IMPACT OF *IPOMOEA CARNEA* JACQ. EXTRACT AS AN ACARICIDE AND REPELLENT OF THE TWO SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH

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Abstract

Plant extracts using for pest control programs is considered as an alternative control method to decrease synthetic pesticides. The efficacy of petroleum ether and water extracts obtained of *I. carnea* plant, Convolvulaceae on *T. urticae* was evaluated. The sprayed leaf disk method was carried out to determine the effect of the plant extract on eggs and adult females under laboratory conditions at concentrations, 5%, 10%, 25% and 50 % were experimented. Mortality % percentages were recorded after 1, 3 and 5 days from treatment. The highest death rates of *T. urticae* adults were found at 50% concentration recording 82.50 % and 35.00% for petroleum ether and water of *Ipomoea carnea* extracts, respectively. Both extracts has poor toxic effect to eggs compared with adult females. Both extracts showed superiority in repellency to *T. urticae*, whereas repellency was decreased gradually as well as time elapsed after treatment. *T. urticae* females preferred to settle, deposit eggs and feed on the untreated leaves of the disc . The majority or mdinduaes refused to settle on the treated part especially in the high concentrations. Both solvent extracts decreased the female longevity and fecundity. of *T. urticae.* As a consequence, of *Ipomoea carnea* are thought to be used as an alternative material to control the two spotted spider mites.

Keywords*:* *Ipomoea carnea, Tetranychus urticae,* Toxicity, Repellency.

INTRODUCTION

Problems associated with the use of synthetic pesticides led researchers to look for natural plant protection compounds such as botanical products. The two-spotted spider mite, (TSSM) is polyphagous, feeding on more than 600 plant species Boland *et al.* (1998). It preferentially attacks the underside of developed leaves, spinning webs and causing silvery-white patches. Infestation by the TSSM initially causes chlorotic areas to appear on the upper surface of leaves. With time, the foliage bronze, dry out, and finally the leaves drop off the plants.

Studies of yield reduction caused by varying population levels of *T. urticae* have demonstrated its potential for damaging crops. Its outbreaks are often a consequence of repeated and non-selective pesticide applications. The greatest problem with this

mite is its ability to rapidly evolve resistance to pesticides Cranham and Helle (1985). The experimental results proved that the biopesticides derived from plants play a major role in combating the insect pest, and thereby prevent the damage caused by the mites Hemant *et al*. (2014). These biopesticide, applied at the right dosage and time it would certainly be an alternative to chemical pesticides at the field level. If these biopesticides produced commercially and farmers are trained for their use there is no doubt that these eco-safe products can replace the hazardous chemicals of the field in coming days. Plant compounds such as extracts were used as acaricids and, repellents (Venkatachalam and Jebanesan 2001 and Kumral *et al*. 2010) reported that methanolic extracts of *Datura stramonium* L. (Solanaceae) leaves and seeds exhibited acaricidal, oviposition deterrent activities against *T. urticae*. Thus, the Objectives of this study were to assess the activity of *Ipomoea carnea* extract against *T. urticae* where, *Ipomoea carnea*, is a species of morning glory. The plant *Ipomoea carnea* belongs to family Convolvulaceae. This flowering plant has heart-shaped leaves that are a rich green and 6–9 inches long.

MATERIALS AND METHODS

Rearing of The spider mite, *Tetranychus urticae* Koch

Samples of bean plants, *Phaseoulus vulgaris* L. leaves infested with *T. urticae* were collected and transferred to the laboratory. The culture was initiated by transferring female and male individuals to leaves of mulberry, *Morus alba* L. placed on cotton wool pad, fully saturated with water as a source of moisture and to prevent mite from escaping. Old leaves were changed as necessary. Female mites were transferred to clean leaves, allowed to oviposit for 24 hr., then removed. Development of these eggs resulted in a cohort of evenly aged mites that were used for all bioassays. The colony was kept under controlled conditions in the laboratory (28 ± 2 ^{o}C and 65 ± 5 % R.H).

