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Original Research Article

The Effect of Some Alcoholic and Aqueous Plant Extracts on the Adults of the Southern Cowpea Beetle *Callosobruchus Maculatus* (Fab.) (Coleoptera: Chrysomelidae)

Nagham Abdul Ghani Muhammad[1*]

[1]Department of Life Sciences, College of Education for Women/University of Kirkuk

***Corresponding Author:** Nagham Abdul Ghani Muhammad
Department of Life Sciences, College of Education for Women/University of Kirkuk

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Abstract: This laboratory study was conducted to test the effect of extracts of plants, leaves and sepals of hibiscus plant *Hibiscus sabdariffa*, leaves of *Pinus sp* and leaves of *Eucalyptus Camaldulenis* on the mortality of adults southern cowpea weevil *Callosobruchus maculates* (Fab) with six concentrations (1000, 2000, 5000, 7000, 9000, 10000) ppm / adult and using the solvent (ethanol and distilled water) and the results were noted after 24 and 48 hours of treatment. The study also tested the effect repellency and attraction Extract ethanol & aqueous plants under study against insect adults and after 15 and 30 minutes of treatment. The results showed that there were influential for each plant extracts used in the study of death adults. Results of the statistical analysis showed that there were significant differences in the toxicity of plant extracts depending on the type of plant and extract concentration, where it was noted that mortality rates increased in direct correlation with the increase in concentration and duration of exposure in each treatment. So, the results showed a various effect in the proportions of attraction and repellency depending on the type of plant extract concentration and time against adults. The results showed that the alcoholic extracts of plants under study super-passed significantly the aqueous extracts on death of adults. And eucalyptus leaves extract in solvents (ethanol and distilled water) outweigh all plant extracts used in the study in their impact on the insect. While the plant extract Hibiscus sepals is the least influential in the insect.

Keywords: Callosobruchus maculatus, Insecticidal activity, Repellency, Attraction, Pest control.

INTRODUCTION

Fabaceae family is one of the important plant families, as it includes a large number of economic crops in the world that are used as food for humans, such as beans, chickpeas, lentils, beans, mung, peas, cowpeas, and as animal fodder such as jet and clover. Legumes represent the second major crop after grasses, as they have a high nutritional value. They are called the meat of the poor because they contain a high percentage of protein, ranging between 20-40%, In addition to being a major source of carbohydrates, fiber, vitamins, and minerals [32], legumes, especially cowpeas, are infested with many field and pests that cause major economic losses. One of these pests is the southern cowpea beetle, *Callosobruchus maculatus* F. It is one of the main warehouse insects and one of the most dangerous and widespread pests, as it infects legumes in The field and moves to the warehouse, increasing the damage to the seeds, reducing their economic value, and affecting germination rates [10-33].

This insect has the ability to infect the seeds of leguminous crops during the growth period in the field and then continue to infect the seeds during the storage period. In this case, the crop is stored without symptoms of external infection appearing on it. Then the symptoms appear clearly on the seeds in an epidemic form during the storage period, and this results from feeding the larvae of this insect. It spends inside the seeds and its harm increases as it continues to be stored, as it consumes a large amount of the seed contents, in addition to the appearance of egg shells stuck to the seeds. The exit holes of adult insects are seen on them, and the weight of the seeds is greatly reduced [2]. It was concluded [13], that the

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southern cowpea beetle, *C. maculatus* F., had a significant impact on the seeds of the cowpea (red, white, brown, red, and black), as its infection led to a significant reduction in the weight of the seeds. 70.77, 55.81, 44.83 and 42.58%, respectively. People resorted to chemical pesticides with quick and effective results, and their types began to increase day after day in the hope of obtaining the desired results [25]. However, the extensive and irrational use of these pesticides and the failure to follow the scientific method in application led to the emergence of many problems, the most important and prominent of which is the phenomenon of insect resistance, which means that the insect is no longer killed at the recommended doses that it used to kill with before, in addition to environmental pollution [9-34]. Modern studies have tended at the present time to try to benefit from many economic wild plants for use as substances that have a biological effect on the insects of stored materials. Studies have mentioned that plant-based extracts are characterized by high toxicity, which is no less than their counterparts from manufactured chemical pesticides. They decompose quickly into natural, non-toxic substances after being used for a relatively short period of time, they do not leave a negative impact on the environment, in addition to their high specialization in their action against one or several types of insects [23]. The positive effect of these plants is due to some of the compounds present in them, including terpenes, phenols, alkaloids, resins, and glycosides. Over time, other numbers of plants were discovered that have a toxic, repellent, nutritional or growth-inhibiting effect [28].

