THE EFFECT OF CADMIUM AND LEAD ELEMENTS ON THE MORTALITY OF *CULEXQUINQUEFASCIATUS*

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ABSTRACT

Present study was carried to evaluate the toxicity of the Pb and Cd elements on the larvae of *Culexquinquefasciatus*. In the laboratory 5 concentrations of lead nitrate and cadmium nitrate , namely 10, 20, 30, 40, and 50 mg\l and 1, 1.5, 2, 2.5, and 3 mg\l of Pb and Cd respectively in each concentration 10 larvae were introduce beside there was a control (0mg/l).

Statically analysis results declare that 1st and 2nd instars effected significantly in comparison with the control .Mortality percentage reached 28, 38.7, 48, 58, and 73.5 % in concentration 10, 20, 30, 40, and 50 mg\l respectively of lead nitrate. On the other hand, cadmium nitrate mortality percentage reached 44, 55, 65, 74.5, and 79.5 % in concentration 1, 1.5, 2, 2.5, and 3 mg\l respectively.

Also, LC_{50} was going higher as the larva going older, measured 14.7, 16.9 for 1st and 2nd instars and 22.3 and 41.4 for 3rd and 4th instars. On the other hand, cadmium nitrate appeared more affect than Leadnitrate with LC_{50} of 0.9, 1.05, 1.3, and 1.8 mg\l for 1st, 2nd, 3rd, and 4th instars respectively.

INTRODUCTION

Water pollution is defined as any change in the physical, chemical or biological properties of water so that water becomes harmful to humans, aquatic organisms or property. So thatPollutant activity, inorganic chemicals, mineral substances, oxygen-

depleting wastes, manufactured organic compounds, plant nutrients, pathogens, thermal pollution and sediment have increased the risk of pollutants in the aquatic environment (1).

The water bodies in Basrah are exposed to pollution. The most important of these pollutants are the heavy elements, which include a large group of about 38 elements, of them are necessary for vital activities such as Fe, other are poisoningsuch as Hg, Pb, Cd and Ni. Continuityemission of these element from natural and industrial sources Lead to increase their concentration in the atmosphere, could be reaches up to 5 g / cm(2).

The most important risk in heavy metals is that they are high solubility and remain in the water for a long time without precipitation. Heavy metals differ from other pollutants, asmost of them have cumulative properties. Many of the insects that spend a life cycle in water are used to assess environmental hazards. They are considered as environmental indicators to determine the state of the aquatic environment, because they are known anatomically and are significantly affected by the state of the environment that live in it, especially when the environment contains metal contaminants, upon them insect arevary in sensitivity from one species to other and that sometimes may lead to the exclusion a species or evolved other (3).

MATERIAL AND METHODS

Culexquinquefasciatus was collected during the period from 1/9/2016 to 1/4/2017, from a water pond in the district of Abu al-Khasib in the city of Basra using a scoop, Thesamples were kept in plastic bottles containing500 ml of water from the same environment collection , Aquarium (30 * 30 * 35 cm) containing tap water left for 3 days to dispose of chlorine with the addition of 2 gm of organic matter (fish feed) each basin for of feeding the larvae .(4) found that this system is the most favorable and appropriate for the development of the larvae.

Investigation larvae until they are converted into virgins were done every day. to get and obtaining a pure, permanent farm.Newly emerged virgins were removed by a wide-bore dropper into plastic containers and placed in cedar-shaped cages of tulle (90 *

90 * 90 cm). Adults fed out with 10% a glucose solution were fed 10% using a piece of cotton saturated with that solution, placed at the top of the cage. This meal is important for the insect to obtain the necessary energy for flight and other life activities. Water was added every three days (5).

After the process of mating and in order to develop the eggs, female was fedingwith a meal of blood through the exposure of bar pigeon placed in the cage,Water vessel was also placed-in the cage for egg layingby the female. Eggs were observed after 2-5 days.Eggs boats transferred to 250 mlplastic containers- containing distal water-using a small brush,Investigation was done till egg hatched and larvae appear, forlaboratory experiments. The larvae are isolated by a small brush and then transferred to the pots used in experiments and container. Theelement concentrations for the four larval stages were used in the experiments. It should be noted that insect breeding and preparation of the farm were carried out under laboratory conditions at 28 ° C and 50% relative humidity and 12 light-12 dark light in the incubator (6).