Preparation of *Ipomoea carnea* Jacq extracts

Ipomoea carnea leaves were collected during the vegetation period from production areas of Zagazige district. Plant material was dried under shade, powdered by using an electric grinder. Extract was kept in the dark at room temperature in 3 liters, glass jars till used. The extraction procedure used in the study was described by Gokçe *et al*. (2005) where plant extract was prepared from a representative sample of 100 g of powdered plant material taken into a 2 liters capacity Erlenmeyer flask for each solvent. Petroleum ether and water. 300 ml of each solvent were added and shaken for 24 hr. in a horizontal shaker at 120 rpm at room temperature. The plant

suspension was sieved through four layers of cheese cloths to separate plant parts. Extract was transferred into a 250 ml evaporating flask and evaporated. The extract solution was kept in a refrigerator at 4 °C until used in the bioassay.

Gas chromatography-mass spectrometry analysis (GC/MS)

Volatile compound analysis was performed with a gas chromatography system (Agilent 6890 GC) with an Agilent mass spectrometric detector, with a direct capillary interface and fused silica capillary column PAS-5 MS (30 m × 0.32 mm × 0.25 µm film thickness). Helium was used as the carrier gas at a flow about 1.0 ml/min pulsed splitless. The solvent delay was 3 min. and the injection size was 1.0 µl. The mass spectrometric detector was operated in an electron impact ionization mode with an ionizing energy of 70 eV. Scanning from m/z 50 to 500 and the ion source temperature was 230ºC. The electron multiplier voltage (EM voltage) was maintained 1250 v above auto tune. The instrument was manually turned using perfluorotributyl amine (PFTBA). Oven temperature program at 45ºC (2 min), 150°C (5 min) at a rate of 2°C min-1, then at 150ºC (2 min), 280°C (5 min) at a rate of 8°C min-1; split 30:1 during 1.50min, carrier gas He: 1 ml min-1, constant flow; sample volume 1 µl. To identify the parts was based on comparison of their mass spectra with those of Wiley and Nist Tutore Libraries Adams (1995).

The effect of *Ipomoea carnea* extracts on spider mite, *T. urticae* eggs

Mated mite females were transferred to four leaf discs about (each of 2.4 cm in diameter) which were placed in prepared Petri- dishes on moist cotton to prevent desiccation of leaf. They were allowed to lay eggs on the lower surface of mulberry leaves, for 24 hr. The adult females were removed after 24 hr. and the number of deposited eggs per disc was counted and recorded about 80 eggs for each concentration (50, 25, 10 and 5%). The disc surface which carrying the eggs was gently dipped separately in concentrations from each extract solvents, petroleum ether and water for about 5 seconds. In control test, the leaf discs were dipped in distilled water only. The treated and untreated eggs were kept under constant temperature of 28 ± 2 ˚C and 65 ± 5 % R.H., In all cases, hatchability percentages were recorded.

Efficacy of *Ipomoea carnea* extracts against adult females of spider mite, *T. urticae*

The method of leaf spray was applied to test the efficacy of the two extracts separately against adult females of *T. urticae*. Total number of 80 individuals (females) as the same age was bio-assayed in 8 replicates each of 10 adult females.

Each extract was tested with different concentrations (50, 25, 10 and 5 %) from each extract solvents, petroleum ether and water. Petri-dishes having the same number of females were sprayed with water as a control. All discs were placed on moist cotton wool pad in Petri-dishes (10 cm in diameter). Discs were sprayed with tested concentrations using a manual atomizer. LC_{50} values from each extract were determined. The treated females and untreated ones were kept under the same conditions of 28 ± 2 °C and relative humidity of 65 ± 5 % R.H. Mortality percentage was calculated during 1, 3, and 5 days after treatment.

Repellent effect of *Ipomoea carnea* extracts against adult females of spider mite, *T. urticae*

To study the repellent effect of *Ipomoea carnea* against females of *T. urticae* at different concentrations (50, 25, 10 and 5 %) of each extract solvents were used. Mulberry leaves were cleaned and cutted into two parts of symmetrical portion along the midrib. One leaf portion of the disc was dipped in tested concentration of each extracts where the other half was dipped in water (control). The treated discs were left to dry and put on top of a wetted filter paper placed inside glass Petri–dishes (10 cm in diameter). Eighty adult females *T. urticae* were distributed on eight discs replicates each of 10 adult females of *T. urticae* and placed in the middle between the two leaf portions. The number of mites found on each leaf portion was counted after 1, 2, 3 and 4 days from exposure. The repellency percentages were computed**.**

Statistical analysis

Data were subjected to statistical analysis using one way analysis of variance, ANOVA Duncan (1955).

