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STUDY OF EFFECT OF ETHYL ALCOHOL AND PETROLEUM ETHER EXTRACT OF *SESBANIA SESBAN* L. TO CONTROL MOVING STAGES OF *TROGODERMA GRANARIUM* (EVERTES) COLEOPTERA: DERMESTIDAE

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Abstract

The study was carried out at November 2018, *S. sesban* leaves and seeds were collected during the flowering season and seed formation, to evaluate the effectiveness of ethyl alcohol extract and petroleum ether for leaves and seeds of *Sesbania sesban* as a safe alternative to chemical pesticides in the direct and indirect manner of different stages insect of *Trogoderma granarium* Everts in laboratory. the results of the study showed the superiority of the ethyl alcohol extract for *S. sesban* leaves and the direct method at the concentration of 7% compared to the extract of petroleum ether, the results of its effect in the mortality of larvae and adult 80.0, 100.0%, respectively, the results for the petroleum ether extract were 70.36, 91.66% respectively.

Key words: Ethyl alcohol, Petroleum ether, *Sesbania sesban L*.

Introduction

Crops and stored agricultural products have been important requirement in the lives of many peoples in the East, the Middle East and the world, for the first time, humans have cultivated and stored agricultural products from 50-100 centuries ago (Zachary and Hopf, 2000), Losses caused by insects in stored materials were estimated at about 5-10% of the world's production, while in the developing tropics they reached 30-50% (Ware and Whitacre, 2004).

In addition to the high costs of its use (David et.al. 2010) and targeting it to the desired natural enemies (Koul *et al.,* 2008).

Traditional chemical pesticides are widely used to control insect pests and evaporators play a major role in reducing insect pests in stored agriculture products, phosphine and methyl bromide, which are caused environmental pollution and adverse biological effects on animals , humans due to reduced bio-degradation (Barnard and Padgitt, 1997).

Moreover, insect resistance to phosphine is another global issue to this day, and several control failures have been recorded in some countries (Collins *et al.,* 2002), causing increased demand by consumers for wide range mortality and increased chemical residues (Thomas and James, 2010).

Trogoderma granarium (Everts) is one of the most dangerous insect pests in the tropics (Bell and Wilson, 1995).

Sesbania sesban L. belongs to leguminosae family and has many properties of anti-oxidation and stops the roots of hydroxide and free fat roots also contains phenol compounds to prevent diseases (Trangvarasittichai *et al.,* 2005).

The studies showed that the plant extract has a toxic effect on the adult stage of the wheat beetle, and gave protection to the plant from infections for more than 6 weeks after treatment, and also considered the extracts of seeds *S. sesban* plant is important in controlling the stored grain pests (Al-Moajel, 2006).

In a study of (Al-Rubaie and Al-Rubaie, 2014), which included the test of the effect of crude extract of the fruits and leaves of the *S. sesban* in some performance parameters of the cowpea beetle, *Callosobruchus*

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maculatus at concentrations of 2, 1, 0.5, 0.25, 0 and also the study of the attractive and the repellent effect of the crude phenol compounds for plant fruits and leaves, because of all these recent interventions, so there is increasing demand for new, safe and biodegradable natural pesticides.

Therefore, our study aims to evaluate the use of the extract of ethyl alcohol and petroleum ether extract of *Sesbania sesban* L. to control different stages *Trogoderma granarium* (Everts) directly and indirectly and with different Concentrations.

Materials and methods

Insect culture:

Trogoderma granarium Everts, collected from an infected wheat grain from the laboratory of store insects in the Department of Plant Protection / College of Agricultural Engineering Sciences / University of Baghdad, and were rearing on the grain, the insects were placed in clean, sterile glass jar 500 ml covered with a woven mesh and tied with an elastic rubber band containing a natural diet from the wheat grain, which was exposure for freezing at 20°C for two weeks to get rid of any stored pests, and then transferred to a incubators in conditions at a temperature of (33 ± 2)°C and relative humidity (65 ± 5%) to obtain different insect stages (Abbas, 2018), and for different treatment, different stages (eggs, pupae, adults at age 24 hours of and larvae at the age of 15 days were isolated separately, 10 individuals for each replicator and 3 replicates for each treatment, in addition to control treatment in incubator conditions at (33 ± 2)°C and relative humidity(65 ± 5%).

