بسم الله الرحمن الرحيم

Sudan University of Science and Technolog

College of Agricultural Studies

Department of Plant Protection

Insecticidal activity of Neemazal against House fly (*Musca domestica vicne*) (Diptera: Muscidae)

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A graduation project submitted in partial fulfillment of the requirements for the degree of B.Sc. Agric. in Plant Protection.

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الآية

قال تعالى:

(يَا أَيُّهَا النَّاسُ ضُرِبَ مَثَلٌ فَاسْتَمِعُوا لَهُ ۚ إِنَّ الَّذِينَ تَدْعُونَ مِن دُونِ اللَّهِ لَن يَخْلُقُوا ذُبَابًا وَلَوِ اجْتَمَعُوا لَهُ ۖ وَإِن يَسْلُبْهُمُ الذُّبَابُ شَيْئًا لَّا يَسْتَنقِذُوهُ مِنْهُ ۚ ضَعُفَ الطَّالِبُ وَالْمَطْلُوبُ(73).

صدق الله العظيم

(الحج73)

DEDICATION

To my mother and father

To my dear brothers and sisters

To all my family

To all my teachers and friends with

Love

&

respect

ACKNOWLEDGEMENT

All thanks are due to Almighty Allah (SWT) who gave me health and strength and helped me tremendously to produce this work. I would like to express my thanks to my supervisor **Dr. Loai Mohamed Elamin** for his helpful assistance, guidance, patience and keen supervision during this work.

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ABSTRACT

Experiment was conducted in the Laboratory of Entomology and Zoology, Department of Plant Protection, College of Agricultural Studies (Shambat), Sudan University of Science and Technology (SUST) in the period of April-May, 2016. This study aimed to test the effectiveness of (NeemAzal-T\S) against the larvae of house fly (*Musca domestica*).

Three concentrations of NeemAzal- T/S were used (4, 2, 1 ml/liter) in this experiment.

The results showed that all concentrations induced significant mortality percentage when compared to untreated control. After 1 hour higher concentration 4ml/l induced mortality of 36.7% and continuously increased till reached 100% after 24 hrs. While other concentrations caused mortality % between 26.7- 60 % after 24 hrs post treatment.

From these mentioned results we conclude that NeemAzal T/S was effective against the larvae of house fly, and it could be used as one of the alternative bio-pesticide against this pest in the future.

ملخص البحث

أجريت هذه التجربة بمعمل الحشرات والحيوان الزراعي بقسم وقاية النبات ،كلية الدراسات الزراعية - شمبات، جامعة السودان للعلوم والتكنولوجيا في الفترة من ابريل – مايو 2016م

الهدف من الدراسة هواختبار أثر وفعالية مبيد (NeemAzal-T/S)على يرقات الذبابة المنزلية.

تم إستخدام ثلاثة تركيزات من مبيد النيمازال هي(4 ، 2 و1 مل /لتر).

أوضحت النتائج ان جميع التركيزات أظهرت نسب موت معنوية عند مقارنتها بالشاهد . أعطي اعلي تركيز (4 مل/ لتر) نسبة موت 36.7% بعد ساعة من المعاملة بعد ذلك استمرت نسبة الموت في الزيادة حتى وصلت 100% بعد 24ساعة من المعاملة بينما بقية التركيزات اعطت نسب موت ترواحت بين 26.7-60%.

من هذه النتائج يمكن أن نخلص الي أن مبيد النيمازال له أثر وفعالية ضد يرقات الذباب المنزلي ويمكن أن يستخدم كواحد من المبيدات الحيوية البديلة ضد هذة الحشرة في المستقبل.

CHAPTER ONE

Introduction

The house fly, *Musca domestica* Linnaeus, is a well known cosmopolitan pest of both farm and home. This species is always found in association with humans or the activities of humans. It is the most common species found on hog and poultry farms, horse stables and ranches. Not only are house flies a nuisance, but they can also transport disease- causing organisms. Excessive fly populations are not only an irritant to farm workers but, when there are nearby human habitations (Amano, 1985).

The control of both agricultural and medical insect pests in Sudan and worldwide depends mainly on the use of synthetic insecticides, but their problems are continuously increasing, such problems include exposure of man and animal to serious hazards, distraction of beneficial organisms in addition to their high cost , this situation has led to the search for other alternatives methods of control , particularly those of plant origin to reduce the heavy using of chemical insecticides and alleviate their hazards (Fernandez and Montagne ,1990).