The current study aims to test the effectiveness of alcoholic and aqueous extracts of the plants under study against adults of the southern cowpea beetle. As well as knowing the effect of different concentrations of the extracts of these plants on the rate of attracting, repelling and killing the insect in order to limit its reproduction and reduce the losses resulting from it, in order to obtain alternatives to pesticides that cause a higher rate of killing the insect and are safer for the environment, and the insect does not have a resistant characteristic after its use.

MATERIALS AND METHODS

1- Insect Collection, Diagnosis, and Breeding

Samples of infected red cowpea seeds were collected from the markets of Kirkuk city, then the adult insects were identified at the Research Center and Museum of Natural History/University of Baghdad, after which the infected seeds were placed in glass bottles with a capacity of (800) milliliters (200 grams/bottle). The nozzles were tightened. Using well-ventilated cloth, tied with rubber belts, and placed in the incubator at a temperature of 28 ± 2°C and a relative humidity of 70 ± 5% [4].

2 - Collecting and Classifying Plants

The plants selected for the current study (hibiscus, pine and eucalyptus) were collected in Table 1. Eucalyptus and pine leaves were collected from the gardens of the Technical Institute/Hawija, and hibiscus plants (leaves and sepals) were collected from a farm near Hawija District/Kirkuk Governorate. The plants were identified in the herbarium of the College of Science/Tikrit University. Then it was transported to the laboratory for the purpose of cleaning it, where it was purified of foreign impurities, then washed well with water and left to dry at laboratory temperature in conditions free of moisture until the preparation of plant extracts begins [5].

3- Preparation of Plant Extracts

The process of preparing plant extracts was carried out in the Nutrition Laboratory, Department of Livestock, College of Agriculture, and the Central Research Laboratory/University of Tikrit, based on the method [31]. The samples were crushed using an electric grinder, and two solvents were used to dissolve the powders of plant parts, one of which was an organic solvent (ethanol alcohol) and the other (distilled water).

3-1 Preparation of Ethanol Extract

40 grams of dry powder of plant leaves (hibiscus, pine, and eucalyptus) and hibiscus sepals were weighed. Then they were placed in the extraction bowl (Extraction thimble), and the extraction process was carried out using a Soxhlet extractor in the Nutrition Laboratory, Department of Livestock, College of Agriculture/Tikrit University, using 400 ml of ethanol, with a concentration of 98% and a boiling point of 60°C. Heating continued until the dark plant color disappeared. This process took 10-12 hours each time, depending on the type of plant.

After the extraction process, the solvent was evaporated from the extract under low pressure and a temperature of 60°C using a rotary vacuum evaporator in the Central Research Laboratory/University of Tikrit to obtain the alcoholic extract in a thick, viscous form, which was stored in 50 ml glass bottles that were opaque, sterile and without It has the name of the plant, the plant part extracted from it, the weight of the extract, and the date of extraction. It is then stored in the refrigerator until use at a temperature of 5°C [29]. Table 2 which represents the weights and percentages of plant extracts resulting from the extraction process, and the percentages were extracted using the following law:

$$\text{Percentage of extract} = \frac{\text{Weight of the viscous material obtained}}{\text{Total weight}} \times 100$$

4-: Preparation of Distilled Water Extract

The method of [6], and [8], was adopted, with some modifications, in preparing aqueous extracts. I took 50 gm of dry matter powder of the plant parts used separately. It was placed in a 500 ml glass beaker containing 250 ml of distilled water, i.e. a 5:1 water ratio. The plant material was mixed using a horizontal shaker for an hour. The solution was filtered through 8 layers of gauze. The sediment was discarded and the filtrate was separated. Using a centrifuge at 3000 rpm for 10 minutes, the suspended plant parts were sedimented and a clear solution was obtained. Then the latter was poured into heat-resistant glass dishes and placed in the oven at a temperature of 45°C until it dried. The sticky material was then collected from the dishes in sterilized opaque glass bottles to avoid light and stored in the refrigerator at a temperature of 5°C until used in the study.

Table 1: Plants used in the study

Arabic name	English name	Scientific name	Family	Parts used
الكركديه	Roselle, Karkade, Tisantea	*Hibiscus sabdariffa L.*	Malvaceae	Sepal leaves
الصنوبر	Pine	*Pinus sp.*	Pinaeceae	leaves
اليوكالبتوس	River Red Gum	*Eucalyptus camaldulenis*	Myrtaceae	leaves

Table 2: Weights and percentages of plant extracts

Plant used	Weight obtained in grams in solvent		Percentage of plant extracts in solvent	
	Ethanol	distilled water	Ethanol	distilled water
Hibiscus (sepals)	3.22	5.3	8.05	10.6
Hibiscus (leaves)	3.85	13	9.62	26
Pine (leaves)	3.94	9.75	9.85	19.5
Eucalyptus (leaves)	11.55	13.33	28.87	26.66

