



## Study the effect of some plant extracts on biological control of bed bugs *Cimex lectularius* (Hemiptera: Cimacidae).

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### ABSTRACT

This research aims to study the effect of some plant extracts on biological control of bed bugs *Cimex lectularius* (Hemiptera: Cimacidae) using the cold aqueous extracts of plant leaves of *Eucalyptus camaldelulensis* Dehnh, *Eruca sativa* L. and extracts plant seeds of *Melia azaderach* L. and *Ricinus communis* L., the study was conducted in Ishaqi city Salahdin governorate, the results diagnosing bed bugs male *Cimex lectularius*, . Adult male *C. lectularius* were maintained in the laboratory at  $25 \pm 2$  ° C and  $75 \pm 5$  % relative humidity, cold aqueous extracts of plant seeds, *R. communis*, caused the highest percentage mortality 92.31% while cold aqueous extracts of plant seeds *M. azaderach* caused percentage mortality 83.14% as well as the cold aqueous extract leaves *E. camaldelulensis* caused percentage mortality 78.32% while the cold aqueous extract plant leaves *E. sativa* showed the lowest percentage mortality of 71.23% a all previous results at the highest concentration of 0.8 mg / ml after 72 hours of treatment. It is clear that the percentage mortality increase with the increase in treatment and the increase in the exposure period of the treatment.

### Introduction

Ectoparasites absorb blood and feed mostly on human blood, including bed bugs *Cimex lectularius* [1]. It is spread throughout warm and temperate regions *C. lectularius* can be 1-5 mm in length and 1-3 mm in width, although this size is small[2]. It is definitely enough to see it with the naked eye [3]. *C. lectularius* usually attack people at night with bites that are painless and invisible to the naked eye[4]. It may also lead to swelling or pimple-like dermatitis [5]. It can transmit hepatitis disease, leprosy., fever, brucellosis, the most common diseases affecting these lesions in humans are *Trepanosoma cruzi* [6]. It is not presented by bite, but when the bite comes in contact with the *C. lectularius*[7]. This can cause Chagas disease, sometimes called American trypanosomiasis, Cagas disease is a disease that causes damage to the heart as well as damage to the central nervous system and can be dangerous [8]. *C. lectularius* bed bugs are characterized by their ability to hide in clothes, luggage, and tissues, and to reproduce rapidly through eggs, [9]. Male bed bugs *C. lectularius* puncture the abdomen of the female to deliver the sperm to her, and the sperms in turn move through the female's tissues to the eggs for fertilization. Once

the eggs hatch, the little bugs need a little blood to grow and move to the next stage of their development to reach adulthood[10], while a female needs bed bugs can reach maturity, depending on some conditions, such as temperature and availability of blood for feeding [11]. Resistance to blood-carrying parasites is due to the development of thicker skin that the insecticide could not penetrate[12]. Research has proven that the bed bug parasite *C. lectularius* is a difficult pest to contain and has become the subject of important research more than ever [13]. Given the medical importance of parasites and their role in transmitting many diseases, and given the importance of biological control as an alternative to chemical control in Iraq, this study came to put another alternative for chemical control by evaluating the efficacy of the cold aqueous extract of leaves plants of *E. camaldelulensis*, *E. sativa* and seeds of the *M. azaderach* and *R.communis* in the fight against some disease-carrying parasite.

#### Study participants

The study participants were from the prisons of Al-Ishaqi Police Directorate, Al-Ishaqi Salahedin governorate. The area of the prison is 1200 m<sup>2</sup> and

the number of prisoners is 300 prisoners. The prison includes 25 rooms. The infection was confirmed by discovering the lesion itself or its mark, which includes egg bags, fallen skins and fecal spots.

#### Collecting samples

The leaves of the *E. camaldelulensis* plant were collected from the public gardens, the leaves of the *E. sativa* from the farmland and the seeds *M. azaderach*, the *R. communis* were purchased from local markets for a country in January of 2021.