Botanical insecticides are considered as an alternative to the synthetic chemicals for being bio- degradable, pest specific, non-hazardous to human health and environment and leaving no toxic residue in nature (Amin *et al.,* 2012).

The objective of this study is to investigate through laboratory screening the activity and the susceptibility of the larvae of house fly (*Musca domestica) to* NeemAzal insecticide.

CHAPTER TWO

Literature Review

2.1 House fly (*Musca domestica)*

2.1.1 Classification

Kingdom: Animalia

Phylum: Arthropoda

Sub phylum: Mandibulata

Class: Insecta

Sub class: Pterygota

Order: Diptera

Family: Muscidae

Genus: *Musca*

Species: *domestica* (Ghose and Manna, 1991)

2.2 Distribution

The house fly, *Musca domestica* is a well-known insect pest of both farm and home. This species is always found m association with humans or activities of humans. Excessive fly populations are obnoxious to farm workers, and when there are nearby human habitations a public health problem is possible (Hogsette *et al.*, 1993)

2.3 Morphology and Description

The housefly (*Musca domestica*) is one of the most common and widely dispersed non biting insects in the world. The body of the housefly, a hard exoskeleton, is covered with minuscule hairs. They have six articulated legs, also covered with hairs. There are sensory receptors for smell and taste distributed on the legs and feet of the housefly, and also on their mouthparts. Adult house fly is no larger than 1/2 inch (1.25 cm), the females surpassing the males in size. The thorax is dark gray, with four dark lines running lengthwise down the back. The ventral side of the abdomen is yellow. House flies have compound eyes, which are made up of several visual units. Because compound eyes are not focused, the vision of the housefly is blurred (Brain *et al.*, 2000)

House flies are gray, with four dark longitudinal stripes on top of the thorax, or middle body region. The mouth parts of the house fly are adapted for sponging u liquids. They cannot bite. Flies ingest only liquid food; they feed on solid food by regurgitating saliva onto it. The saliva liquefies the solid material, which is then sponged up with the proboscis. They require water since they continually salivate. Fly specks seen on surfaces visited by house flies are the excreted wastes (Brain *et al.*, 2000)

2.4 Biology and life cycle

House flies have been known to transmit serious diseases; therefore it is important for the biologist to make a close study of its life history and habits.

2.4.1 Eggs

The mature female of housefly lays many batches of eggs with 100 to 150 eggs in each batch. Decaying organic matter such as manure heaps, feces, or almost any exposed food material, are selected as breeding sites The last four segments of the abdomen of the female housefly, normally retracted and withdrawn into the body, are extended to make an ovipositor, by means, the eggs are placed a f millimeters below the surface, and danger of drying out is avoided. The eggs are white, elongate oval, about one millimeter long and with two rib-like thickenings down each side. They hatch after eight to twenty-four hours according to the temperature The bacteriological fermentation that goes on within a manure heap usually keeps the temperature high and fairly independent of external changes so that development proceeds rapidly (Dewey1999).

2.4.2 Larva

The larva (maggot) is a semi-transparent, later becoming white. Twelve segments are visible, becoming larger at the posterior end. The tiny head is usually pulled back into the anterior segments and is not visible. Two black, hook-like tee projecting from above the mouth are used for movement through the breeding place and for tearing up potential food. The larva has no legs, but on the low sides of segments six to twelve are crescent-shaped pads bearing short spines which assist its movement. Spiracles open on the second and last segment only. The larva feeds on the organic matter in which it finds itself, taking in only fluids and tiny particles. It has no simple or compound eyes but must be able to distinguish light and darkness since it moves away from light. This negative response to light tends to keep it in the warmer, moister regions of its breeding ground. It grows to about one cm long in five days, shedding its cuticle twice. Before its final ecdysis its reactions to light and moisture change, and it migrates to a drier position just below the surface of its breeding ground where it pupates (Dewey1999).

2.4.3 Pupa

The last larval cuticle is not cast but retained as a pupal case or puparium. The latter darkens and hardens, becoming a brown, cigar-shaped object. In the next three days the pupa metamorphoses to the perfect insect (Dewey1999).

2.4.4 Adult

The adult crawls out of the puparium on to the surface of the breeding ground where its wings expand and harden in the next few hours, and then it flies away. In ten to fourteen days it n b sexually mature and Jay eggs four days after mating. In suitable condition of temperature, humidity and food, the entire life cycle may be complete in three or four weeks (Dewey1999).