The effect of different concentrations of cadmium nitrate and lead nitrate on the four larval stages of Culex mosquitoeswas studied. Ten larvae from each instar were introduced to each concentration by (3 replicates/ concentration /instar) using plastic containers (9 * 8 * 10) of 100 ml capacityfor each concentration in addition to the control sample with distal water only (8). The number of dead larvae after 48 h of treatment was calculated as the semi-lethal concentration to revive LC50 according to the following equation Y = ax + b where a = intercept and b = slope. All laboratory experiments were analyzed using the spss program Probability 0.05 (9)

Preparation of concentrations of lead and cadmium

The salts of the heavy metals used in this experiment were Pb $(No_3)_2$ and Cd $(No_3)_2.4H_2O$, preparation of concentrations for the studied elements and their effect on the larvae was done as described by(7),by melted 0.8 g of lead nitrate salt and completed to 500 ml of deionized distilled water to obtain the original solution stock solution at 1 mg/l, which is 1000 ppm. The studied concentrations were 10, 20, 30, 40 and 50 mg /l . They dissolved in 1.4 g of cadmium nitrate salt and completed to 500 ml of distilled water free of ions to obtain the original solution (stock solution) at a concentration of 1

mg /l, which is equivalent to 1000 parts per million and attended the studied concentrations 1, 1.5, 2, 2.5 and 3 mg /l.

RESULTS AND DISCUSSION

The statistical analysis of the results of the present study showed a significant effect of the elements Cd and Pb with their different concentrations on larval stages of mosquitoes *C. quinquefasciatus*. The effect of cadmium with its different concentrations on the larval stages after 48 h is shown in table 1 . The mean percentage of the first phase was measured at 1 mg /l of 44% cadmium nitrate and the concentration was 1.5 mg / l 55% and concentration 2 mg /l 65% and concentration of 2.5 mg /l 74.5% and concentration 3 mg /l 79.4% compared to control treatment of 0%.

Table 1: Mortality for different larval stages of*C . quinquefasciatus* In different concentration of Cadimium

	Mortality percentage					
Conc. / stageS	0	1	1.5	2	2.5	3
1st stage	0	56	70	80	86	93
2nd stage	0	50	60	70	76	83
3rd stage	0	40	50	60	73	76
4th stage	0	30	40	50	63	66
Mean mortality for each concentration		44	55	65	74.5	79.4

R L S D = 0.57

The effect of the lead element in its different concentrations on the larval stages after 48 h is shown in Table. The mean percentage of the first phase was 10 mg/l of lead nitrate, 28% concentration, 20 mg /l 38.75%, concentration 30 mg /l 48% 40 mg/l 58% and 50 mg/l concentration 73.5% compared to control treatment of 0%.

Table2: mortality for different larval stages of*C . quinquefasciatus*

In different concentration of Lead

	Mortality percentage					
	0	10	20	30	40	50
1st stage	0	**43**	**56**	**63**	**73**	**86**
2nd stage	0	**33**	**43**	**53**	**63**	**76**
3rd stage	0	**23**	**33**	**43**	**53**	**66**
4th stage	0	**13**	**23**	**33**	**43**	**66**
Mean mortality for each concentration		**28**	**38.75**	**48**	**58**	**73.5**

R L S D = 0.01

Present results showed that affected of the lead and cadmium on the first and second larval stages was significantly different compared to other stages. This finding is in agreement with (10)whom obtained on their study of the effect of lead, cadmium and manganese toxicity on *C pipienis* mosquito larvae. Same results was obtained by (11),whom they found that during the examination of different concentrations of Cd, Zn and Cu in three water complexes in Calcutta, mortality*C quinquefasciatus* mosquito larvae increased. due to increasing of water contaminated with these elements compared to water-free of these elements.