RESULTS AND DISCUSSION

Chemical composition of *Ipomoea carnea* leaves

The bioactive phytochemicals of *I. carnea* leaves were analyzed by using hydro-distillation and GC–MS. The results revealed 40 compounds representing 99.49% of the contents Table (1). The identification of phytochemical compounds is based on the ARE % Undecane (CAS\) 9.45 %, decane (CAS) 8.75% , Dodecane (CAS) 8.38%,1,2 Cyclohexanedi carboxylic acid , decyl 2- ethylhexyl ester 8.08% 1,2 Cyclohexanedi carboxylic acid , dinonyl ester 8.10% 1,2 Cyclohexanedi carboxylic acid , and dinonyl ester 8.02%.

Table 1. Compositions and percentages of volatiles from *Ipomoea carnea* leaves

Peak	Compound name	RT/min.	Area %
1	Nonane , 2-methyl – (CAS) $$ 2- methyl nonana $$ 2- methyl – nonane $$ etinecs 212-814 -5	6.592	1.50
2	3- Hexene , 3- ethil -2,5 -dimethyl - $$ (3E) – 3 Ethyl – 2,5 –dimethyl –3- hexane #	7.168	1.74
3	DECANE (CAS) $$ n- decane $$ Isodecane $$ n- cloh 22 $$ un2247 $$ ai3- 24107	7.646	8.75
4	Oxalic Acid , 2- ethylhexyl pentadecyl ester	8.246	1.43
5	Cyclohexane , butyl - $$ n- b utylcycl ohexane $$ butane , 1- cyclohexyl	8.473	0.67
6	Naphthalene , decahydro - $$ Bicyclo (4.4.0)decane $$ Dec $$ Decahydron aphthalene	9.049	0.46
7	Decane, 2- methyl - $$ 2- methyldecane $$ C8H17CH (CH3)2	9.300	0.90
8	Cyclohexane , 1,1 dimethyl -$$ Gem- Dimethylcyclohexane $$ 1,1 Dimethyl cyc1 ohexane	9.783	0.79
9	Undecane (CAS) $$ N – Undecane $$ Hendecane $$ n – C1 1H24 $$ UN2330 $$ AI3 – 21126	10.202	9.45
10	Naphthalene , decahydro 2- methyl – n$$ Decaydro -2- methylnaphthalene	10.423	0.59
11	CIS – SYN – 2 – METHYL - DECAHYDRONAPHTHAL ENE $$ NAPHTHALENE , DECAHYD RO – 2- METHYL	10.423	1.38
12	Cyclohexane , pentyl - $$ Cyclohexane , n - $$ pentane , 1 – cyclohexyl	10.942	0.88
13	Octane , 4 – ethyl - $$ 4 – Ethyloctane	11.396	0.66
14	Undecane , 2 – methyl - $$ 2 – Methylundecane	11.582	1.91
15	Sulfurous acid , cyclohexylmethyl heptadecyl ester	12.042	0.47
16	Dodecane (CAS) $$ N – Dodecane $$ Ba 51 – 090453 $$ Adakane 12 $$ isododecane	12.362	8.38
17	Undecane , 2, 6 – dimethyl - $$ 2,6 – Dimethylundecane	12.601	1.34
18	Cyclohexane , $$ hexyl - $$ Hexane , 1 – cyclohexyl $$ Cyclohexane , n – hexyl	13.090	0.59
19	Dodecane , 2 – methyl $$ 11 – Methyldo decane $$ methyl dodecane	13.544	.039
20	Tridecane $$ n – Tridecane $$ Tridecane , n	14.214	0.54
21	Cyclohexane , 4- ethenyl 4- methenyl – 3 – (1-- methenyl ethenyl) 1-1 (methenyl ethenyl) - , 3Rtran	14.959	0.33
22	Caryophyllene	16.397	0.76
23	Germacrene – D	17.404	2.55
24	Hexadecanoic acid , methyl ester (CAS) $$ methyl palmitate	24.407	0.84
25	Hexadecanoic acid (CAS) $$ palmitic acid $$ n – Hexadecoic acid	24.024	0.57
26	9, 12 , 15 – Octadecatrienoic acid , methyl ester , (Z ,Z ,Z)	25.515	1.01
27	R* ,R*- (E)]] [R- [Phytol $$ 2 – Hexadecen – 1 – o1 , 3 , 7 , 11 , 15 tetramethyl - ,	25.654	2.54
28	Bis (2- ethylhexyl) phthalate $$ phthalic acid , bis (2- ethylhexyl) este	30.184	0.34
29	Ethyl (2 S) -2- (hydroxtmethyl) pyrrolidine -1- carboxylate	30.999	1.17
30	1,2 Cyclohexanedi carboxylic acid , 3- methylbut -2- yl nonyl ester	31.215	1.31
31	1,2 Cyclohexanedi carboxylic acid , di (2- methylbut yl ester	31.442	3.48
32	1,2 Cyclohexanedi carboxylic acid , dinonyl ester	31.669	5.88
33	1,2 Cyclohexanedi carboxylic acid , decyl 2- ethylhexyl ester	31.890	8.08
34	1,2 Cyclohexanedi carboxylic acid , 4-octyl ester	32.164	8.02
35	1-naphthamide, N- (4- chlorophenyl)	32.303	8.10
36	1,2- Cyclohexanedi carboxylic acid , heptyl nonyl ester	32.525	5.54
37	1,2 Cyclohexanedi carboxylic acid , isobutyl tetradecyl ester	32.740	3.91
38	Teteacosane $$ n – Teteacosane	33.217	0.95
39	Eicosane (CAS) $$ n- Eicosane $$ Icosane $$ n –eicosane $$ n – icosane	34.842	1.29
40	Octacosane $$ n- Octacosane	36.554	0.36

