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# Effects of Neemazal-T/S and Malation57 on the Rust-Red Flour Beetle *Tribolium castanum* (Herbst) Coleoptera: tenebrionidae

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## Abstract

The purpose of this research was to assess the efficacy of dissimilar doses of NeemAzal-T/S, Malathion57 and their combination against larvae and adult of the red flour beetle *Tribolium castaneum*. The recommended dose of NeemAzal-T/S didn't cause mortality to the adults until the 7<sup>th</sup> day up to 11<sup>th</sup> day (6.7%), (13.3%) respectively, where the larvae's mortality was reached (43.3%) on the 7<sup>th</sup> day and (83.3%) on the 11<sup>th</sup> day .

The recommended dose of malation57 caused mortality to all adults on the second day, where the treated larvae died completely on the 4<sup>th</sup> day. The combination of malathion57 and NeemAzal-T/S showed that 60% of the adults died on the first day where the larvae's mortality reached 57% on the same day, the mortality among the adults on the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> day was 80, 93, 100 % respectively , compared to the larvae on the same days 70, 77 and 97 % respectively.

It is clear for the results that Malation57 was more hasty mortality than NeemAzal-T/S which takes a long period of exposure.

## Introduction

The world's stored grains losses by insect damage, estimated between 10 to 50 % of the core world's production, in certain tropical and sub-tropical countries, estimates are much higher (Robert, 1978), for solving these crises, different methods of storage insect control are used including botanical and chemical pesticides applications.

Due to accumulated side effects of synthetic chemicals scientists resorted to plants and began to think seriously about exploiting these rich sources. Plant extracted active ingredients are characterized by their instability under light and ventilation in addition to their low toxicity on mammals ( Casida, 1983 and Bowers , 1983 ) .

## General objective

To observe Effects of Neemazal-T/S and Malation57 on the Rust-Red Flour Beetle *Tribolium castaneum* (Herbst) Coleoptera: tenebrionidae

## Specific objectives

- 1- To scrutinize the effect of the NeemAzal-T/S on the Red Flour Beetle ( adult and larvae stags )
- 2- To examine the Effects of the Malation57 on the Red flour Beetle ( adult and larvae stags )
- 3- To compare the Effects of combination of NeemAzal-T/S and Malation57 on the Red Flour Beetle

## Material and Methods

### Insect rearing

The red flour beetle *Tribolium castaneum* was obtained from the stock culture of grain storage at Agricultural Research and Technology Corporation (ARTC) Food processing Research Center ( FPRC) in Khartoum.

The collected adults and larvae were brought to the laboratory of the Entomology, Department of Plant Protection, Collage of Agricultural Studies, Sudan University of science and Technology (SUST). Larvae and adults were reared at the room temperature ranging between 27 and 30 centigrade, the adults were kept in plastic containers (11.22 cm in diameter), in each container was supplied by broken maize and covered with muslin cloths (plate1 ). After the egg hatched, the larvae were immediately transferred into separate plastic container (15.5 cm in diameter) containing broken maize (plate 2).

### Effect of the NeemAzal-T/S on the Red Flour Beetle

The toxic effects of NeemAzal-T/S were studied by comparing the mortality caused by three different doses, the first dose were 0.25 ml/ 150 ml water , 05 ml/ 150 ml ware and the recommended dose by the company were 0.75 ml/150 ml water . Broken maize were dipped in each dose for 40- 45 seconds and left for 15-20 minutes under room conditions.

Ten third instar larvae and ten adults were introduced to each petri dish lined with 15 g of broken maize, each treatment was replicated three times and Completely Randomized Block Design was used in this study, the mortality was recorded daily.

### **Effects of the Malation57 on the Red flour Beetle**

Three different doses of Malation57 were used as follows 5ml/ 250 ml water, 10ml/250ml water as recommended dose and 15ml/250ml water. And each dose was dipped 15 g of broken maize for 40-45 seconds, and then treated maize was carefully transferred to Petri dish.

Separately ten instar of larvae and the adult stage were placed in each petri dish. The control petri dishes were added with 15g of untreated broken maize, the same procedure was followed for adults. Each treatment was replicated three times.

Dead insects were counted and mortality was recorded daily, the experiment was conducted using a Completely Randomized Block Design.

