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Insecticidal effect of ethanolic extract from *Zizyphus lotus* L. against *Tribolium castaneum (Herbest) (coleopteran:Tenebrionidae)*

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INTRODUCTION & AIM

Introduction:

Tribolium castaneum (*Herbest*) is one of the most concerning pests of food products. The control of this pest primarily relies on the use of chemical pesticides, whichraise numerous issues for human health and the environment. Therefore, it is crucial to explore alternative biological methods. Among the products studied, essential oils derived from aromatic and medicinal plants are considered natural fumigants. The fumigant effect involves eliminating insects through vapors, while the repellent effect refers to the ability of volatile molecules extracted from these plants to deter insects from approaching stored goods due to their odor.

Objective

In this study, we evaluated the effectiveness of ethanolic extracts from the leaves of *Zizyphus lotus* L. for the control of *Tribolium castaneum (Herbs*t). We analyzed the effects of contact toxicity and fumigation on the adults and larvae of this insect.

METHOD

COLLECTION OF VEGETAL MATERIAL AND AIR DRYING

The leaves of *Z. lotus* L. were harvested at maturity in the Tamanrasset region, located in the southern Sahara of Algeria, within the Hoggar mountain range, at an altitude of 1,400 meters. All samples were dried at room temperature (25 ± 3 ° C).

INSECT REARING

The study focused Coleopteran specie: *T. castaneum*, which were sampled from infested seed wheat from farmers' wheat stocks. *Tribolium.castaneum* was reared in glass jars containing a mixture of 1 kg commercial wheat and commercial semolina. The trays were maintained at 20 - 25° C and, 65 to70% relative humidity (RH).

Contact and Fumigation Toxicity Tests

Toxicity tests by contact and fumigation were conducted according to an established protocol. The ethanolic extract was dissolved in acetone for both tests, and mortality rates were recorded 72 hours after treatment, corrected using Abbott's formula. The median lethal concentration (LC50) values were assessed through probit analysis. To evaluate the toxicity of the ethanolic extract as a fumigant, adults and larvae of *T. castaneum* were separately exposed in one-liter glass jars, used as fumigation chambers. Mortality rates were also recorded after 72 hours and corrected using Abbott's formula, with LC50 values determined through probit analysis.

RESULTS & DISCUSSION

The ethanolic extract of the leaves of *Zizyphus lotus* L. characterized in this analysis exhibited a diverse composition, including rutin, robin, kaempferol, and apigenin. The ethanolic extract from *Z. lotus* L. contained significant amounts of rutin (25.9%), followed by robin (10.5%), kaempferol, and apigenin (15.06%, 7.04%). These compounds play a key role in defining the overall composition and contribute significantly to the insecticidal activity of the extract.

The tables below show that a clear dose-response relationship between the concentration of ethanolic extracts and the mortality rates of *Tribolium. castaneum* was observed from the regression equations generated from the data. The ethanolic extract of *Zizyphus. lotus* L. exhibits a decreasing LC50 value with increasing exposure time, indicating greater efficacy with longer exposure times. The LC50 value was 38.67 µl/l of air at 24 hours and gradually decreased to 13.92 µl/l of air at 96 hours, indicating the highest efficacy of *Zizyphus. lotus* L.

Table 1 : Lethal concentration of tested ethanolic extracts against *T. castaneum*

Pest species	Ethanolic extracts	Time (hour)	LC50 (µl/l air)	Regression equation	95% confidence level	
					Lower bound	Upper bound
T.castaneum	*Z.lotus*L.	24	38.67	Y = − 3.63 + 2.26x	0.69	3.90
		46	22.94	Y = − 4.18 + 2.91x	1.22	4.44
		72	16.90	Y = − 2.55 + 1.8x	1.10	4.12
		96	13.92	Y = − 1.11 + 1.01x	0.34	3.20

Table 2 : Lethal times of tested ethanolic extracts against *T. castaneum*

Pest species	Ethanolic extracts	Dose (µl/l air)	LT50 value (hour)	Regression equation	95% confidence level	
					Lower bound	Upper bound
T.castaneum	*Z. lotus L.*	10	100.01	Y = − 2.67 + 1.21x	0.59	5.12
		20	77.05	Y = − 2.58 + 1.33x	0.70	2.60
		30	31.24	Y = − 3.27 + 2.11x	1.35	3.40
		50	10.97	Y = − 3.26 + 2.96x	1.90	4.42

CONCLUSION

In conclusion, the ethanolic extract of *Zizyphus lotus* L. leaves demonstrates promising potential as a natural insecticide, attributed to its high rutin content and its ability to induce significant mortality in *Tribolium castaneum*, with an LC50 of 13.92 µl/l of air after 96 hours.

FUTURE WORK / REFERENCES

I want to test the insecticidal activity on other adult pest insects and larvae, as well as the bioactive components separately, and the mixture of two or more extracts and oil

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