The effect of certain phases of heavy metals on these insects may be due to the fact that weakness or breakdown of the metal responsive transcription factors (MTF-1), which controls the work of certain genes of the mosquitoes that regulate and control the insect's response to high concentrations of heavy metals (12)Stopping the action of the MTF-1 protein in the Drosophila insect resulted in an increased sensitivity of the insect to some heavy elements,

The statistical analysis showed that the percentage of mortality in the larvae increased with increasing concentrations of the elements.

In a study of the toxicity of some heavy metals on the larvae of various mosquitoes, (13) noted that cadmium and manganese primarily affects larvae. The researcher concluded that the salts of heavy elements are absorbed into the bodies of animals at different rates depending on the elements causing the death of the animal or the appearance of deformities according to the amount of salt taken for the concentration. Therefore, the difference in the toxicity of the elements (the difference in time required to reach the semi-lethal concentration) in equal concentrations of these elements calls for the assumption that the rate of entry and accumulation of these elements in animal bodies . The researcher found that the concentration that is sufficient to cause killing or deformation of the larvae varies according to the salts of the elements and is low in the salts that cause a clear toxicity after a short period of time and therefore the elements that are absorbed quickly are highly toxic. The study found that the LC50 concentration of larvae treated with cadmium citrate was 0.9, 1.05, 1.3 and 1.8 mg /l for larvae of the first, second, third and fourth stages respectively (Fig 1-4),