### **Effects of combination of NeemAzal-T/S and Malation57 on the Red Flour Beetle**

Fifteen gram of broken maize was dipped in a solution consisting of a mixture of the recommended dose of NeemAzal-T/S and Malation57 (1:1). The treated maize was carefully transferred into petri dish and added 10 instar larvae and adults separately. Each treatment was replicated three times on the other hand control petri dishes were supplied with 15g of untreated broken maize. The mortality was recorded daily; the experiment was conducted using a Completely Randomized Block Design

### **Statistic analysis**

The data was statistically analyzed according to analysis of variance (ANOVA) ; LSD test was used for means separation ( Devore, 1982 ) .

### **Results**

#### **The effect of NeemAza-T/S against the larvae and adults of *Tribolium castaneum***

Considering the mortality among the larvae and adults (as seen table .1 and illustrated in fig.2 and fig.3) there was no significant differences among the three tested doses until the fifth day.

On the sixth day NeemAzal higher dose gave a significantly higher mortality than the lower and recommended dose, whereas in the adults had no significant difference in mortality among the three dose. On the seventh day the recommended dose gave a significantly higher mortality among the larvae than the lower dose but it was significantly lower than the higher dose. On the other hand there was no significance difference among adults for the three doses, but the last day of the experiment (11<sup>th</sup> day) the NeemAzal higher and recommended doses gave 80 and 83 % mortality respectively and there were no

significantly different. As for the adult's only 11%, 13.3% and 20% mortality were obtained using the lower, the recommended and the higher dose respectively. As for the control treatment not a single larva or adult died throughout the experiment.

Continue to Table (1)

Treatments	Mortality percentage											
	6 <sup>th</sup> day		7 <sup>th</sup> day		8 <sup>th</sup> day		9 <sup>th</sup> day		10 <sup>th</sup> day		11 <sup>th</sup> day	
	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	adult
NeemAzalT/S lower Dose	26.9b	0a	26.7bc	3.3a	46.7b	3.3b	60b	6.7bc	66.7b	6.7bc	73.7b	11b
NeemAzalT/S Recommended Dose	30b	0a	43.3b	6.7a	63.3a	6.7ab	66.7a	10ab	80a	13.3ab	83.3a	13.3b
NeemAzalT/S Higher Dose	36.7a	3.3a	50a	6.7a	60a	13.3a	70a	16.7a	76.7a	20a	80a	20a
Control	0bc	0a	0bcd	0a	0bc	0b	0bc	0bc	0bc	0bc	0bc	0bcd
SE ±	1.670	1.848	1.569	3.58	1.554	3.07	1.953	2.277	1.844	2.733	1.953	1.789
LSD	5.007	5.560	4.704	10.73	4.658	9.22	5.855	6.827	5.527	8.192	5.855	5.366
C.V%	5.0	6.9	4.704	12.7	4.3	10.7	5.0	7.7	4.8	9.1	5.0	5.9

Means followed by the same letter (s) are not significantly different at p 5%

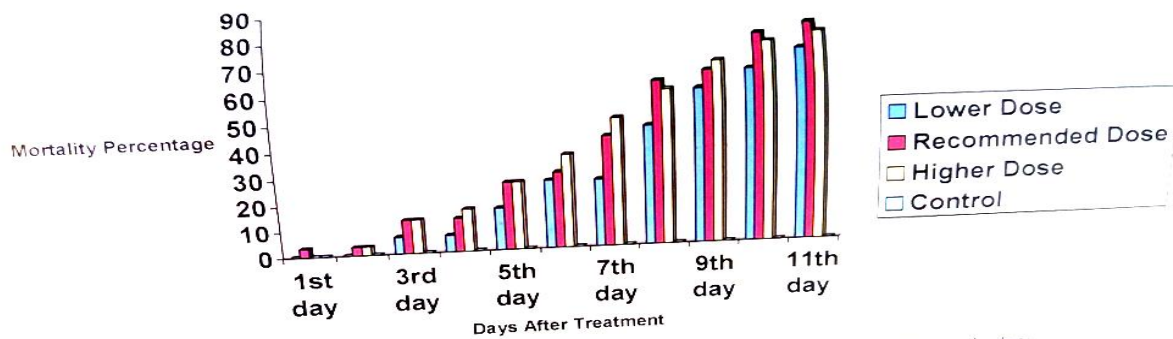


Figure 2: the effects of NeemAzal T-S against the larvae of *Tribolium Castaneum* Var. cherbsti

