Response Of *Latheticus oryzae* (Coleoptera: Tenebrionidae) To Three Pyrethroid Insecticides

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الخلاصة

في دراسة مختبرية لتقدير استجابة يرقات الطورين الرابع والسادس والبالغات بعمر 1 أسبوع لحشرة الخنفساء طويلة الرأس *Latheticus oryzae* للسمية بعد 24 و 48 و72 ساعة من تعريضها للحنطة المعاملة بتراكيز مختلفة من المبيدات البيايريثرويدية الفاكيم ALPHACHEM® (مستحلب مركز5%)، ديسس®DECIS (مستحلب مركز 20%) وترست ®TRUST (مسحوق قابل للبلل 25%). بينت نتائج الاختبارات وبالاعتماد على قيم ت ق 50 أن يرقات الطور الرابع وبشكل عام كانت الأكثر حساسية لتأثير المبيدات من يرقات الطور السادس والبالغات بعمر أسبوع وان سمية المبيدات ازدادت (قيم ت ق 50 انخفضت) مع زيادة فترات التعريض من 24 إلى 72 ساعة. فضلاً عن ذلك تشير النتائج إلى أن المبيدين الفاكيم وديسس أكثر سمية من المبيد ترست.

Abstract

Laboratory experiments were carried out to evaluate the response of 4th and 6th larval instars and 1week old adults *Latheticus oryzae* by exposure for 24, 48, and 72 hour to wheat treated with different concentrations of the three pyrethroids: ALPHACHEM® (5 EC), TRUST® (25 WP) and DECIS® (20 EC). Based on the Lc_{50} values of the three insecticides the result showed that 4th instar larvae were much susceptible to the insecticides than the 6th instar larvae and adults. The toxicities of insecticides increased (the values of Lc_{50} decreased) as the exposure period increased from 24 to 72 hour. Also th study showed that, ALPHACEM and DECIS were more effective than TRUST.

Introduction

The major biotic factors influencing wheat loss during storage are insects, moulds, birds and rats. The major insect species known to infect wheat include Khapra beetle, *Trogoderma granarium* (Everts) Red flour beetle, *Tribolium castaneum* (Hbst). and Long headed flour beetle *Latheticus oryzae* (waterhouse) which is infest storages of grain and found in the home and grocery stores. All these insects may be found extensively in most developing countries to different extremes (1,2) The long-headed flour beetle *L. oryzae* (waterhouse) is a member of very large cosmopolitan of beetles Tenebrionidae and is a significant pest in tropical and sub-tropical regions of the world (3). For control of pests infestation and economic damage, most of the recent studies tended towards using insecticides, Pyrethroids for example is used increasingly, but because new resistances continue to develop, research on replacement or new protectants has continued (4).

In Iraq an impressive amount of research has been done to evaluation the toxicity of insecticides to stored products insect pests. However, to the best of my knowledge none has been done on *Latheticus oryzae*. Results are reported here of studies conducted in the laboratory to evaluate the response of *L. oryzae* to three pyrethroid insecticides.

Materials and methods

Fourth and sixth instar larvae and 1-week old adults of *L. oryzae* Were obtained From an established laboratory culture which had been reared on whole wheat flour at 35C and 75% hr (5,6). The synthetic pyrethroids used were ALPHACHEM® (5 EC), TRUST® (25 WP) and DECIS® (20 EC). All insecticides diluted in distil water to produce solutions.

Efficacy Tests :

Initially insecticides were applied at rate of 0.5ml / 50g of wheat *Triticum aestivum*. Solutions were pipetted on to the sides of jars immediately above the wheat surface and the jars were sealed, shaken briefly by hand for 5 minutes. Batches of 10 one-week old adults, 4^{th} or 6^{th} instars larvae were added to each jar (7). Five concentrations of each insecticide (1.0,3.0,5.0,7.0 and 10.0 µ/ml of ALPHACHGEM and DECIS1.0,3.0,5.0,7.0 and 10.0 µg/ml of TRUST) along with distil water treated control, all with three replicates. Jars were then covered with pieces of cloth and kept at rearing conditions. At 24,48 and 72 hour Post exposure the number of dead insects were counted. Affected insects which were unable to walk in a coordinated manner were considered responding to the insecticides. Mortality was corrected using Abbott's correction (8). Then the percentage mortalities were plotted against the concentrations on log–probit paper and the lethal concentration (Lc_{50}) values were obtained by inspection (9).

