

Effect of alcoholic extract of dendritic enamel *Lantana Camara* on the destruction of larvae and adults of the red rusty flour beetle *castaneum* (Harbst) *Tribolium*

Huda A. Ameer^{1*}, Abbas G. Hamza² and Najah M. Bari³

^{1,2,3} Al-Mussaib Technical College, University of Al-Furat Al-Awsat Technical, 51009, Babylon, Iraq

* Corresponding author: ashanwer9@gmail.com

Abstract:

The mortality rates of the alcoholic extract of the enamel tree plant for the adults of the red rusty flour beetle were 22.18% at a concentration of 25%, while the larvae reached 33.28%, while at a concentration of 50% it reached 50.11% for larvae it reached 52.22%, while at a concentration of 75% it reached 74.44%, and the larvae reached 81.16% Compared with the control treatment, where the highest percentage of death reached 0.00%, and this is an average of time periods during (72,48,24) hours for dendritic enamel plants, and the results indicated that there is a direct relationship between the concentration of the extract and the percentage of the death rate

1- Introduction: The red rusty flour beetle, *Castaneum* (Harbst) *Tribolium*, is one of the most important insect pests, as the red rusty flour beetle attacks stored grains and other food products, including flour, cereals, pasta, beans and nuts, causing them to be lost and damaged, as the United Nations estimated that the beetle Flour is the most common by-product of all plant commodities stored around the world (2). Warehouses are infected with many pests, the most important of which is the red rusty flour beetle, which attacks the crop in the field and moves with it to the warehouses (11). The infection begins in the field and then moves to the warehouse with the seeds when left unprotected. The damage of this pest is limited to the larvae that feed inside the seeds, forming tunnels in The seed and consumes its nutritional contents, thus reducing the germination rate and the nutritional value of the seeds (7). The safety of storing food and preserving it from various spoilage factors has become an important matter at the present time, and the pollution factor and what it causes is one of the most widespread problems at the present time that can occur during... Any of the stages of food production and marketing, such as harvesting, transportation, storage, etc. (11) Infection of stored grains with insect attacks is one of the problems Dangerous due to the huge losses it causes in the stored foodstuffs, and the reports of the Food and Agriculture Organization (FAO) indicated that the annual losses as a result of infection amount to 10% of the total amount of grain (14) ,The recent directions of the study focused in this field, including the idea of research on effective natural plant compounds for insect control, due to the effective secondary compounds contained in plants that have an important impact on the control of warehouse pests, because the Iraqi environment contains diverse plants rich in effective compounds of medical importance that can be used in Insect control (4) In addition, the repeated use of manufactured chemical pesticides caused the emergence of insect strains that are genetically resistant to these pesticides and increased the cost of control as well as polluting the ecosystem, which necessitated the search for alternative biological methods of plant origin, which showed distinct results, including plant extracts and alcohol in controlling insect pests and limiting who was injured (3).

Elmina shrub plant: -

It is a strong, erect tree that usually grows to a height of 4 meters. The leaf is oval in shape, measuring 2-10 cm (length) and 2-6 cm (width). On the ascent up to 15 meters with the help of the support, it can grow easily in favorable conditions and usually the flowers appear in the months of March and August or throughout the year in the event of adequate humidity and light, the color of the fruit is blue-green-black with two nuts, mature plants produce up to 2000 seeds Annually, the roots are very strong with a main root with many small lateral roots (9) The plant contains a wooden stem and several different colors of flowers, such as white, cream, or yellow to orange, pink, purple, and red. The plant also contains thorns or pricks. It is considered an important medicinal plant as well as an essential plant for producing oils from the Verbenaceae family. It was called Lantana in 1753, and it consists of Essential of seven types, six from America and one from Ethiopia (15). It is used as a popular ornamental plant in gardens. It grows in tropical, subtropical, and temperate regions at a high altitude of up to 2000 meters (5) Several important phytochemicals have been isolated from Camara. L including ursolic acid, oleanolic acid, lantanoside, coumarinic acid, and phytol. oligosaccharides, triterpenoids, glycosides, erbidoids, and glycosides. Vinyl(5). The plant has therapeutic potential due to its various biologically active components, including steroids, , the plant is used as a medicine to treat various diseases such as measles, asthma, smallpox, tetanus, eczema, fever and rheumatism (6).