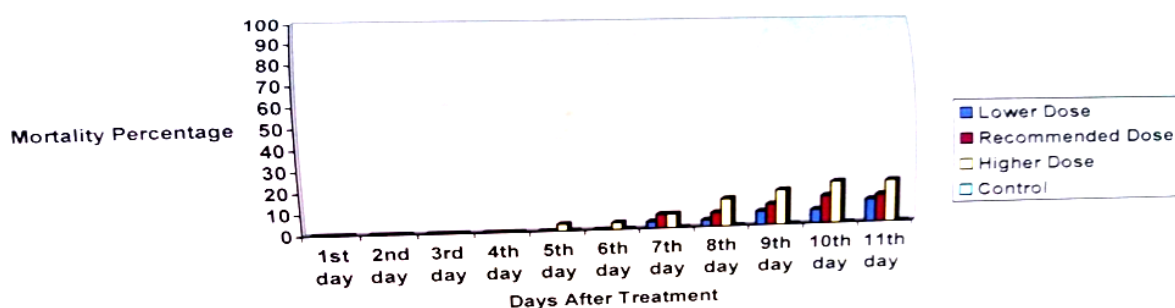


Figure 3: the effect of NeemAzal-T/S against the Adults of *Tribolium castaneum* var. (herbsti)

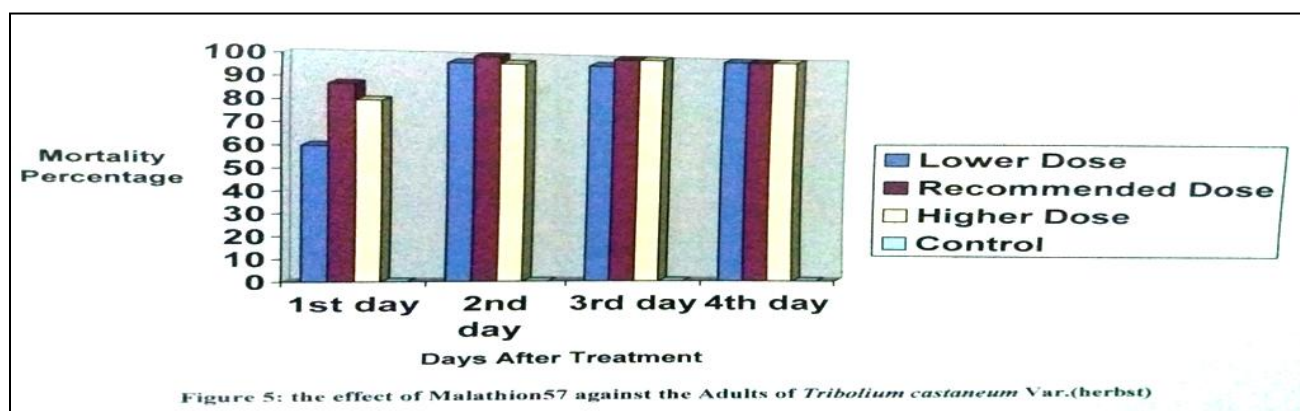
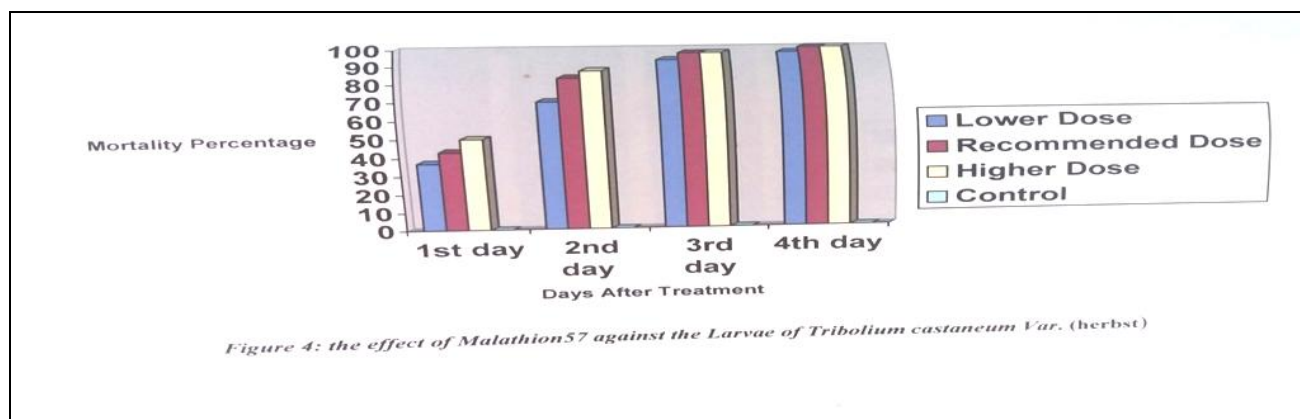
### The effect of Malation57 against larvae and adults of *Tribolium castaneum*

