity, and light.



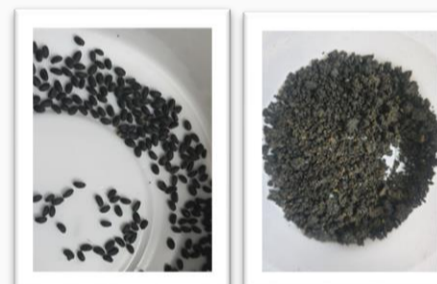
3.3 Leaf powder preparation

In this study dry leaf of three plant species such as *Mentha sp. Myrtis communis* and *Thymus sp* were purchased from a local market in Erbil, and were ground to fine powder with the help of an electric grinding machine before use.



3.4 Seed powder preparation

The test plant materials seeds of the three same plants, were purchased from the local market and were ground to fine powder with the help of an electric grinding machine before use.



Conclusion

The findings of the present study indicate that a few tested plant powders were not effective to some degree in reducing the number of adult *T. castaneum*. Differences of insect mortality were observed depending on plant species and exposure time. Treatments with higher mortality (2.67% after 25 days) had comparatively higher and significant total mortality of adult *T. castaneum* than those of lower mortality (0.0% after 30 days). When the lethal effect compared. Results suggested that plant powders may have potential as a control agent against this major stored product insect, as these substances are not only an inexpensive, but also have non-toxic effects on non-target organisms and less environmental influence in terms of insecticidal hazard.

Results

Efficiency of leaf powder from three plants against *T. castaneum* at various exposure periods.

Plant	Time					
	10 /1/2023	13 /1/2023	16 /1/2023	19 /1/2023	22 /1/2023	25 /1/2023
Control	0.0000	0.0000	0.00 b	0.00 b	0.00 b	0.00 b
Mentha	0.3333	0.6667	1.00 ab	1.00 ab	1.00 ab	1.00 bc
Myrtus	0.3333	0.6667	1.00 ab	2.00 b	2.00 b	2.00 ab
Thyme	1.0000	1.3333	1.67 a	2.33 b	2.33 b	2.67 a

Effect of duration time of leaf powder on percent mortality of *T. castaneum*

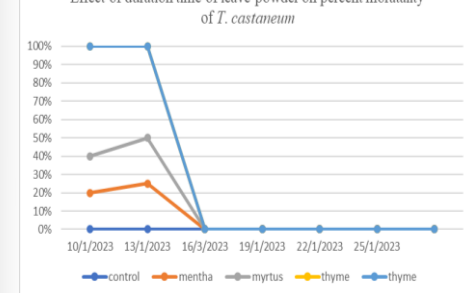


Figure 1: Effect of duration time of leaf powder on percent mortality of *T. castaneum*.

Efficiency of Seed powder from three plants against *T. castaneum* at various exposure periods.

Plant	Time					
	10 /1/2023	13 /1/2023	16 /1/2023	19 /1/2023	22 /1/2023	25 /1/2023
Control	0.0000	0.0000	0.0000	0.00 b	0.00 b	0.00 b
Mentha	0.3333	0.3333	0.6667	0.67 b	0.67 b	1.67 b
Myrtus	0.3333	0.3333	1.3333	1.67 a	2.00 a	2.33 bc
Thyme	0.3333	0.6667	1.3333	2.00 a	2.33 a	2.67 c

Effect of duration time of seed powder on percent mortality of *T. castaneum*

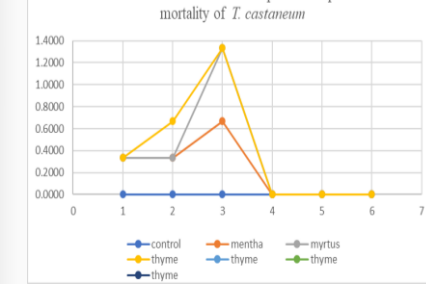


Figure 2: Effect of duration of seed powder on percent mortality of *T. castaneum*

Discussion

During the search in reviewing the literature, there are no recent revisions or nearby studies to our work, therefore the list below reflects our best effort at achieving a list based on available literature.

These literatures used medicinal and aromatic plants extracts methods in the controlling of stored insects, such as aqueous extracts, essential oils extracts, alcoholic extracts, toxic fumigants. Petroleum, acetone, and ethanol extracts also used.

In the current study, for the first time, the powder of fresh leaf and seeds was used directly after mixing it with rice grains. the results were in complete agreement with the results of (Sadia et al., 2006; Farkhand et. al., 2011; Susana et al., 2013; Saeed et al., 2016; Manonmani et al., 2017; Sara et al., 2019; Salim et al., 2019; Ghozlene et al., 202; finally, Mustafa and May 2022).

References

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3. Islam, Waqar. (2017). Eco-Friendly Approaches for the Management of Red Flour Beetle: *Tribolium castaneum* (Herbst). Journal international Triannually, 5(2):105-114.
4. Mdugu, M. A. (2021). Biocidal Effects of Some Plant Extracts against the Red Rust Flour Beetle *Tribolium castaneum* Herbst (Coleoptera: Tenebrionidae) in Northeastern Nigeria. International Journal of Innovative Science and Research Technology, 6(5):30-34.

The mortality percentage of plant powders on red flour beetle.

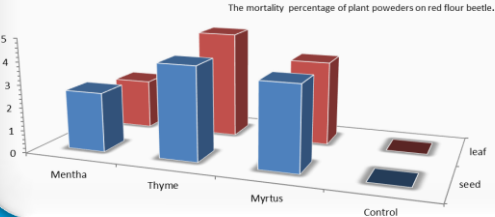


Fig.3: The bar chart mortality percentage of plant powders on *T. castaneum*