RT: Retention Time

The action of *Ipomoea carnea* extracts against eggs and adult females of spider mite, *T. urticae*.

The result shows that the ovicidal and adult effect of the experimented natural extract against eggs and females of *T. urticae* varied considerably in Table (2). Both extracts were effective on eggs and caused moderate unhatchability %. ranged between 25 - 50% Obtained results represeented that the percentages of eggs unhatchability increased as well as the concentration increased, therefore, at the concentrations of 50.00, 25.00, 10.00 and 5.00%,the unhatchability %was 53.75%, 38.75% 35.00 and 27.25% at tested concentrations, respectively while the water extract was the least effect as compared with petroleum ether extract . Unhatchability percentages could be arranged as the following descending order : 45.00% , 32.50% , 25.00% and 21.25% at 50.00 , 25.00 , 10.00 and 5.00 % concentrations , respectively. Unhatchability was low in control wherase, it was 3.75 % and 10.00 % for water and petroleum ether, respectively. In addition the incubation period recorded 6.22 and 5.75 days for petroleum ether and water extracts compared with control of 3.62 days for water and 4.18 days for petroleum ether. These results are agreement with Hussein *et al*. (2006) who stated that ethyl acetate extract of the plant *Capparis aegyptia* L leaves and fruits were the most potent extracts tested against *T. urticae* eggs. Barakat *et al*. (1984) tested some plant extracts of *Piper nigrum* and *Datura stramonium* showed considerable ovicidal properties. Mortality percentages of females increased by increasing the concentrations of both solvent extracts. Petroleum ether extract was the most effective extract against females that caused 82.50 % mortality at 50% after 5 days of treatment compared with water extract while the mortality% was75% at the same concentration. However, each of 25 % and 15% concentrations caused variable mortality percentages ranged between 72.50% and 61.25 %. The lowest concentration of 5% caused 25 % and 35% mortality for water and petroleum ether extracts, respectively. These results agree with Saber and Isman (2006) who evaluted the efficacy of rosemary, *Rosmarinus officinalis* L., essential oil against the two-spotted spider mite. Laboratory bioassay results indicated that pure rosemary oil caused complete mortality of spider mite at concentrations that aren't phytotoxic to the host plant. Hemant *et al*. (2014) found that the extract of *Ipomoea carnea* effective against mite, *Eriophyes cheriani* Massee.

The toxicity may be related to the bioaccumulation of selenium species in leaves Sabogal and Borkowski (2007). All pesticides registrations of naphthalene including use as a moth repellent and insecticide HSDB (2003)

Table 2. Toxicity of the *Ipomoea carnea* extract against eggs and adult females of spider mite, *T. urticae* under laboratory conditions.