As seen in table. 2 and illustrated in fig. 4 and fig. 5. The first day, as mortality results show, there is no significant difference in mortality among larvae for all tested doses of Malation57 which gave significantly higher mortality than the control. As for the adults the recommended dose gave significantly higher mortality than the lower dose. By the second day all adults treated with Malation57 recommended dose were dead and there was no significant difference in Malation57 among the larvae treated with the recommended and higher dose of Malation57 whereas the lower dose gave significantly lower mortality. By the third day there was no significant difference in mortality of the larvae among the three tested doses causing 93-97 % mortality. As for the control, not even a single adult or larva died throughout the experiment

Table (2) .The effect of Malathion57 against larva and Adult of *Tribolium castaneum*

Treatments	Mortality Percentage							
	1 <sup>st</sup> day		2 <sup>nd</sup> day		3 <sup>rd</sup> day		4 <sup>th</sup> day	
	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult
Malathion57 lower Dose	37a	60b	70b	97a	93a	97a	97a	100a
Malathion57 Recommended Dose	43a	87a	83a	100a	97a	100a	100a	100a
Malathion57 Higher Dose	50a	80a	87a	97a	97a	100a	100a	100a
Control	0b	0bc	0bc	0b	0b	0b	0b	0b
SE ±	6.72	3.28	3.98	3.29	5.43	2.92	4.65	0
LSD	20.14	9.83	11.93	9.86	16.28	8.76	13.93	0
C.V%	60.2	19.1	20.8	14.1	21.1	11.5	15.9	0

Means followed by the same letter (s) are not significantly different at p 5%



### The effect of NeemAzal-T/S and Malathion57 combination against larvae and adults of *Tribolium castaneum*

As seen in table.3 and illustrated in fig.6 and fig.7. The result of the first day mortality larvae demonstrated that the combination of malation57 and NeemAzal-T/S and Malation57 recommended dose were significantly higher than NeemAzal which was not significantly different from the control. On the other hand, the Malathion57 recommended dose caused a significantly higher mortality among the adults than the combination of Malation57 and NeemAzal-T/S and also thanNeemazl-T/S recommended dose.

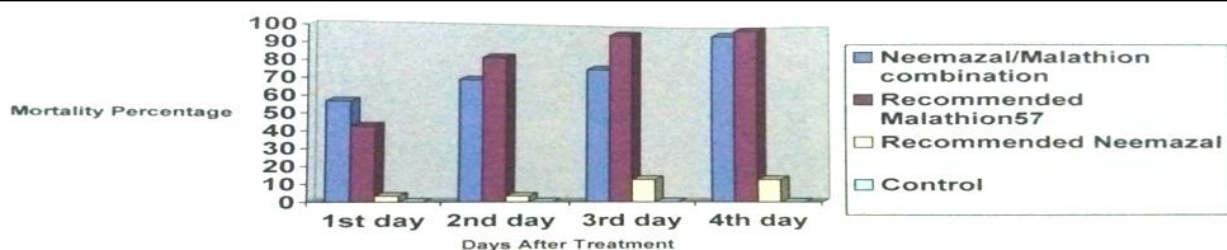
On the third day Malathion57 resulted in 100% kill of adults as opposed to 93% caused by the combination. By the last day of the experiment (the fourth day) all adults treated by Malathion57 recommended dose and the combination were dead, whereas NeenAzal-T/S recommended dose killed 0% of the adults and 13% of the larvae.