5- Preparing Concentrations for Experimenting with Plant Extracts

Different concentrations of raw plant extracts (alcoholic and aqueous) were prepared to test their toxicity, repellent, attractive effects on adults of the southern cowpea beetle *C.maculatus*, depending on the amount of sticky substance present in the alcoholic and aqueous extracts by taking a specific weight of each plant extract in an appropriate volume of solvent (alcohol, Distilled water) respectively and on a ppm basis (extract/solvent), [17]. The concentrations were (1000, 2000, 5000, 7000, 9000, 10000) ppm/adult. Dilution method in preparing aqueous extracts.

6- Conducting Transactions (Toxicological Studies)

6-1 Testing the Toxicity of Alcoholic and Aqueous Extracts against Adults of the Southern Cowpea Beetle

The toxicity of plant extracts was tested on adult insects using concentrations (10000, 9000, 7000, 5000, 2000, 1000 ppm/adult using an Ultra low volume micro-spray device) from a distance of 10 cm [3], where 10 insects were treated with alcoholic and aqueous extracts. For each concentration and three replicates, the insects of the control plants were treated with the solvent only.

After that, the treated insects were placed in plastic dishes containing holes for ventilation, with clean food (red kidney beans) added to them, and then placed in the incubator. At a temperature of 30±2°C and a relative humidity of 70±5%. Results were taken after 24 and 48 hours of treatment, and the killing percentages were corrected using the Abbott equation [20].

$$\text{Corrected percentage of death} = \frac{\text{Percentage of death in test - Percentage of death in comparison}}{\text{100 – percentage of death in comparison}} \times 100$$

The LC50 of plant extracts was calculated using special papers for this purpose (Log- probit paper).

6-2. Testing the Attractive and Repellent Effect of the Ethanolic and Aqueous Extract on the Adults of the Southern Cowpea Beetle *Callosobruchus Maculatu* F

Using a chemotropism measuring device [24]. Made locally and taken from a Chemotropometer [27]. The device consists of a wooden box with a length of 48 cm, a width of 20 cm, and a height of 20 cm. It has a movable lid, and on the opposite sides of the box there are two openings through which a glass tube with a length of 100 cm and a diameter of 3 cm passes, and in the middle of the tube is an opening for insects to enter [15].

The glass tube is divided into centimeters, placed inside the box, its end is closed with a piece of cotton, while at the opposite end is placed a piece of cotton treated with one millimeter of ethanolic extract or distilled water. Then, 10 adult insects are introduced into one replicate, with three repetitions, then the number of insects moving in the tube is

recorded at a distance of 25 cm towards the two holes, 15 and 30 minutes after the insects are introduced, and the attraction and repulsion ratio and the balancing ratio are calculated according to the following equations.

$$\text{Percentage of attraction} = \frac{\text{The number of insects that headed towards the tested substance and traveled a distance of 25 cm from the center}}{\text{The total number of insects}} \times 100$$

$$\text{Expulsion percentage} = \frac{\text{The number of insects that moved in the opposite direction of the tested substance and traveled a distance of 25 cm from the center}}{\text{The total number of insects}} \times 100$$

Balance ratio = attraction ratio – repulsion ratio

7-Statistical Analysis

The results of this research were analyzed statistically according to the Complete Randomized Design (C.R.D.), and with factorial and single-factor experiments, and the least significant difference method (L.S.D.) was followed. At a significance level of 0.05 to ensure the significance of the difference between the rates [7].

DISCUSSION & RESULTS

1- The Effect of Ethanol and Aqueous Extract on the Death of Adults of the Southern Cowpea Beetle after 24 Hours of Treatment

Table 3 shows the percentages of death of plant extracts after 24 hours of treatment of adult *C. maculatus* F. by the effect of plant extracts of ethanolic and aqueous solvents in concentrations (10000, 9000, 7000, 5000, 2000, 1000) ppm/adult. The results showed that there is an effect of all plant extracts used in the study on the death of adult. The results of the statistical analysis showed that there are significant differences in the toxicity of plant extracts depending on the type of plant extract and the concentration used in the study, as it was noted that the killing rates increase directly with increasing concentration. The fact that alcoholic extracts have toxic activity against the insect under study may be due to the fact that the active compounds in plants may be more dissolved in alcohol than in distilled water, or due to the alcoholic extract containing compounds that have the ability to spread in living tissues similar to pesticides, knowing that ethanol has killing activity. For the insect, at a rate of 20% of the individuals treated in the control, the opposite of what is found in distilled water Which did not show any effect on the insect in the 0% control treatment, and this was confirmed by [21], [16, 17]. It is noted that there is a difference between plants in producing their toxic effect, such that one plant outperforms another, and the reason is due to the difference in the quality and quantity of active compounds contained in various plants that affect the nervous system of the insect, paralyzing it, leading to shock and then death, or affecting the work of the necessary enzymes responsible for one of the important vital processes, causing the cessation of metabolic processes and then death [15].