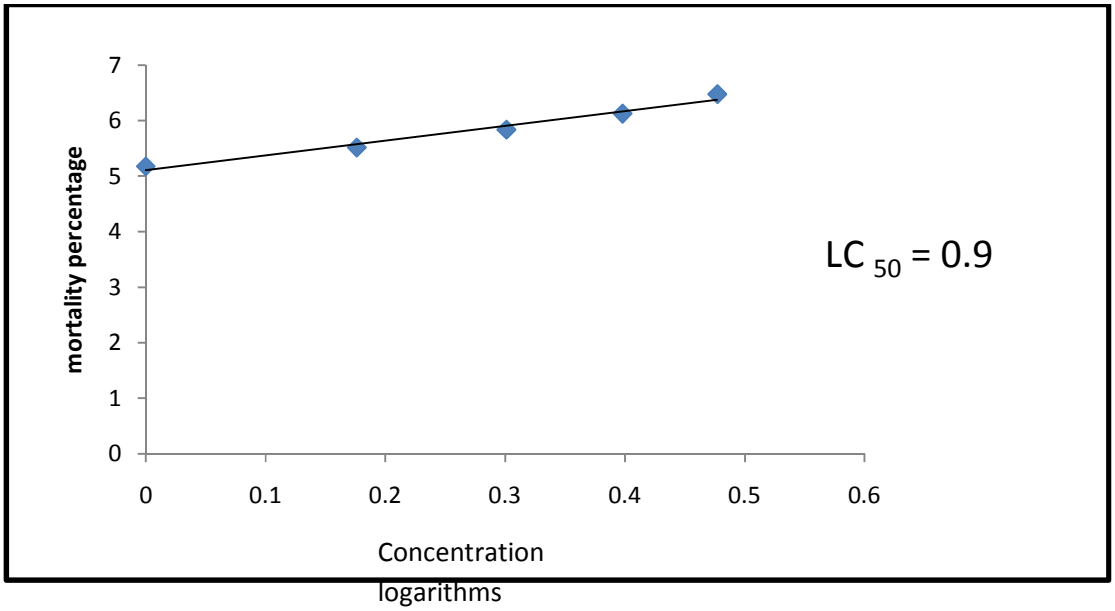

Fig. 1: LC50 for Cadmium on the 1st larval stage of*C quinquefasciatus*

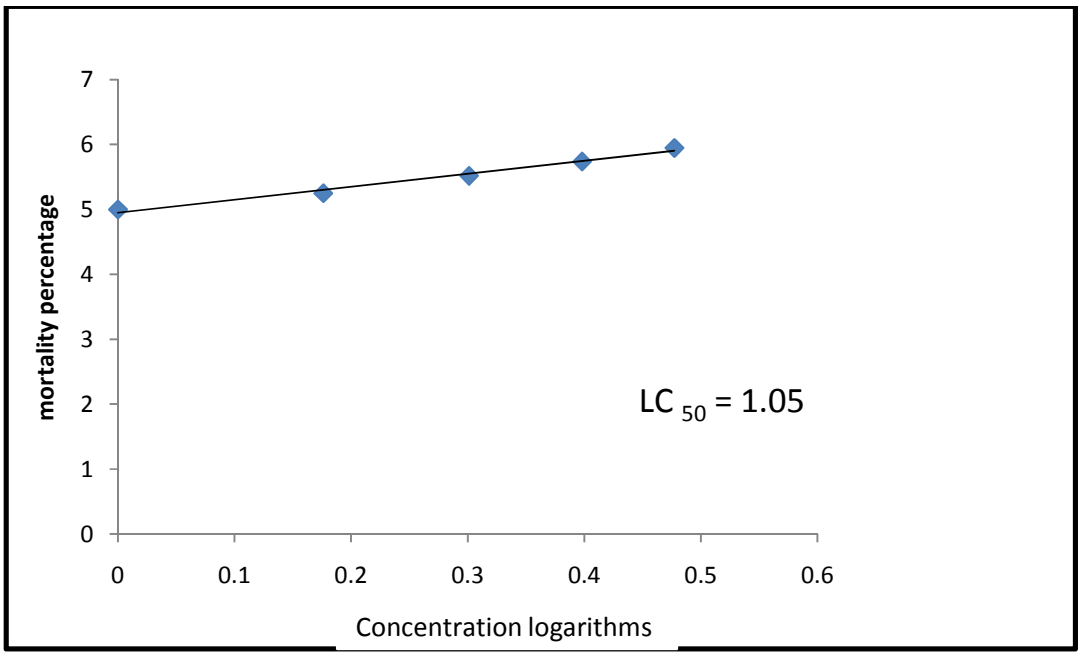

Fig: 2. LC50 for Cadmium on the 2nd larval stage of*C quinquefasciatus*

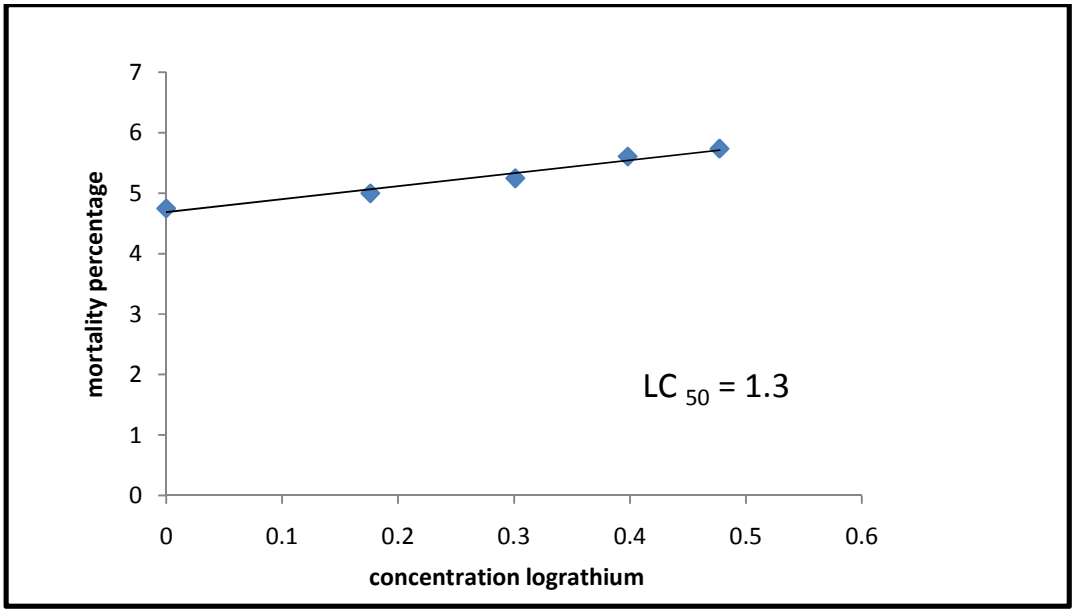

Fig.3: LC50 for Cadmium on the3rd larval stage of*C quinquefasciatus*