2- MATERIALS AND METHODS: The rusty flour beetle *Tribolium castaneum* was collected from infected flour and placed inside a vial containing pure flour, then two

tablespoons of powdered milk and one tablespoon of baking yeast are added to it, then the vial is pierced from the top allowing air to enter and the vial is closed to prevent the exit of beetles. In a warm place for about a month to a month and a half for the purpose of obtaining a pure strain



Fig (1): Flour infested with the red rusty beetle

2-1- Collection and diagnosis of L. Camara dendritic enamel plant The leaves of Al-Mina plant were collected from the gardens of Al-Musayyab Technical College on 1/3/2023. Samples (whole plant) were diagnosed in the plant production laboratory / Al-Musayyib College of Technology. After diagnosis, the leaves were washed to remove dust, then the leaves were dried in the shade under laboratory conditions, then ground by a mill. electrophoresis to obtain a fine powder to be used in the preparation of the extract



Fig (2) dendritic myna plant

Table No. (1) plants used in the research .

Collection area/ Babylon	The part used	Plant family	The scientific name	Local name
Musayyib Technical college Gardens	Flowers	Verbenaceae	<i>Lantana Camara</i>	Dendritic enamel

2-2-Preparation of alcoholic extract of the flowers of the plant L.Camara

Method (8) was followed in preparing the alcoholic extract (ethanol) by taking the weight of 10 gm of the dry matter powder of *N. oleander* flowers and placed in the extraction apparatus (Soxhlet apparatus) and 200 ml of ethyl alcohol was added to it and the extraction was done for 24 hours at a temperature of 45 °C. ° The extracted sample

and the container were concentrated on the raw extracted materials of plants, and the process was repeated several times to obtain a sufficient quantity. The material was dried in the electric oven at a temperature of 40-45 °C, after which the dry residuals were taken and placed in glass containers closely sealed with weight information and kept in the refrigerator until use. For the purpose of determining the biological effectiveness of the crude alcoholic extract of the oleander plant, 4 g of the dry

residue of the extract was taken and dissolved in 5 ml of ethyl alcohol and 3 ml of the diffuser, then the volume was completed to 100 ml with distilled water, and the concentration of the basic solution became 4%, or the equivalent of 40 mg/ml. The concentrations were prepared (25%, 50%, 75%) mg/ml, and the control treatment was 5 ml of ethyl alcohol and 3 ml of the diffuser, then the volume was increased to 100 ml of distilled water

2-3-The effect on the percentage of death of the larval stage of the rusty flour beetle insect using the alcoholic extract of the myna dendrite plant in the laboratory:

larvae were taken from the larval stage to a Petri dish with a diameter of 9 cm containing 10 filter paper for the purpose of treating them with the extract of the enamel dendrite plant, where three replicates were used for each of the concentrations (25, 50 and 75 %) mg / ml. The covers of the dishes were punctured with a sterile needle For the purpose of ventilation, in addition to the control treatment, the larvae were placed in Petri dishes with a brush and treated with alcoholic extract for each concentration separately, then placed in the incubator at a temperature of 30 ± 2 m° and were continuously monitored every 24 hours, and the death rate was recorded after (24, 48, 72) hours of treatment (16).

2-4- The effect on the percentage of deaths of adults of the rusty flour beetle using alcoholic dendritic enamel extract in the laboratory:

Adults were obtained after their development from the pupal stage to an adult, as adults were taken at an age not exceeding 24 hours for each replicate, with 3 replicates for each concentration of the extract separately. In addition to the control treatment, filter papers were placed in Petri dishes, then 10 adult females were placed in Petri dishes

using a brush and treated with alcoholic extract at concentrations of (25%, 50% and 75%) mg/ml, then they were placed in the incubator at a temperature of $30 \pm 2^\circ\text{C}$ and were monitored continuously every 24 hours. An hour and the percentage of death was recorded after 3 days of treatment (16)

Statistical analysis: The experiments were analyzed according to the factorial experiment model and with a completely randomized design (C.R.D) and using the Least significant difference (L.S.D) test under the probability level (0.05) to show the significance of the existing differences. The percentage of mortality was corrected according to the equation (1) .

$$\text{Corrected Percentage of Loss} = \frac{(\text{Control Treatment at Loss \%} - \text{Treatment at Loss \%})}{(\text{Control Treated at Loss \%} - 100)} \times 100$$