#### Preparing aqueous extracts

##### Plant material extraction

The extraction was done separately for each as follows

-*E. camaldelulensis* leaves: 1 kilogram cut into small pieces and put in 2 liters of water for 20 minutes. The extract was filtered and further processed by a soxhlet to concentrate the extract [14]. Leave the extract to cool down. The contents were kept in containers at 4 ° C for use.

- *E. sativa* leaves : 1 kg of fresh whole plant leaves was crushed with a mortar and pestle and boiled in 2 liters of water for 20 minutes. The resulting content underwent similar proceed.

- *R. communis* seeds: 1 kg of seeds were crushed to obtain a smooth paste and soaked in 2 liters of cold water for 3 days, filtered and concentrated. The content was then kept in a container at 4 ° C.

- *M. azaderach* seeds : 1 kg of seeds were crushed to obtain a smooth dough and soaked in 2 liters of fresh water for 3 days, filtered and concentrated. The content was then kept in a container at 4 ° C. In order to know the efficacy of the extracts of *E. camaldelulen* leaves, watercress *E. sativa*, castor seeds *R. communis* and *M. azaderach* seeds, 2 g of the dry raw material were taken from each extract separately and dissolved in 100 ml of distilled water to obtain a concentration of 20 g / ml and from Then the concentrations were prepared (0.2, 0.4, 0.6, 0.8) mg / ml. As for the control factor, it was by using distilled water only.

#### Laboratory studies

Adult bed bugs male *C. lectularius*, engorged with blood were collected from bed layers and bed joints and identified by an entomologist. Adult *C. lectularius* bed bugs were maintained in the laboratory at  $25 \pm 2$  ° C and  $75 \pm 5\%$  relative humidity. Glass chambered cages (20 cm x 15 cm x 10 cm) were used with two chambers separated by a controlled perforated mesh to test the effect of plant extracts [15]. Five different groups of adult *C. lectularius* were used in this experiment. Four of them were experimental and one total for control. Five adult *C. lectularius* were placed in one compartment of each cage and controlled for their movement. In the experimental groups, adult *C. lectularius* was treated directly with concentrations of 2,4 mg / ml of *E. camaldelulensis* leaves extracts, watercress *E. sativa*, castor seeds *R. communis*, and *M. azaderach* seeds for groups 1, 2, 3 and 4. The group treated By hand sprinkler from cold aqueous extract of leaves plants of *E. camaldelulensis*, *E. sativa* and seeds *M. azaderach* and *R. communis*. The control group treated by hand sprinkler with 2,4 mg/ml of distilled water.

#### Results and discussion

##### Effect of cold aqueous extracts in killing adult male *C. lectularius* after 24 hours .

The results showed the effect of cold aqueous extracts in killing adult male *C. lectularius*, as shown in Table (1) at concentration 0.8 mg/ml that cold aqueous extract of seeds, *R. communis*, caused the highest percentage mortality 77.28% as well as the cold aqueous extract of seeds *M. azaderach*, caused the highest percentage mortality 69.11 % while leaves extract *E. camaldelulensis* caused percentage mortality of 60.72% while leaves extract *E. sativa* showed percentage mortality of 53.74%. , all these results after 24 hours of treatment, it was evident that the percentage mortality increased with increasing treatment and increasing the exposure period., and the statistical analysis shows that there are significant differences in the percentage of mortality.

Table 1: The effect of cold aqueous extracts on *C. lectularius* after 24 hours of treatment.

Group	Extracts	concentration mg/ml				Average mortality of each plant
		0.2	0.4	0.6	0.8	
		mortality percentage				
Group1	<i>R. communis</i>	52.23	61.49	65.12	77.28	64.03 A
Group2	<i>M. azaderach</i>	49.36	57.21	61.29	69.11	59.24 B
Group3	<i>Camaldelulensis E.</i>	43.19	51.87	54.35	60.72	52.23 C
Group4	<i>E. sativa</i>	40.52	50.69	48.12	53.74	48.26 D
Group5	Control	0	0	0	0	0 E
Average mortality percentage of each concentration		37.06	44.21	45.77	52.17	
		c	b	b	a	

\*Similar small letters in one line horizontally mean no significant differences.