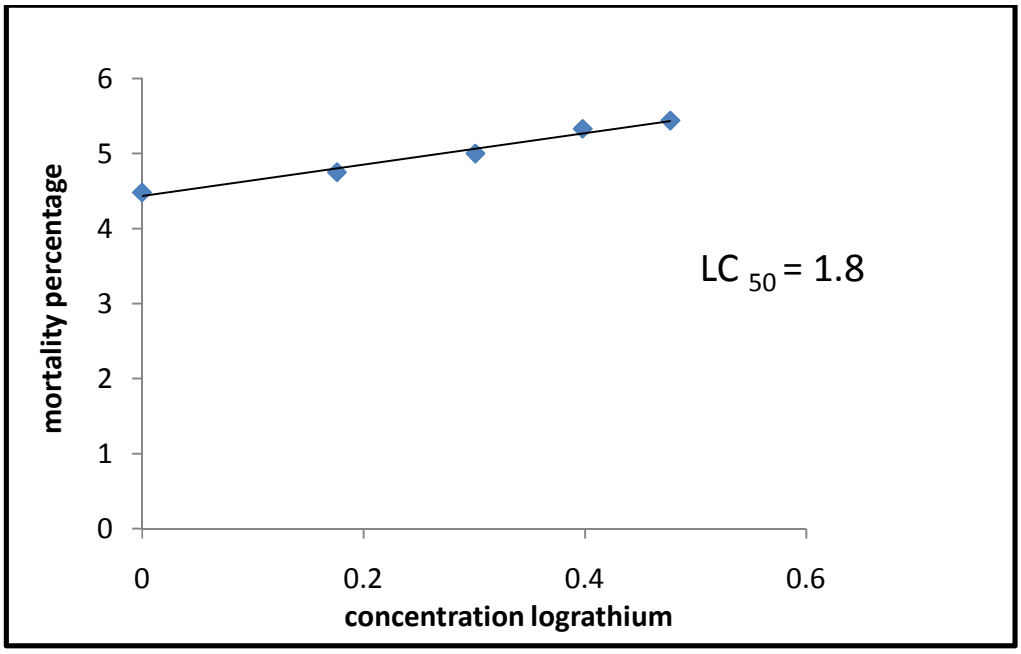

Fig.4: LC50 for Cadmium on the 4th larval stage of*C quinquefasciatus*

While LC50 concentration of larvae treated with lead nodules was 14.7, 16.9, 22.8 and 41.4 mg /l for the first and second phase larvae and third and fourth respectively (Fig5-8).