Collection and Preparation leaves and seeds of *S. sesban* powders

S. sesban leaves and seeds were collected during the flowering season and seed formation (al-Rubaie and al-Rubaie, 2014), the leaves and seeds were isolated and cleaned well and dried in the shade place drying, and then placed inside polyethylene bags kept in the fridge at 4 °C (Supavarn *et al.*, 1974) . For the purpose of grinding both separately by an electric mill and sieved with size of 60 meshes (Al-Mashhadani, 2012).

Extraction method:

The extraction process was carried out after a day of grinding the seeds and leaves in the plant extracts laboratory, both organic solvents for the study were 96% ethyl alcohol and petroleum ether, add the powders of leaves or the seeds both separately, weight 100 g in a glass flask capacity 2 liters and add to it 400 ml of organic ethyl alcohol with 96% concentration, Petroleum ether Both alone with boiling point 40-60 C°, left samples for 72 hours with shake from time to time, and filter the resulting extract by filter paper (Whitman No. 2), Put in a funnel and below it is a bowl to collect the extract, and to isolate the solvent and concentration of the extract using rotary vacuum evaporator at a temperature of 40-50 m and the number of cycles up to 90 cycles / minute and in 40 minutes to obtain the extract of alcohol for each of the leaves and seeds both alone , while extracting with petroleum ether (leaves and seeds) at the temperature of 40 - 50 m and the number of cycles up to 90 cycles / minute and in 15-20 minutes, put the extracted extract in sterile glass dishes and left to dry at the laboratory temperature to get rid of the rest of the solvent And get the raw material (crude) and for both the extractors which were then placed in dark bottles capacity of 50 ml and stored in the refrigerator at a temperature of 4°C. Until time for testing (Harborn, 1973).

Preparation of concentrations of alcohol extract

The concentration 7% was prepared by taking 7g of the crude alcohol extract for both the leaves and seed separately to 10ml of the ethyl alcohol (96%) and completing the volume to 100ml with the distilled water and repeat the way to get other concentration respectively, in addition to control treatment was mixed with 10ml ethyl alcohol with 90ml distilled water.

Preparation of concentrations of petroleum ether extract

The concentration 7% was prepared by taking 7g of the crude petroleum ether extract for each of the leaves and seeds, each separately and add 5ml of solvent (acetone : ethanol) at a concentration of 99.5% for each solvent and in quantity (1:1) with a shake solution until solubility and then complete the volume to 100ml with distilled water and repeat the way to get other concentration respectively , while control treatment was represented by a solution of mixing 5ml of the solvent (acetone : ethanol) and completing the volume to 100ml of distilled water.

Method of direct and indirect spraying for extracts:

Spray the different stages treated with different treatments for the extracts with a small handy sprinkler 15ml and at a distance 15cm plus control treatment in the manner indicated. and transferred to on sterile wheat grains with 10g of each treatment, while in the indirect way wheat grains 10g were treated with different treatments for the extracts by same way and transferred the insects on, and transfer all treatments to the incubator at conditions at (33 ± 2)°C and relative humidity (65 ± 5%) and the results were analyzed statistically.

Results

The results of table 1 showed the effect of ethyl alcohol and the petroleum ether of *S. sesbania* seeds on the Larvae of the *T. granarium* in direct treatments with lethal rates reached 80.0 and 70.36% respectively.

Concentration of 7%, while the lowest results in the petroleum ether extract in the direct and indirect treatment of lethal rates reached 37.03 and 13.33% respectively at the concentration of 1% and the result showed most significant effect of the direct and indirect direct alcohol treatment compared to the petroleum ether treatment with lethal rates reached 80.0, 68.33% and 70.36, 17.03% respectively at the concentration of 7%, the results of the statistical analysis showed a significant effect of the ethyl alcohol extract and the petroleum ether for the leaves of the *S. sesbania* in the larval mortality rate of 59.9 and 35.92%, respectively, the method of using the extract has an effective on the mortality rates of the larvae and the mortality rates were 60.43 and 35.44%, respectively.