The results of Table 3 show that the ethanolic and aqueous extracts of Eucalyptus leaves are more effective against the insect than the rest of the plant extracts in terms of their effect on killing rates, so that the death rates were (87.5 and 70%) at the concentration of (10,000) ppm/adult for the alcoholic and aqueous extracts, respectively. The results showed that the lethal concentration (LC50) for 50% of the individuals treated with the ethanolic and aqueous extract of Eucalyptus leaves against the insect was equal to 4500 and 5500 ppm/adult, respectively, Table 5. concluded [14]. The volatile and fixed oils extracted from the Eucalyptus plant have a fatal effect on the southern cowpea beetle when its outer surface is treated. The killing rate ranged from 40-46.6%.

The results are consistent with the study [22]. Cineol terpenes, which are one of the components of the essential oils found in the leaves of the Eucalyptus plant *E. camaldulensis*, have insecticidal activity, and this substance is considered lethal by its penetration into the insect's body through contact.

The results of Table 3 showed that the ethanolic and aqueous extract of hibiscus leaves comes after the extract of eucalyptus leaves in terms of their effect on the insect, as it showed death rates of 75 and 60% at a concentration of 10,000 ppm/adult. The LC50 for the southern cowpea beetle is 5600 and 7000 Ppm/adult for the ethanolic and aqueous extract, respectively. Table 5. The reason for the effect of the ethanolic and aqueous extract of hibiscus leaves may be attributed to the quality and quantity of the active compounds they contain, which affect the nervous system of the insect, paralyzing it, leading to shock and then death. Many studies have shown the importance of this plant in the pharmaceutical industry, as the active medicinal substance is concentrated in its leaves, including phenolic compounds and glycosides [30].

Table 3 shows. The ethanolic and aqueous extract of pine leaves comes after the extract of hibiscus leaves in terms of their effect on the insect, as it showed death rates (70.82 and 53.3%) at the concentration (10,000 ppm/adult),

respectively. The results showed that the lethal concentration for 50% of the individuals treated with the southern cowpea beetle is (5200 and 9200 ppm/adult) for the ethanolic and aqueous extracts, respectively. Table 5.

The results agreed with what was reported by [12]. The volatile oils extracted from pine and eucalyptus plants are very effective when used in quantities of (0.25, 0.10, 0.15) ml/strip respectively in combating Varroa. She indicated [18]. The pine plant contains active ingredients such as glycosides, alkaloids, resins and flavones.

The results are shown in Table 3. The ethanolic and aqueous extract of the sepals of the hibiscus plant had the least effect on the insect, as it showed death rates of (66.6 and 50%) at the concentration (10,000 Ppm/adult), respectively. The results showed that the lethal concentration for 50% of the treated individuals of the southern cowpea beetle is (7400 and 10500 ppm/adult) for the ethanolic and aqueous extracts, respectively, Table 5. These results were consistent with the results of [11]. Which shows that the aqueous extract of Datura fruits is the least effective of the aquatic plant extracts on the southern cowpea beetle. *C. maculatus* F. The highest percentage of killing was (50.00)% at the concentration (10000) ppm/adult after 24 hours of treatment.

The current study showed that the alcoholic and aqueous extract of the sepals of the hibiscus plant had a weak effect against the insect, while the extract of the hibiscus leaves had a clear effect and high killing effectiveness against the insect under study.

Table 3: Percentage death rates of plant extracts after 24 hours of treatment for adults of the southern cowpea beetle

		At concentration ppm death rate %					
Plant	**Solvent**	**1000**	**2000**	**5000**	**7000**	**9000**	**10000**
Hibiscus (sepals)	Ethanol	---	4.162	25	45.825	62.5	66.66
			F r	D n	F jk	D ef	D e
	Distilled water	0	10	23.3	33.3	43.3	50
		C r	E g	D n	H m	G kl	F i
Hibiscus (leaves)	Ethanol	---	12.5	37.5	66.625	70.75	75
			D p g	C lm	B e	B d	B c
	Distilled water	13.3	23.3	40	50	56.6	60
		B p	A n	C i	E i g	E g h	E f g
Pine (leaves)	Ethanol	---	16.6	58.33	62.5	66.5	70.825
			C op	A g	C e f	C e	C d
	Distilled water	0	13.3	23.3	40	50	53.3
		C r	D p g	D n	G l	F i j	F h i
Eucalyptus (leaves)	Ethanol	---	20.83	45.825	75	83.25	87.5
			B n o	B j k	A c	A b	A q
	Distilled water	13.3	20	46.4	56.6	63.3	70
		B p g	B n o	B j k	D g h	D e f	C d
Control	Ethanol	20	20	20	20	20	20
		n o A	B n o	n o E	I n o	H n o	n o G
	Distilled water	0	0	0	0	0	0
		r C	G r	r F	J r	r I	r H