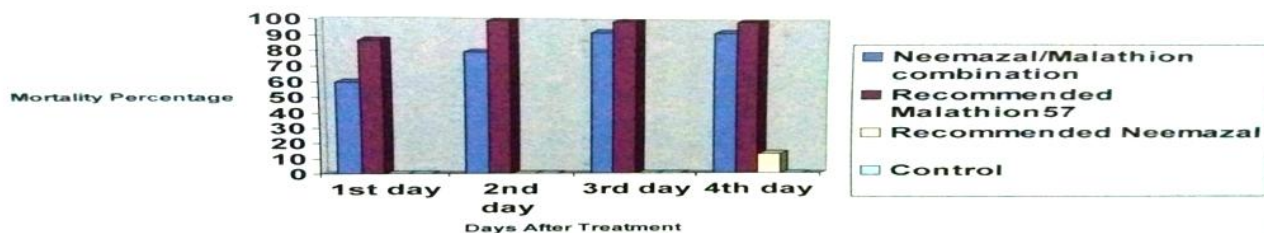
**Table (3). The effect of Combination Malathion57 and NeemAzal-T/S (50:50%) compared with Malathion57 Recommended dose and NeemAzal-T/S Recommended dose against larvae and adults of *Tribolium castaneum***

Treatments	Mortality Percentage							
	1 <sup>st</sup> day		2 <sup>nd</sup> day		3 <sup>rd</sup> day		4 <sup>th</sup> day	
	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult
Combination of Malthion57 and NeemAzal-T/S	57a	60b	70b	80b	77b	93a	97a	100a
Malathion57 Recommended Dose	43a	87a	83a	100a	97a	100a	100a	100a
NeemAzl-T/S Recommended Dose	3.3b	0bc	3.3bc	0bc	13bc	0bc	13bc	0bc
Control	0b	0bc	0bc	0bc	0bc	0bc	0bc	0bc
SE ±	6.72	3.28	3.98	3.29	5.43	2.92	4.65	0
LSD	20.14	9.83	11.93	9.86	16.28	8.76	13.93	0
C.V%	60.2	19.1	20.8	14.1	21.1	11.5	15.9	0

Means followed by the same letter (s) are not significantly different at p 5%



**Figure 6: the effect of NeemAzal-T/S and Malathion57 combination against the larvae of *Tribolium castaneum* Var. (herbst)**



**Figure 7: the effect of NeemAzal-T/S and Malathion57 combination against the Adults of *Tribolium castaneum* Var. (herbst)**



## Discussion

The search for safe naturally occurring pesticides for the pest of the field crops and storage pests has been intensified in the last few decades. The extract of the neem tree is found to be among the most important and economic natural products because of its wide spread, abundance and availability, in addition to that it restrains successful insecticides.

The present research was undertaken to study the efficacy of Neemazal-T/S, Malathion57 and their combination against the larvae and adults of *Tribolium castaneum* the results obtained demonstrated that the Neemazal-T/S is less effective than both the Malation57 and the combination of NeemAzal-T/S and Malathion57 against the larvae and adults of the red flour beetle.

The results showed that the different concentrations of NeemAzal-T/S caused different mortality percentages even after 11 days in both adults and larvae. In fact larvae showed higher mortality than the adults. This may be due to azadirachtin which prevents the larvae of some insects for molting by inhibiting production of ecdysone hormone, which responsible for triggering molts. These results agreed with the finding of ( Weinzierl and Henn 1991), who reported that azadirachtin effected larval molting and caused insects to stop feeding after ingestion due to secondary physiological effects. NeemAzal-T/S was less potential when mixed with Malation57.

## Conclusion

The larvae of *Tribolium castaneum* shewed higher susceptibility to NeemAzal-T/S than the adult. The results showed that Malation57 was more effective against both larvae and adults compared with the NeemAzal-T/S alone and the combination of the NeemAzal-T/S 50% and Malation57 50%. In addition to that Malation57 caused higher mortality perecentage in the adult stage than the larvae stage. The combination of Neemazal-T/S 50% and Malation57 50% showed more potency than the Neemazal-T/S alone and less potency than the Malathion57. So it can be concluded that, the NeemAzal-T/S is less potential when it is used alone than when it mixed with the Mation57.

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