\*Similar capital letters in one column vertically mean no significant differences

##### Effect of cold aqueous extracts in killing adult male *C. lectularius* after 72 hours of treatment,

The results showed the effect of cold aqueous extracts in mortality dult male *C. lectularius*, as shown in Table (2) at concentration 0.8 mg/ml that cold

aqueous extract of seeds *R.communis*, caused the highest mortality percentage 92.31% as well as the aqueous extract of seeds *M.azaderach* caused the highest mortality percentage 83.14% while leaves extract *E. camaldelulensis* caused mortality percentage 78.21% while leaves extract *E. sativa*

showed mortality percentage 71.23%. all these results after 72 hours of treatment, it was evident that the mortality percentage increased with increasing treatment and increasing the exposure period , and the statistical analysis shows that there are significant differences in the percentage of mortality.

**Table 2: The effect of cold aqueous extracts on *C. lectularius* after 72 hours treatment.**

Group	Plant	concentration mg/ml				Percentage mortality of each plant	
		0.2	0.4	0.6	0.8		
		Percentage of mortality					
Group1	<i>R. communis</i>	66.31	76.28	82.31	92.31	79.33	A
Group2	<i>M. azaderach</i>	56.78	66.91	78.38	83.14	71.30	B
Group3	<i>Camaldelulensis E.</i>	45.67	50.03	64.59	78.21	59.12	C
Group4	<i>E. sativa</i>	43.32	49.83	58.73	71.23	55.95	D
Group5	Control	0	0	0	0	0	E
Average Percentage Mortality of each concentration		42.41	48.61	53.13	65.02		
		a	c	b	a		

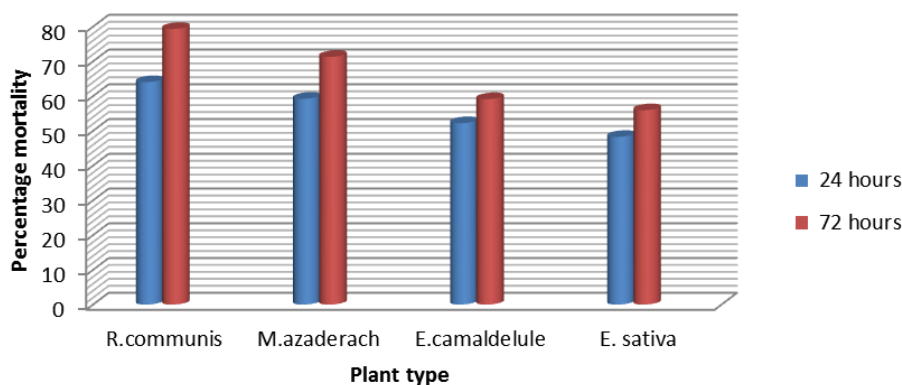
\*Similar small letters in one line horizontally mean no significant differences.

\*\*Similar capital letters in one column vertically mean no significant differences

**Comparing the rate mortality percentage of plant extracts**

When comparing the effect of different concentrations of plant extracts of *E. camaldelulensis*, *E. sativa* and seeds *M. azaderach* and *R.communis* after 24 hours and 72 hours, it was found that the effect of the concentration(0.2,0.4, 0.6, 0.8) mg / ml

increases with time Figur1 due to the increase in the effect of the active substances in the plants used over time the effect is in the insect's skeletal system, where the active compounds in the plant extracts work to prevent the absorption of nutrients thus the insect dies.