*Similar capital letters in the same column mean that there are no significant differences between them at a probability level of 0.05))

**Similar lowercase letters mean that there are no significant differences between them at the probability level (0.05)

2- The Effect of Ethanolic and Aqueous Extract on the Death of Adults after 48 Hours of Treatment

The alcoholic and aqueous plant extracts under study had a higher effect on the adults of the southern cowpea beetle C. maculatus (Fab.) after 48 hours of treatment than they had after 24 hours of treatment.

This is due to the exposure duration factor, which caused an increase in killing rates [26], [3-16]. Table 4 shows the percentages of death of plant extracts after 48 hours of treatment for adults of the southern cowpea beetle. With the effect of plant extracts of ethanolic and aqueous solvents, the results showed that the ethanolic and aqueous extract of Eucalyptus leaves was superior in killing the insect more than the rest of the plant extracts in terms of their effect on the killing rates, so that the death rates increased to 91.66% for the concentration (10000 Ppm/adult) of the ethanolic extract after it was 87.5% after 24 hours, the death rates reached 76.6% for the aqueous extract after 48 hours at the same concentration after it was 70% after 24 hours. Thus, the lethal concentration for 50% of the treated individuals of the insect decreased to (3600 and 4100 Ppm/adult) for the ethanolic and aqueous extracts, respectively, Table 5.

The fact that the leaves of the Eucalyptus plant contain volatile oils such as cineole oil led to its superiority in affecting the entire role of the insect under study, and this effect increased significantly with the increase in the period of exposure to the extract. The results of this study agree with what was mentioned by [1]. The ethanolic extract of the leaves of the plant achieved Eucalyptus kill rate 100% % in concentration (10000 ppm/adult) after 24 hours. The killing rate reached 100% at the concentration (8000 Ppm/adult) after 48 hours of treatment.

The results of Table 4 showed that the hibiscus leaf extract came after the eucalyptus leaf extract in terms of its effect on the insect, as the ethanolic and aqueous extracts showed mortality rates of (79.16 and 66.6%) respectively at the concentration (10000 Ppm/adult). The results showed that the lethal concentration for 50% of the individuals treated for the insect is (4300 and 5000 Ppm/adult) for the ethanolic and aqueous extracts respectively, as shown in Table 5.

The results of Table 4 showed that the pine leaf extract came after the hibiscus leaf extract in terms of its effect on the insect, as the ethanolic and aqueous extracts showed mortality rates of (75 and 60%) respectively at the concentration (10000 Ppm/adult). The results showed that the lethal concentration for 50% of the treated individuals for the insect is (4500 and 7500 Ppm/adult) for the ethanolic and aqueous extracts respectively, as shown in Table 5 showed that there were no significant differences in the killing rates between the ethanolic extract of pine leaves and hibiscus sepals at a concentration of (10000 Ppm/adult) in the adult insect after 48 hours of treatment. The toxicity of pine leaves is due to their containing active ingredients such as taenopsis, tadolegal glycosides, resins and flavones [18].

The results of Table 4 showed that the ethanolic and aqueous extracts of hibiscus plant sepals were the least effective extracts on the insect. They showed mortality rates of (75 and 56.6%) at the concentration (10000 Ppm/adult) respectively. The results showed that the lethal concentration for 50% of the treated individuals of the southern beetle was (5400 and 8800 Ppm/adult) for the ethanolic and aqueous extracts respectively, Table 5.

Table 4: Percentage mortality rates of plant extracts after 48 hours of treatment for adult southern cowpea beetle