3- Results and discussion

3-1- Effect of interfering amount of alcoholic extract of L.Camara dendritic enamel. Percentage of the larvae of the red rusty flour beetle T. castaneum, after (72, 48, 24) hours:The results of Table (2) showed the effect of the amount of extract and the time period on the percentage of larval mortality, as the highest percentage of mortality was at a concentration of 75% and a time period of 72 hours, reaching 86.67%, while the lowest percentage of mortality was at a concentration of 25%, reaching 23.33% for the alcoholic extract of the dendritic myna plant. The results of the statistical analysis indicated that there are significant differences between the results. The cause of the caterpillars' death is due to the caterpillar's ingestion of the alcoholic extract during its entry into the flour when it was treated with the alcoholic extract

of the plants under study. It is also due to the quality of the chemicals and the degree of polarity of the solvents it extracts. For example, ethyl alcohol extracts tannins, alkaloids and phenols, and hexane extract extracts volatile oils and fatty compounds, and ethyl acetate extracts the compounds. Alkaloids and polyphenols, as these substances are considered very effective (17), as the highest percentage of mortality was at the highest concentration of 75% (76.83, 80.00, 86.67), respectively, during a period of

time (24, 48, 72) hours compared to the control treatment, which amounted to 0.00. whileThe percentage of loss at the concentration was 50% (43.33, 50.00, 63.33) respectively during a period of time (24, 48, 72) hours compared to the control treatment, which amounted to 0.00, and the lowest percentage of loss at the concentration was 25% (23.33, 26.33, 36.33) hours, compared to With a control factor of 0.00 (13).

Table No. (2) Effect on the percentage of death of rusty flour beetle larvae by using alcoholic dendritic enamel extract in the laboratory

Average	72%	48%	24%	Concentration
0.00	0.00	0.00	00.0	Comparison
33.28	36.33	26.33	23.33	25%
52.22	63.33	50.00	43.33	50%
81.16	86.67	80.00	76.83	75%
	46.58	39.8	35.77	Average
	Interference	Periods	Concentration	L.S.D
	6.32	6.12	7.06	

3-2-Effect of overlapping the amount of alcoholic extract of L.Camara dendritic enamel. Percentage of deaths of adults of the rusty red flour beetle T. castaneum after (72, 48, 24) hours: Table (3) shows that the superiority of the alcoholic extract of the dendritic enamel plant in killing adults of the red rusty flour beetle indicates that it contains effective compounds similar to those found in chemical pesticides, and these are toxic, repellent, or inhibiting nutrition, which affect the absorption of food from the

gastrointestinal tract, leading to its destruction. (12)

This is also due to the degree of polarity of the solvents and the type of chemical substances it extracts. For example, ethyl alcohol extracts tannins, phenols, and alkaloids, the hexane extract extracts fatty compounds and volatile oils, and ethyl acetate extracts alkaloid compounds and multiple phenols, as these substances are considered very effective as the highest percentage of destruction was reached at the highest levels(10). The concentration

reached 75% (66.67, 76.67, 80.00) respectively over a period of time (24, 48, 72) hours compared to the control treatment, which amounted to 0.00, while the percentage of death at concentration reached 50% (40.33, 50.00, 61.00) respectively over a period of time (24, 48, 72) hours compared to the

control treatment, which amounted to 0.00, and the lowest percentage of death was at a concentration of 25% (23.33, 30.00, 33.33) hours, compared to the control treatment, which amounted to 0.00. The results of the statistical analysis indicated that there were significant differences between the results

Table No. (3) Effect on the percentage of death of rusty flour beetle adults using alcoholic dendritic enamel extract in the laboratory

Average	72	48	24	Concentration
0.00	0.00	0.00	0.00	Comparison
22.18	33.33	30.00	23.33	25%
50.11	61.00	50.00	40.33	50%
74.44	80.00	76.67	66.67	75%
	43.58	39.16	32.58	Average
	Interference	Periods	Concentration	L.S.D
	7.32	8.12	9.80	

4-Conclusions and recommendations

4-1-Conclusions

1- The alcoholic extract of the dendritic enamel plant demonstrated a high ability to kill adults of the red rusty flour beetle. The treatment increased with increasing concentrations and time periods under study.

2- The effect of the alcoholic extract of the dendritic myna plant on the larvae of the red rusty flour beetle, and the percentage of mortality increased with increasing concentration.

3- The larval stage was more affected by the alcoholic extract than the adults by increasing the concentration and the duration of the extract .

4-2-Recommendations

1- Testing the effectiveness of the extracts against insects belonging to different insect orders

2- Searching for different local plants to know their repellent effect to protect stored flour against insect infestation of stored materials.

Reference

1- Abbott , W. S .(1925). A method of computing the effectiveness of an insecticide . J. Econ. Entomol . 18 : 265- 267.