Results and Discussion

General speaking, the Lc_{50} data table-1 indicate that the three insecticides are very toxic to adults and larvae of Long-headed flour beetle tested. and the toxicities are in the order of ALPHACHEM> DECIS> TRUST and that the Lc_{50} values of the three insecticides decreased as post-exposure period increased from 24 to 72 hour.

Response Of *1- week old* adults *L. oryzae:*

The Lc_{50} values indicate that the most toxic one ALPHACHEM is 2.25, 2.30, 2.00 and 1.70, 1.30, 1.40 times respectively more toxic than TRUST and DECIS at 24, 48 and 72 hour of post-exposure to treated wheat. The beetles became more susceptible as the exposure period increased. This result is in a full agreement with that obtain by Allatar and Abbass (2004) who found that the susceptibility of Confused and Red flour beetles to some synthetic pyrethroids increased with the passage of time.

The high toxicity of the three insecticides tested in this study could be, at least partially, due to the low levels of the insecticides metabolizing enzymes, the mixed function oxidases and/or the increased levels of insecticides penetration. On the other hand, the decrease in susceptibility could be attributed to the ascend of enzymes level as the exposure period expanded (11, 14, 15)

The Response Of Larval Instars:

The results in table 1 also show the Lc_{50} values of the three insecticides against the 4th and 6th instar larvae. In general, there was appreciable decreased in Lc_{50} values as exposure periods increased, and the toxicities of DECIS, TRUST and ALPHACHEM against 4th instar larvae at 72 hour post-exposure, were 7.0, 2.8 and 2.o times respectively more than the toxicities of the three insecticides against the adults. On the otherhand, the 6th instar larvae were in general, as susceptible to the three insecticides as the adults, and only slightly more tolerant to the three insecticides than 4th instar larvae at 24 hour post-exposure, but were 1.4, 2.8, and 4.0 times more tolerant to ALPHACHEM, DECIS and TRUST respectively, at 72 hour post-exposure. These results are in agreement with the results of Abbass (2000) who reported that the larvae of *T.*

confusum and *T. castaneum* were less susceptible to pyrethroid insecticides as the larval instar advanced.

It is obvious from the the Lc50 values that, the three insecticides were about equi-toxic to the 4^{th} instar larvae at each of the exposure period. The trend of increasing toxicity as the exposure period increased is similar to that observed with the adults. When tested with the 6^{th} instar larvae the three insecticides at 24 and 48 hr post-exposure were only slightly less toxic than to 4^{th} instar larvae, but were greatly less toxic than to 4^{th} instar larvae at 72 hr post-exposure. With the exception of the toxicity of ALPHACHEM at 24 hr post-exposure to the three insecticides are slightly more toxic to the 4^{th} instar larvae than to the adults. In contrast the three insecticides were only more toxic to the adults than to the 6^{th} instar larvae. A similar result was observed in McDonald (1981) study who indicate that the 6^{th} instar larvae of Pale Western cut worm *Agrotis orthogonia* were less susceptible to pyrethroid insecticides than the 4^{th} and 5^{th} instars larvae.

From the results of this study it can be concluded that the level of the insecticide metabolizing enzymes, which play a vital role in determining the response of an insect to an insecticide, varied with period of exposure and stage of development and this is manifested in the response of the adult and larvae to the insecticides tested.

Table-1: The Response of 1-week old adults 4^{th} and 6^{th} instar larvae of *Latheticus oryzae* to the three insecticides

Insecticides	periods exposure (hour)	1-week old adults		4^{th} instar larvae		6^{th} instar larvae	
		Lc50	Slope	Lc50	Slope	Lc50	Slope
ALPHACHEM	24	2.00	1.51	2.60	1.57	2.50	1.93
	48	1.30	1.57	1.00	1.68	2.00	1.70
	72	1.00	1.38	0.40	2.05	1.40	1.62
DECIS	24	3.50	2.02	2.20	1.40	3.30	1.44
	48	1.70	1.79	1.50	1.56	1.20	1.79
	72	1.40	1.56	0.20	2.33	0.96	1.77
TRUST	24	4.50	2.23	3.60	1.87	4.00	1.46
	48	3.00	1.76	1.70	1.55	1.60	1.90
	72	2.00	1.68	0.46	1.81	1.00	1.89

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