		At concentration ppm death rate %					
plant	Solvent	**1000**	**2000**	**5000**	**7000**	**9000**	**10000**
Hibiscus **(**sepals**)**	Ethanol	4.16	25	45.825	54.125	66.66	75
		E u v	B p g	El m	D i j k	D e f	C cd
	Distilled water	10	20	33.3	43.3	50	56.6
		CD t	C gr	F no	E m	F kl	E h i j
Hibiscus **(**leaves **)**	Ethanol	8.25	20.75	58.25	70.825	75	79.16
		D t u	C gr	B g h i	B de	B cd	B b c
	Distilled water	16.6	30	50	56.6	63.3	66.6
		B r s	A op	D kl	D h i j	D f g	D e f
pine **(**leaves **)**	Ethanol	8.33	25	62.5	66.6	70.8	75
		D t u	B p g	A f g	C e f	C de	C cd
	Distilled water	10	16.6	36.6	46.6	56.6	60
		C t	D r s	F n	El m	E h i j	E g h
Eucalyptus **(**leaves **)**	Ethanol	12.5	29.16	54.16	79.16	83.25	91.66
		C s t	A op	C i j k	A b c	A b	A a
	Distilled water	20	26.6	53.3	63.3	70	76.6
		A gr	B p	C j k	C f g	C de	BC c
Control	Ethanol	**20**	**20**	**20**	**20**	**20**	**20**
		gr A	C gr	gr G	F gr	gr G	F gr
	Distilled water	**0**	**0**	**0**	**0**	**0**	**0**
		v F	v E	v H	v G	v H	v G

*Similar capital letters in the same column mean that there are no significant differences between them at a probability level of (0.05)

**Similar lowercase letters mean that there are no significant differences between them at a probability level of (0.05)

Table 5: LC50 values (the concentration that kills 50% of individuals) for plant extracts in adult southern cowpea beetles

Plant	**Solvent**	**LC- 50 ppm after 24h**	**LC- 50 ppm after 24h**
Hibiscus (sepals)	Ethanol	7400	5400
	Distilled water	10500	8800
Hibiscus (leaves)	Ethanol	5600	4300
	Distilled water	7000	5000
Pine (leaves)	Ethanol	5200	4500
	Distilled water	9200	7500

Eucalyptus (leaves)	Ethanol	4500	3600
	Distilled water	5500	4100

3- The Effect of Alcoholic and Aqueous Plant Extracts in Repelling and Attracting the Entire Population of the Southern Cowpea Beetle F. *Callosobruchus Maculatus*

The results of the statistical analysis of Table 6, which shows the rates of attractive and repellent effects and the percentage balance of the ethanolic and aqueous extracts of the plants under study at concentrations (10000, 9000, 7000, 5000, 2000, 1000) ppm on the entire Southern cowpea beetle after 15 and 30 minutes of treatment, indicate that the ethanolic and aqueous extracts of eucalyptus leaves gave the highest average expulsion rates compared to other plant extracts, as the expulsion rate reached (27.3, 22.95) respectively. The highest attraction rate reached (33.01)% for the ethanolic extract of pine leaves and the lowest rate (12.18) for the aqueous extract of pine leaves. The average expulsion rate for the ethanolic and aqueous extracts of pine leaves reached (21.65, 18.03) respectively. The average attraction ratios of the ethanolic and aqueous extracts of hibiscus leaves were (26.09, 21.34) respectively. The repellency ratio of the ethanolic and aqueous extracts was (18.30, 20.52) respectively. It was explained that the average attraction ratios of the ethanolic and aqueous extracts of (hibiscus sepals) were (12.19, 21.07) respectively. The repellency ratio of the ethanolic and aqueous extracts was (12.48, 19.14) respectively. The results of the statistical analysis indicate that there is a variation in the rates of attraction and repulsion, and the balance values of the southern cowpea beetle F. *C. maculatus* depending on the type of plant extract, concentrations and time used in the study. The study of the repellent and attractive effect is important in order to know the repellent characteristic in keeping insects away from the places that need to be protected from infection, and the attraction characteristic is useful in attracting and catching insects to the place where the toxic substance is located, killing them and getting rid of them, and this is what many studies have confirmed. Where [19], studied the attractive, repellent and lethal effect of some plant extracts of the leaves and roots of the borage and shell plants against the southern cowpea beetle *C. maculatus* showed that there are significant differences in the rates of attraction, repulsion and killing depending on the type of plant extract and concentrations, but most of the extracts showed a repellent effect on the insect and the shell plant root extract was superior to the rest of the extracts in killing the insect.

Table 6: Attractive and repellent effects of ethanolic and aqueous extracts of plants at concentrations of (10000, 9000, 7000, 5000, 2000, 1000) ppm on adult southern cowpea beetle after 15 and 30 minutes of treatment