**Fig. 1: The rate mortality percentage of plant extracts**

This study showed clear differences between the concentrations of extracts of different parts of plants. It was found that the higher concentration is more effective than the lower concentration. This study is consistent with[16] that which proved that plant extracts *Capsicum annum* caused a high rate of killing bugs male, *C. lectularius*. The study was carried out on many rural villages where bugs male *C. lectularius*, are present. This study converged with a study[17] in which it was proved that the aqueous extract of some plants led to a 100% killing rate of bugs male *C. lectularius* after 2 minutes, 4 minutes and 5 minutes, and for all plant extracts used in the study. This study was approached with a study[18] in which it demonstrated the possibility of controlling progression killing bugs male, *C. lectularius* through the use of different plant extracts. A study[19] in which it was proven that flower extract worked

significantly in influencing the development of any cause, with different killing rates and with different periods. A study [20] in which it was proven that flower extract *Tagetes erecta* Linn. worked significantly in influencing the development and cause different killing rates with different periods. This study was combined with a study[21] was proven that pyrethroids penetrate the cuticle layer of bed bugs and then affect its vital activity, but weakly as proteins accumulate in the body wall plate and densely.

**Conclusion**

Plants contain many bioactive molecules. Plant extracts are often easily obtainable and alternative insecticides have become more attractive for resource-limited places. The results of this study revealed that a set of candidate plant extracts had

remarkable insecticidal activity against bed bugs, *C. lectularius*, and *C. lectularius* bed bugs have since developed resistance against most traditional insecticides, particularly pyrethroid insecticides which are considered one of the key factors in recurrence. Recently, bugs have appeared. In this

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- context, a combination of extracts from *E. camaldelulensis*, *E. sativa*, *R.communis* and *M.azaderach* seeds have proven effective and could play a pivotal role as an effective anti-bed bug agent *C.lectularius* in the near future instead of chemical control.
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## دراسة تأثير بعض المستخلصات النباتية في مكافحة الحيوية لبق الفراش

*Cimex lectularius* (Hemiptera:Cimacidae)

رياح حسن سعدي

وزارة التربية ، تربية صلاح الدين ، تكريت ، العراق

## الملخص

يهدف هذا البحث إلى دراسة تأثير بعض المستخلصات النباتية في مكافحة الحيوية لبق الفراش *Cimex lectularius* (Hemiptera: Cimacidae). باستخدام المستخلص المائي البارد لأوراق نباتات اليوكالبتوز *Eucalyptus camaldelulensis* Dehnh والجرجير *Eruca sativa* L. وبذور السبج *Melia azaderach* L. والخروع *Ricinus communis* L. ، اجريت الدراسة في مدينة الاسحاقي محافظة صلاح الدين، تم تشخيص بق الفراش *C. lectularius* و أظهرت النتائج تأثير المستخلصات المائية في قتل بالغات بق الفراش *C. lectularius* ، أن المستخلص المائي لبذور الخروع *communis* . سبب أعلى نسبة قتل إذ بلغت نسبة القتل 92.31% عند أعلى تركيز مستخدم 0.8 ملغم / مل بعد مرور 72 ساعة من أما مستخلص نبات بذور السبج *M. azaderach* سبب نسبة قتل بلغت 83.14% عند أعلى تركيز مستخدم 0.8 ملغم / لتر بعد مرور 72 ساعة ، بينما سبب مستخلص أوراق اليوكالبتوز *E. camaldelulensis* نسبة قتل بلغت 78.21% عند أعلى تركيز مستخدم 0.8 ملغم / لتر بعد مرور 72 ساعة من بينما أظهر مستخلص نبات أوراق الجرجير *E.sativa* أقل نسبة قتل 71.23% عند أعلى تركيز مستخدم 0.8 ملغم / لتر بعد مرور 72 ساعة من المعاملة يتضح أن نسب القتل تزداد بزيادة المعاملة وزيادة فترة التعريض ، ويبين التحليل الإحصائي وجود فروق معنوية في نسبة القتل.