The results of table 2 showed the effect of ethyl alcohol and the petroleum ether of *S. sesbania* seeds on the larvae of the *T. granarium* insect in direct treatments with lethal rates reached 68.14 and 64.81% respectively at the concentration of 7%, while the lowest results in the petroleum ether extract in the direct and indirect treatment of lethal rates reached 32.22 and 3.33% respectively at the concentration of 1% and the result showed most significant.

Effect of the direct and indirect direct alcohol treatment compared to the petroleum ether treatment with lethal rates reached 68.14, 56.66 and 64.81, 11.11% respectively at the concentration of 7%, the results of the statistical analysis showed a significant effect of the ethyl alcohol extract and the petroleum ether of *S. sesbania* seeds in larval mortality rates where the mortality rates were 49.33 and 26.81%, respectively, the direct method is more efficient in mortality rates of larvae than Indirect method, with a significant difference. The mortality rate was 52.21 and 23.93%, respectively.

The results of table 3 showed the effect of ethyl alcohol and the petroleum ether of *S. sesbania* seeds on the adults of the *T. granarium* insect in direct treatments with lethal rates reached 100.0 and 91.66% respectively and at the concentration of 7%, while the lowest results in the petroleum ether extract in the direct and indirect treatment of lethal rates reached 30.35 and 13.22% at the concentration of 1% and the result showed most significant effect of the direct and indirect direct alcohol treatment compared to the petroleum ether.

Treatment with lethal rates reached 100.0, 86.90 and 91.66, 21.42% at the concentration of 7%.

The results of the statistical analysis showed a significant effect of the ethyl alcohol extract and the petroleum ether for the leaves of the *S. sesbania* in the rate of mortality the adult 75.87 and 39.13%, respectively, and the direct.

Method is the most effective than indirect method, and results showed there was a positive correlation between adult mortality rates and increased concentration with significant difference, and that there were significant differences between the extracts and the method of use and concentration in adult mortality rate.

The results of table 4 showed the effect of ethyl alcohol and the petroleum ether of *S. sesbania* Seeds on the adults of the *T. granarium* in direct treatments with lethal rates reached 86.11 and 69.83% respectively and at the concentration of 7%, While the lowest results in the petroleum ether extract in the direct and indirect treatment of lethal rates reached 20.63 and 4.16% at the concentration of 1%, and the result showed most significant effect of the direct and indirect direct alcohol treatment compared to petroleum ether treatment with lethal rates reached 86.11, 58.33 and 69.83, 16.92% at the concentration of 7%.

Table 1: Effect of ethyl alcohol extract and petroleum ether for *S. sesbania* leaves on the larvae of the *T. granarium* insect.

Type of extracts	Type of treat-ment	Corrected lethal rate% concentration					Median effect type of extract	Median effect treatment way
		1	2	3	5	7		
Ethyl alcohol	Direct	41.83	54.07	70.83	76.66	80.0	59.95	60.43
	Indirect	40.66	49.16	55.83	62.5	68.33		
Petroleum ether	Direct	37.03	48.14	59.25	66.66	70.36	35.92	35.44
	Indirect	13.33	13.33	17.03	17.03	17.03		
Median effect concentration		33.22	41.09	50.74	55.72	58.93		
LSD values at 0.05%		6.36**					4.02**	4.02 **
		overlap : 12.72 NS						

* The sign means there are statistical differences according to the LSD test at the level of probability 0.05%.

Table 2: Effect of extract ethyl alcohol and petroleum ether for *S. sesbania* seeds on the larvae of the *T. granarium* insect.

Type of extracts	Type of treatment	Corrected lethal rate% concentration					Median effect type of extract	Median effect treatment way
		1	2	3	5	7		
Ethyl alcohol	Direct	39.25	52.5	57.77	64.44	68.14	49.33	52.21
	Indirect	28.14	31.85	40.83	53.7	56.66		
Petroleum ether	Direct	32.22	39.25	42.59	61.47	64.81	26.81	23.39
	Indirect	3.33	3.33	3.33	7.03	11.11		
Median effect concentration		25.74	31.73	36.13	46.57	50.18		
LSD values at 0.05%		5.54**					3.50**	3.50 **
		Overlap* 11.08:						

* The sign means there are statistical differences according to the LSD test at the level of probability 0.05%

Table 3: Effect of extract ethyl alcohol and petroleum ether for *S. sesbania* leaves on the adults of the *T. granarium* insect.