Concentrations%	Solvents	Eggs		Mortality % females		
		Unhatchability %	Incubation period (days)	1 day	3 days	5 days
5	Petroleum ether	27.5[c]	4.5 1 ±0.04	15.00	30.00	35[e]
	Water	21.25 [d]	3.55±0.02	11.25	22.50	25[f]
10	Petroleum ether	35.00[b]	4.98±0.05	26.25	52.50	61.25[c]
	Water	25.00[c]	4.08±0.12	21.25	43.75	51.25[d]
25	Petroleum ether	38.75[a]	5.97±0.03	35.00	63.75	72.50[b]
	Water	32.5[c]	5.74±0.06	28.75	56.25	61.25[d]
50	Petroleum ether	53.75[a]	6.22±0.04	46.25	77.50	82.50[a]
	Water	45.00[b]	5.75±0.01	37.50	73.75	75.00[ab]
Control		3.75	3.62±0.02	0	2.50	5.00[g]

Means in the columns followed by the same letter are not significantly different at 5% level (Duncan's multiple range tests). ± Standard Error

Mwandila *et al*. (2013) evaluated the effect of Syringa (*Melia azedarach*) fruit and seed extracts (SSE) on red spider mite (*Tetranychus* spp.) eggs, nymphs and adults which it was high toxic and raised the mortality percentage to 90% two days after treatment.

Repellency effect of *Ipomoea carnea* extracts on adult females of spider mite, *T. urticae*

Data in Table (3) showed that four levels of concentrations (5, 10, 25 and 50%) for each of Petroleum ether and water extracts were tested for repulsion percentages of *T. urticae*. The repellency effect reached an average of 68.75% at 50% concentration of petroleum ether extract after one day of application . forturath, that was considered the most effective action . The rate of repellency effects were decreased gradually by time elapsed after treatment. Generally, all the tested extracts wers ranged between (68.75% - 37.50%) and (61.25% – 30%) for one day and four days after treated with petroleum ether and water extract,

respectively. Each of 10% and 25% concentrations were succeeded in repulsion of spider mite, *T. urticae* individuals, whereas the repellency reached 12.50% and 7.50 for petroleum ether and water extracts, respectively. at 5% concentration. Repellency percent in control was 11.25 and 2.50 for water and petroleum ether after that decreased. These findings indicated that when concentration increased the repellency percent also increased. The female mites may control eating when food is abundant. However, under food shortage the mites feed in other areas to guarantee their survival. These results are in agreement with Saber (2004) who tested the effect of petroleum ether, chloroform, ethyl acetate and ethanol extracts of sand wormwood (*Artemisia monosperma* Del) against *T. urticae* females. The majority of mite females preferred settle and feeding on untreated discs, while few individuals fed on the treated portions.

Table 3. Repellency effect of *Ipomoea carnea* against the spider mite, *T. urticae* under laboratory conditions.

Concentrations %	Solvents	Repellency% / days after treatment			
		1	2	3	4
50	Petroleum ether	68.75[a]	51.25	45	37.50[a]
	Water	61.25[b]	46.25	38.75	30[b]
25	Petroleum ether	56.25[b]	43.75	36.25	31.25[b]
	Water	46.25[c]	37.50	31.25	22.50[c]
10	Petroleum ether	50[d]	33.75	27.50	20[c]
	Water	43.75[d]	31.25	20	17.50[c]
5	Petroleum ether	35[e]	25	18.75	12.50[d]
	Water	25[e]	21.25	12.50	7.50[c]
Control		2.50	0	0	0

Means in columns followed by the same letter are not significantly different at 5% level (Duncan's multiple range tests)

The petroleum ether extract was the most effective in repellency effect. Dhroug, *et al*. (2000) indicated that Bitter apple seed hexane extract proved superiority in repellency effect against spider mites followed by camphor / olive oil mixture. They added that the crude American aloe juice and crude banana leaves juice gave inefficacy effect for mite.