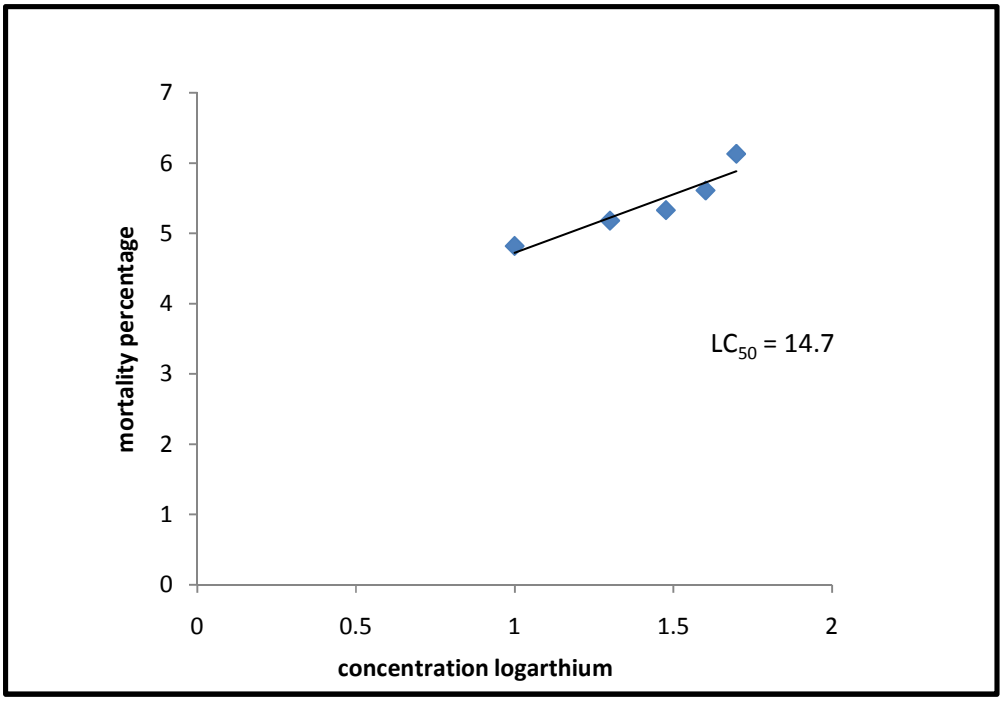

Fig.5: LC50 for lead on the 1st larval stage of*C quinquefasciatus*

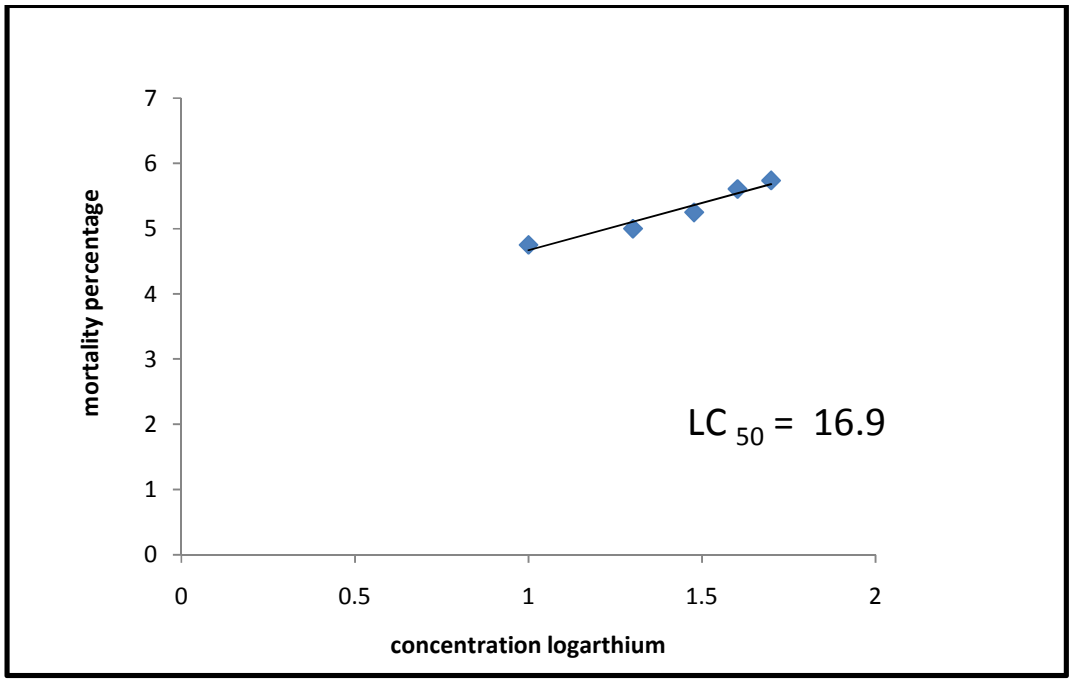

Fig.6: LC50 for lead on the 2nd larval stage of*C quinquefasciatus*

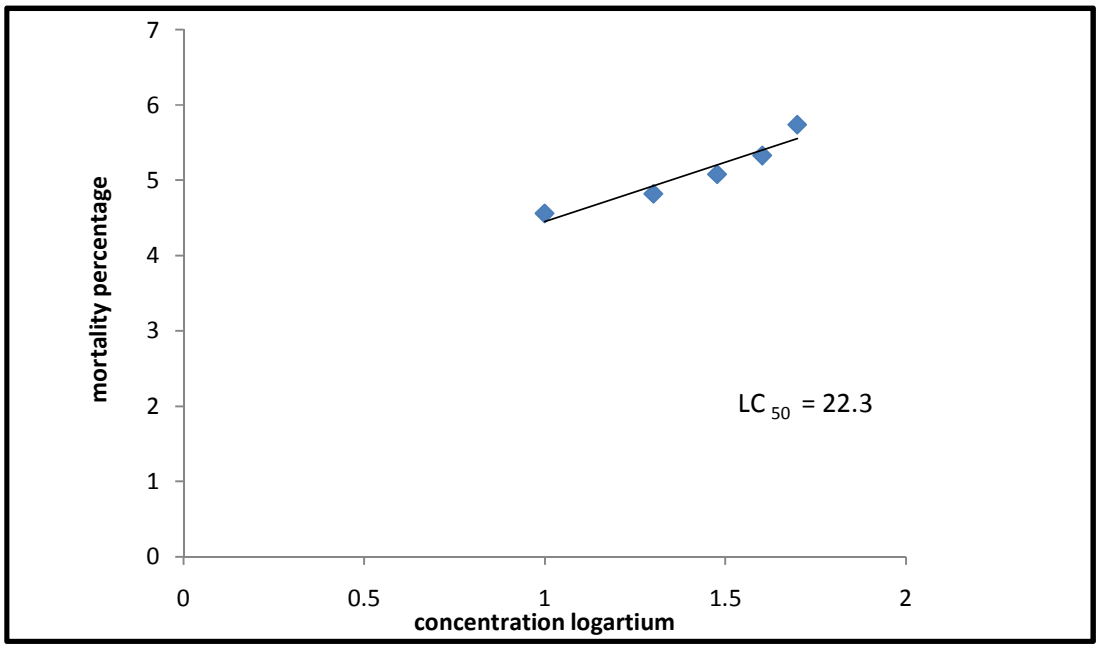

Fig.7: LC50 for lead on the 3rd larval stage of*C quinquefasciatus*

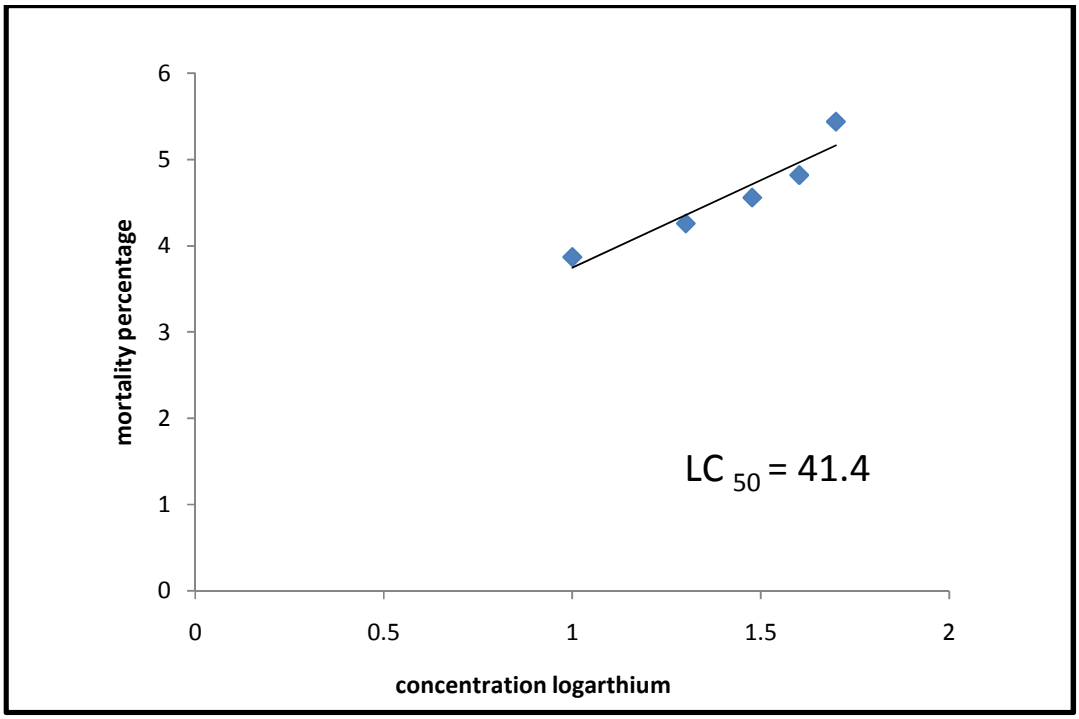

Fig.8: LC50 for lead on the 4th larval stage of*C quinquefasciatus*

(14) found that LC50 for lead to kill mosquito larvae within 24 h was 0.18 mg /l. On the other hand, (3) showed that the difference in absorption rates of heavy metals varies according to the types of aquatic insects.It has been found that Cd absorption is controlled by specialized cells that regulating the passage of ions, and concludethat the mean of absorption and accumulation of Cd is related to the number of cells that transform cadmium . Concentration of calcium ions may affect the