Type of extracts	Type of treatment	Corrected lethal rate% concentration					Median effect type of extract	Median effect treatment way
		1	2	3	5	7		
Ethyl alcohol	Direct	58.99	80.09	81.34	100.0	100.0	75.87	72.88
	Indirect	40.87	54.56	83.79	85.86	86.90		
Petroleumether	Direct	30.35	43.45	64.88	77.97	91.66	39.13	42.13
	Indirect	13.22	13.22	17.26	17.85	21.42		
Median effect concentration		35.86	51.16	55.59	69.91	75.0		
LSD values at 0.05%		5.47**					3.46**	3.46**
		:10.94** overlap						

* The sign means there are statistical differences according to the LSD test at the level of probability 0.05%.

Table 4: Effect of extract ethyl alcohol and petroleum ether for *S. sesbania* Seeds on the adults of the *T. granarium* insect.

Type of extracts	Type of treatment	Corrected lethal rate% concentration					Median effect type of extract	Median effect treatment way
		1	2	3	5	7		
Ethyl alcohol	Direct	29.38	43.05	55.55	72.22	86.11	46.80	Direct51.61
	Indirect	18.05	22.22	40.21	45.76	58.33		
Petroleum ether	Direct	20.63	43.38	46.02	52.90	69.83	28.82	Indirect24.0
	Indirect	4.16	4.16	13.22	16.92	16.92		
Median effect conc.	17.31	28.21	38.77	46.95	57.80			
LSD values at 0.05%		5.27**					3.33**	3.33 **
		NS 10.54: overlap						

* The sign means there are statistical differences according to the LSD test at the level of probability 0.05%.

The results of the statistical analysis showed a significant effect of both extract of the leaves of *S. sesbania* in the adult mortality rate reaching 46.80 and 28.82% respectively and significantly, and the method of using the extract in the direct was better than the indirect and with a significant difference and mortality rate reached 51.61, 24.1% , respectively, and it was found that there was a positive relationship between the mortality rates of adults and increased concentration used with a significant difference for all concentrations tested.

Discussion

Active compounds in plant extracts effected in some physiological activity of the plant or have toxic effects on insects, depending on the concentration treatments of the Planticide (Isman, 2002). Our results are supported by the results of (Suripto *et al.*, 2010) research, that leaves of the plant (*Sesbania sesban* L. Merr.) contain the highest percentage of saponins, which have the potential to influence insects, the ethyl alcohol extract for leaves and seeds of *S. sesbania* was superior to the petroleum ether extract, this may be due to the fact that the alcohol extract may contain most of the compounds affecting the polarity or semi-polarity of the compounds. Or it prevents the larvae from feeding as a result of exposure to the extract, which leads to her death (Rockestien, 1978), the cause of the death of the larval stage of the insect may be due to its sensitivity to the toxic substances

found in the plant or to poison the cells of the channel of digestion responsible for the absorption of food and in turn to decrease the efficiency of food conversion , as the phenolic compounds found in the *S. sesbania* linked with proteins, forming complexes with strong hydrogen bonds be difficult to digest (Kelany , 2001). Studies have confirmed the effect of ether extracts, chloroform and acetone from seeds of *Sesbania sesban* L. against *Sitophilus granarius* in wheat showed that there were significant toxic effects of all extracts on adults, ether extract was the most toxic (7.4 ml/kg). And all extracts have also prevented the emergence of adults, Adult growth in petroleum ether was reduced by 97% (Emimal, 2010), the results of another experiment showed the significant effect of direct treatment when *Tribolium castaneum* and *Tribolium confusum* were exposed to bio-tests in open field to exposed aerosol mix (pyrethrin + methoprene) in both direct and indirect treatment, causing a decrease in the emergence of adults and the transformation of the larvae of both species in direct treatment compared to indirect treatment (Arthur, 2015).

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