2- Al-Azzawi, Abdullah Falih and Mahdi, Muhammad Taher (1993). (Warehouse Insects), Ministry of Higher Education and Scientific Research, Mosul, Directorate of the University Press, University of Mosul, p. 464.

- 3- Al-Jassani, Afrah Abdel-Zahra Mohsen (2007) Comparison of the effect of alactic pesticide and extracts and powders of some plants in protecting cowpea seeds from infestation by the southern cowpea beetle *Callosobruchus maculatus* (Fabricius) (Coleoptera: Bruchidae) Master's thesis. College of Agriculture / University of Kufa. 57 pages.
- 4- Badawi, Ali Ibrahim and Al-Durahim, Youssef bin Nasser (1991), (Pests of grains and stored materials and methods of controlling them), Kingdom of Saudi Arabia, King Saud University
- 5- Begum, S.; Ayub, A.; Qamar Zehra, S.; Shaheen Siddiqui, B.; Iqbal Choudhary, M. (2014). Leishmanicidal triterpenes from *Lantana camara*. *Chemistry & biodiversity*, 11, 709–718, <https://doi.org/10.1002/cbdv.201300151>.
- 6- Gebreyohannes, L., Egigu, M. C., Manikandan, M., & Sasikumar, J. M. (2023). Allelopathic Potential of *Lantana camara* L. Leaf Extracts and Soils Invaded by It on the Growth Performance of *Lepidium sativum* L. *The Scientific World Journal*, 2023.
- 7- Hajam, Y. A., & Kumar, R. (2022). Management of stored grain pest with special reference to *Callosobruchus maculatus*, a major pest of cowpea: A review. *Heliyon*, e08703.
- 8- Harborne, J.B. (1984). *Phytochemical Methods, A guide to modern techniques of plant analysis*. 2nd ed., London, New York. Chapman and Hall.pp.. 288.
- 9- Joy, J.M.; Vamsi, S.; Satish, C.; Nagaveni, K. (2012). *Lantana camara* Linn: a review. *International Journal of Phytotherapy*, 2, 66–73
- 10- Mahdi, Muhammad Taher and Radi, Fadel Hamoudi (1984). The effect of using some vegetable oils on controlling the southern cowpea beetle (Coleoptera: Bruchidae) *Callosobruchus maculatus*. *Journal of Agriculture and Water Resources*, 3(2): 104-110.
- 11- Mahmoud, Imad Ahmed (1989). Mechanism of resistance of some legume seeds to the southern cowpea beetle (Coleoptera: Bruchidae) *Callosobruchus maculatus*. Doctoral thesis, College of Science, University of Baghdad, 115 pages.
- 12- Muhammad, Abdul Karim Hashem (2009) The effect of sesame oil, almond oil, and clove oil on the effectiveness of some pesticides on the southern cowpea beetle (Fab.) *Callosobruchus maculatus*, *Tikrit Journal of Agricultural Sciences*, 9 (1), pp. 268_278.

13- Roshetko, J. M., Pingault, N., Quang Tan, N., Meybeck, A., Matta, R., & Gitz, V. (2022). Asia-Pacific roadmap for innovative technologies in the forest sector (Vol. 15). CIFOR.

14- Sharma, R., & Ram, H. (2023). Water: Disinfection & Microbiological Analysis. Journal of Survey in Fisheries Sciences, 10(2S), 3079-3087.

15- Sivakumar, B., VA, V. G., Beerappa, D. C., & Nithin, K. P. (2022). A REVIEW ON MEDICINAL PROPERTIES OF LANTANA CAMARA LINN.

16- Uroko, R. I., Aguwamba, C., Aaron, C. F., Nweje-Anyalowu, P., & Uche, M. E. (2022). Evaluation of phytochemicals, antioxidant contents and in vitro antioxidant activities of a combined ethanol extract of *Spermaceoce radiata* and *Hypselodelphys poggeana* leaves. Journal of Medicinal Herbs,, 13(3), 57-65.

17- Zidane, Hindi Zidane; Gomaa, Ahmed Ali; Afifi, Fathi Abdel Aziz; Fam, Ezzat Zaki and Sayed Ahmed, Salwa Mustafa (1993). The remaining biological activity of some plant extracts on some stored grain insects and its relationship to the vitality of treated seeds, Journal of the Union of Arab Universities for Agricultural Studies and Research, Ain Shams University, Cairo: Volume 1, Issue 1, 113-123 pages.