Hibiscus (seplat)			**Hibiscus (leaves)**			**Pine (leaves)**			**Eucalyptus (leaves)**			**Plant**	**Percentages**
Average	30m	15m	Average	30m	15m	Average	30m	15m	Average	30m	15m	Time Solvent	
12.19 B	12.75 b	11.63 b	26.09 A	29.1 a	26.08 a	33.013 A	33.68 a	32.166 a	20.816 A	21.08 3 a	20.55 a	Ethanol	Attraction%
21.07 A	21.08 a	21.06 a	21.34 B	23.28 b	19.4 c	12.18 B	11.06 b	13.3 b	20.75 A	19.9 a	21.6 a	distilled water	
12.48 B	13.85 c	11.1 d	18.305 A	18.85 b	17.76 b	21.65 A	21.65 a	21.65 a	27.341 A	30.816 a	23.86 c	Ethanol	Expulsion%
19.14 A	17.76 b	20.53 a	20.52 A	22.2 a	18.85 b	18.35 B	18.31 b	17.76 b	22.95 B	27.1 b	18.8 d	distilled water	
-0.29 B	-1.1 c	.53 b	7.785 A	7.25 a	8.32 a	11.363 A	12.21 a	10.516 b	-6.524 B	-9.733 d	-3.316 b	Ethanol	Balance %
1.925 A	3.32 a	0536 b	0.805 B	1.08 b	0.55 b	-5.8 B	-7.2 d	-4.4 c	-2.2 A	-7.2 c	2.8 a	distilled water	

Similar capital letters vertically within the same rate in the same trait and for the same plant mean that there are no significant differences between them at the 0.05 level.

REFERENCES

1. Ahmed, Ahmed Ali Issa. (2011). The effect of some plant extracts and dichlorvos pesticide (DDVP) on the life of the southern cowpea beetle *Callosobruchus maculatus* F. *Tikrit University Journal of Agricultural Sciences, 11*(1), 170-182.
2. Ismail, Ismail and Kamal Tawfiq Awad Allah and Samir Al-Sharif Ibrahim (1993). Economic Insects, Faculty of Agriculture - Cairo University 542 pages.
3. Al-Takriti, A. A. I. (2001). The toxic effect of extracts of *Melia azedarach* L. and *Cyperus rotundus* L. plants on the life of the southern cowpea beetle *Callosobruchus maculatus* F. Master's thesis - College of Education - Tikrit University - Iraq.
4. Al-Jabry, Ibrahim Abdul-Rasoul & Abdul-Karim H. M. (1987). The effect of accumulated temperatures on the development of the southern cowpea beetle *Callosobruchus maculatus* F. and using thermal accumulation as an indicator for field prediction of its appearance in Nineveh Governorate, *Al-Rafidain Agriculture Journal, 19*(1), 235-246.
5. Al-Hadidi, I. A. M. (1989). The Interaction Effect of Temperature and Moisture Content of Wheat on the Life of Three Species of Storehouse Insects. *Tribolium castaneum* (Herbst) *Tribolium confusum* Duval (Coleoptera: Tenebrionidae) *Oryzaephilus surinamensis* (Coleoptera: Silvanidae). Master's Thesis, University of Salahaddin, College of Science, Iraq – Erbil.
6. Al-Dhahab, A. I. L. (1998). Antagonistic Activity of Iraqi Plant Extracts on Some Pathogenic Bacteria, Master's Thesis, College of Science - University of Babylon.
7. Al-Rawi, Khashe' M., & Abdul Aziz, K. A. (1980). Design and Analysis of Agricultural Experiments, Dar Al-Kutub for Printing and Publishing - University of Mosul 488.
8. Al-Zarfi, S. K. L. (2003). A biological study to know some medicinal plant extracts and their effect on the growth of algae, Master's thesis. College of Science - University of Babylon.
9. Al-Zamiti, M. S. S. (1997). Applications of integrated pest control for agricultural pests, Dar Al-Fajr for Publishing and Distribution, 455.
10. Al-Azzawi, A. F., & Muhammad, T. M. (1983). Storehouse insects, Ministry of Higher Education and Scientific Research, Mosul University Press, 71.
11. Al-Faraji, S. M. L. (2008). A comparative study between the effectiveness of some plant extracts and dichlorvos (DDVP) pesticide on the adult southern cowpea beetle *Callosobruchus maculatus* F., Master's thesis - College of Science - Tikrit University.
12. Al-Mashhadani, M. S. A. (1997). Biology and control of Varroa jacobsoii, a parasite of honey bees *Apis mellifera* in Iraq. PhD thesis. College of Agriculture - University of Baghdad, 102.
13. Hassan, A. A. H. (2013). Biological and molecular study of the southern cowpea beetle *Callosobruchus maculatus* (Fab.) (Coleoptera: Chrysomelidae) on four varieties of cowpea seeds, PhD thesis, College of Education - Tikrit University, Iraq.
14. Daoud, A. S. (1991). The stimulating effect of some vegetable and mineral oils in the deltamethrin pesticide against the adults of the southern cowpea beetle, *Al-Rafidain Journal of Agriculture, 23*(1), 211-220.
15. Shaaban, A., & Nizar Mustafa Al-Mallah. (1993). Pesticides, Ministry of Higher Education and Scientific Research, Dar Al-Kutub for Printing and Publishing, University of Mosul - Iraq, Mosul, 13-520.
16. Abdul-Jabbar, H. D. (2006). The biological effect of some plant extracts, watercress *Eruca sativa*, radish *Raphanus sativus* and lettuce *Lactuca sativa* on the life of the southern cowpea beetle (*Callosobruchus maculatus* F. Coleoptera: Bruchidae), Master Thesis - College of Education - Tikrit University.
17. Obaid, H. M. (1999). The toxic effect of extracts of some medicinal plants on metabolic processes in the southern cowpea beetle *C. maculatus* F. Master Thesis - College of Education for Girls - Tikrit University - Iraq.
18. Ajeena, S. J. (2009). The effect of crude alcoholic extracts of some plant parts in inhibiting the growth of a type of pathogenic bacteria that cause food spoilage, PhD thesis, *College of Veterinary Medicine - University Baghdad*.
19. Mohammed, A. K. H., Abdul Jabbar Khalil Al-Abbadi, & Fadhel, M. R. (2011). The attractive, repellent and lethal effect of some plant extracts on the southern beetle *Callosobruchus maculatus* (Fab), *Tikrit University Journal of Agricultural Sciences, 11*(2), 204.
20. Abbot, W. S. (1925). Amethod of computing the effectiveness of an insecticide. *J. Econ. Entomol, 18*, 265 – 267.
21. Adedire, C. O., & Akinneye. J. O. (2004). Biological activity of treemarigold , *Tithonin diversifolia* ,on cowpea seed bruchid, *Callosobruchusmaculates* (Coleoptera : Bruchidae*)*. Food storage technology program, Department of Biology, Fedral University oftechnology , PMB 704,Akure , Nigeria , Ann. Appl, *Biol. Printed in UK*,144, 185 – 189.
22. Ahmed, S. M., & Eapen, M. (1986). Vapour toxicity and repellency of some essential oils to insect pests. *Indian Perfurmer, 30*, 273-278.
23. Al-Sharook, Z. M., Balan, Y. J., & Rembold, H. J. (1991). Insect growth inhibitors from Tow trop *Meliaceae ical* effect of crud extracts on mosquito Larvae. *J.Appl. Entom, 111*, 425-430.
24. Busvine, J. R. (1971). A critical review of the teachia use of testing insecticides Common Wealth. Agris London.
25. Collins, P. T. (1985). Resistance to grain protectants in field population of saw toothed grain beetle in southern queens-Land. *Aust. J. Exp. Agric, 2*, 683-686.