Latent effect of LC_{50}, 49.28 % of *Ipomoea carnea* on longevity and fecundity of *T. urticea*

Data summarized in Table (4) showed that the two solvents extracts were shortened the longevity and reduced fecundity of *T. urticae.* Pre-oviposition period lasted 1.97 and 1.73 days for petroleum ether and water extracts as compared with 1.50 and 1.53 days for untreated one, respectively. On the other hand, oviposition period was 9.73 and 11.14 days for the two solvents, while it becomes 2.29and 2.04 days for post-oviposition , while this lasted 2.94 and 2.21 days for untreated females, respectively. Female longevity averaged 13.99 and 14.91 days for petroleum ether and water extracts but 20.72 and 21.2 days for control, respectively. The total number of deposited eggs for petroleum ether and water extract was (28.11 and 35.14 eggs). While, it was (65.35and 69.87 eggs) for untreated females. These results similar to those of Kawka and Tomczyk (2002) who evaluated two extracts made of fresh and dry leaves of *Salvia officinalis* L. that reduced the total number of eggs produced by *T. urticae* females by about 35-45%. The female longevity was reduced by about 25%. Activity of females feeding on ivy leaves was strongly affected by *Ipomoea carnea* extracts**.**

Table 4. Latent effect of LC_{50} *Ipomoea carnea* extract on some biological aspects of *T. urticae* adult females

Solvent extracts	Pre-oviposition period	Oviposition period	Post-oviposition period	Longevity days	Fecundity
Petroleum ether	1.97±0.36	9.73±1.14	2.29±0.54	13.99±2.04^{b}	28.11±3.12^{c}
Water	1.73±0.12	11.14±2.07	2.04±0.26	14.91±2.35^{b}	35.14±3.95^{b}
Control	1.53±0.07	17.46±2.19	2.21±0.16	21.2±2. 98^{a}	69.87±4.28^{a}

Means in columns followed by the same letter are not significantly different at 5 % level (Duncan's multiple range tests). ± Standard Error

Generally, it was found that *Ipomoea carnea* plant petroleum ether and water extracts showed an obvious effect on *T. urticae* eggs and adult females under laboratory conditions. Synthetic pesticides, which are widely used, are known for causing adverse effects on human beings, and the environment.

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كفاءة مستخلص *Ipomoea carnea* Jacq. كمبيد أكاروسى وطارد للعنكبوت الأحمر *Tetranychus urticae* Koch (Acari:Tetranychidae)

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معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى– الجيزة – مصر

يعتبر إستخدام المستخلصات النباتية إحدى الطرق البديلة الهامة فى مكافحة الأفات بالمبيدات الكيميائية نظراً للأضرار التى تسببها المبيدات من مشاكل عديدة للإنسان والحيوان والنبات و خلل فى التوازن الطبيعى.

أوضحت النتائج أن المستخلص الطبيعى من نبات ***Ipomoea carnea*** بإستخدام كلا من petroleum ether والماء كمذيبات عضوية كان له اثــراً فعالاً ضد إناث الحلم العنكبوتى وطور البيضة حيث إستخدم أربع تركيزات مختلفه ٥٠ و٢٥ و١٠ و٥ % من مستخلص **نبات *Ipomoea carnea*** وتم حساب نسبة الموت بعد ١ و ٣ و٥ يوم من المعاملة.

– أوضحت النتائج ان نسبة الموت تزداد بزيادة التركيز حيث بلغت ٨٢,٥٠ % و ٧٥,٠٠% عند تركيز ٥٠% للمذيب البترولیم إيثر والمائى على التوالى بينما تناقصت بانخفاض التركيز .

– كان لهذا المستخلص تأثير على طور البيضه حيث سبب نسبة عدم فقس للبيض المعامل بلغت ٥٣,٧٥ و ٤٥,٠٠% لنفس الترتيب السابق مع زيادة مدة الحضانة مما أدى الى طول مدة دورة الحياة بالمقارنة بالبيض الغير معامل.

– كان لمستخلص **نبات *Ipomoea carnea*** تأثير طارد ضد الإناث البالغة من الحلم العنكبوتى حيث بلغت نسبة الطرد ٦٨,٧٥ % لمستخلص petroleum ether بينما كانت ٦١,٢٥ % للمستخلص المائى وذلك عند تركيز ٥٠ % وذلك بعد يوم من المعاملة وانخفضت هذه النسب بانخفاض التركيزات والأيام بعد المعاملة.

– تأثر بيولوجى الحلم تأثير معنوى خاصة الإناث المعاملة بالتركيز النصف قاتل من مستخلص ***Ipomoea carnea*** حيث قلت مدة حياة الإناث وحدث نقص فى معدل الخصوبة (عدد البيض / الانثى) بالمقارنه بالإناث الغير معاملة.