absorption of Cd and Zn in the insect of *HydropsycheCalifornia*.Also it has also been found that insects containing more chloride transferred cells on the surfaces of their gills, absorb Cd and Zn faster than that of lower.

تاثير عنصري الرصاص والكادميوم على هلاكات يرقات بعوض *Culexquinquefasciatus*

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الخلاصة

أجريت هذه الدراسة لمعرفة تأثير سمية كل من الرصاص والكادميوم المأخوذين على شكل أملاح ذائبة في الماء وبتراكيز مختلفة على يرقات بعوض ***Culexquinquefasciatus***في المختبر ، إذ استخدمت 5 تراكيز لملحي نترات الرصاص ونترات الكادميوم وهي ١٠ و ٢٠ و ٣٠ و ٤٠ و ٥٠ ملغم/لتر من نترات الرصاص و ١ و ١.٥ و ٢ و ٢.٥ و ٣ ملغم/لتر من نترات الكادميوم .

وعرضت حشرات الإختبار في تجارب منفصلة على شكل مجاميع ، كل مجموعة متكونة من ١٠ يرقات ، فضلاً عن استخدام عينة سيطرة لغرض المقارنة، بواقع ٣ مكررات لكل تركيز من تراكيز العناصر المذكورة ،إذ حُسبت نسبة الهلاك لكل طور من الأطوار الأربعة. بين