26. EL-Nahal, A. K. M., & Schomidt, G. H., & Risha, E. M. (1989). Vaparus of *Acorus calamus* oil Aspaee treatment for stored product insects. *J. Stor. Pro. Res*, *25*(4), 211-21.
27. Folsum, J. W. (1931). Achemotrophometer. *J. Econ. Entomol*, *24*, 827 –833.
28. Grainge, M. S. A., & Mitchell, W. C., & Hylin, J. W. (1986). Plant special reportedly possessing pest control properties An Ecw- Uhdatabase Honolulu, Hawaii USA.
29. Islam, B. N. (1983). Pesticide action of neem and certain indigenous plants. Proc.2nd.Int. Neem. Conf. Rauischolzhousen: 263 – 29J. *Biomed Sci*, *9*, 656– 664.
30. Resendiz, L. I., P. D. L., & Castano, E. T. (1998). Antimutagenicity of natural phenolic compounds in dried flowers from (*Hibiscs sabdariffa* L.) against I- nitropyrene. On line: file: 11A:\ Hib 5. Htm.
31. Riose, J. L., Recio, M. C., & Villar, A. (1987). Antimicrobial activity of selected plant employed in the Spanish Mediterranean area. *Ethm.Pharmacology*, *21*, 143 - 152.
32. Meiners, C. R., Derise, N. L., Lau, H. C., Crews, M. G., Rirchey, S. J., & Murphy, E. W. (1976). Proximate composition and yield of raw andcooked mature dry Lagumes. *J. Agric. Food chem*, *24*, 1122-1126.
33. Haider, A. A., & Mohammad, N. A. G. (2024). A practical study of the southern cowpea beetle *Callosobruchus maculatus* F. Journal of agriculture and biological sciences. *Web of agriculture*, *2*(6), 21-26.
34. Mohammad, N. A. G., Haider, A. A., & Hassan, M. O. (2021). The effect of pyrrolidinium bromide salt in the life of the southern cowpea beetle *Callosobruchus maculatus* (Fab.) (Coleoptera: Chrysomelidae). Earth and environmental science. *IOP conference series*, *910*(1), 012140.