التحليل الأحصائي للنتائج تأثر الطوريينالبرقيين الأول والثاني بشكل معنوي بجميع التراكيز مقارنة بمعاملة السيطرة ، وقد بلغت معدلات النسب المئوية لهلاك اليرقات المعاملة بملح نترات الرصاص ٢٨ و ٣٨.٧ و ٤٨ و ٥٨ و ٧٣.٥ % في التراكيز ١٠ و ٢٠ و ٣٠و ٤٠ و ٥٠ ملغم /لتر على التوالي. بينما بلغت معدلات النسب المئوية لهلاك اليرقات المعاملة بملح نترات الكادميوم ٤٤ و ٥٥ و ٦٥ و ٧٤.٥ و ٧٩.٥ % في التراكيز ١ و ١.٥ و ٢ و ٢.٥ و ٣ ملغم /لتر على التوالي ، كما جرى حساب قيمة التركيز نصف القاتل لليرقات بعد ٤٨ ساعة من التعرض الى تراكيز العناصر المدروسة ،ورسمت مخططات LC_{50}لكائنات الاختبار ملغم/لتر و 16.9لليرقات المعاملة بملح نترات الرصاص ١٤.٧ ملغم/لتر و LC_{50} السمية إذ بلغت قيمة ال LC_{50}لليرقات ملغم/لتر و ٤١.٤ ملغم/لتر للطور الأول والثاني والثالث والرابع على التوالي ، وكانت قيمة ال 22.3

المعاملة بملح نترات الكادميوم ٠.٩ و ١.٠٥ و ١.٣ و ١.٨ ملغم/لتر للأطوار الاول والثاني والثالث والرابع على التوالي.

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