2.5 Sex determination

The housefly is an object of biological research, mainly because of one remarkable quality, the sex determination mechanism. The housefly exhibits many different mechanisms for sex determination, such as male heterogamy (like most insects and mammals), female heterogarny (like birds) and maternal control over offspring sex. This makes the hoi one of the most suitable species to study the evolution of sex determination (Dubendorfer *et al.*, 2002).

2.6 Feeding habits

The mouth parts comprise a proboscis, carried bent up under the head when not in use, but extended by means of blood pressure and muscles when feeding. The base of the proboscis is expanded into two lobes, the lower surface of which is traversed by parallel channels called pseudotracheae. Only liquids can be taken in by the housefly. When settles on food the proboscis is extended so that the oral lobes are placed on the surface of the food. Saliva is secreted from salivary glands and runs down a channel into the pseudotracheae and on to the food which it begins to digest and liqued. Muscles in the proboscis enable the oesophagus to pump up the semi-digested liquid from the pseudotracheae which converge into the oesophagus, and pass it to the crop and 'stomach' or mid Sometimes the fly regurgitates the partly digested fluid, which hangs as a large drop from the lobes of the proboscis and may be left on the surface where the fly has settled, and seen as a 'vomit spot' on windows, etc. This procedure possibly enables the fly to mix more saliva with the food, since the salivary duct opens into the oesophagus only just above the lob, of the proboscis. The saliva probably contains a mixture of enzymes, since the fly can be seen feeding on a great variety of substances though it may have a preference for sweet and soluble carbohydrates (Dewey1999).

2.7 Medical importance

House flies can transmit a large number of infections to humans because of their habits of visiting, almost indiscriminately, feces and other unhygienic matter and people's food. Pathogens can be transmitted by three possible routes:

(1) By flies' contaminated feet, body hairs and mouthparts. Most pathogens, though, remain viable on the fly for less than 24 hours, and there are usually insufficient numbers to cause a direct infection, except possibly with Shigella. However, if pathogens are first transferred to food they may then multiply sufficiently to reach the level of an infective dose.

(2) By flies vomiting on food during feeding, which they do frequently.

(3) By defecation, which they often occurs on food. This is probably the most important method of transmission.

It appears that more than 100 different pathogens have been recorded from house flies, and that at least 65 of them can be transmitted to people. With the exception of *Thelazia* species (eye-worms) transmission is mechanical, that is the fly acts just as a physical carrier.

House flies can transmit viruses of polio, Coxsackie and infectious hepatitis; rickettsiae of Q fever (*Coxiella burnetii*); bacteria such as anthrax, Campylobacter, cholera (*Vibrio cholerae*), *Shigella* and *Salmonella*, *Escherichia coli*, *Staphylococcus aureus*; spirochaetes of yaws (*Treponema pertenue*); protozoans including Entameba, Cryptosporidium and Giardia. In addition, house flies can carry eggs of a variety of helminths, for example *Taenia*, *Ancyostoma*, *Dipylidium*, *Diphyllobothrium, Enterobius, Trichuris and Ascaris*.

Eye-worms (*Thelazia* species) are rather rare infections of the eye and are transmitted biologically by *Musca* species. Fungal infections such as *Microsporum canis*, causing 'tinea capitis' in humans have also been found in fly excreta.

It seems that because house flies do not commonly rest on or near the eyes they are unlikely to be important vectors of trachoma (*Chlamydia trachomatis*). In marked contrast, adults of the bazaar fly (*Musca sorbens*) frequently settle on or around the eyes and have been shown to play an important role in the transmission of trachoma. Consequently in trachoma endemic areas their breeding sites, such as human feces, should be eradicated or at least greatly reduced (Service, 2012).

In the tropical Americas house flies can also carry the eggs of *Dermatobia hominis*, a myiasis-producing fly. Larvae of house flies have occasionally been recorded causing urogenital and traumatic myiasis, and more rarely aural and nasopharyngeal myiasis. If food infected with fly maggots is eaten, then they may be passed more or less intact in the excreta, often causing considerable alarm and surprise. There is, however, no true intestinal myiasis in humans. Although house flies are potential vectors of many pathogens to humans, it may be difficult to assess their importance in disease transmission because their role in the spread of disease is often circumstantial – for example, seasonal increase of fly abundance associated with outbreaks of diarrhoeal diseases (Service, 2012) .

2.8 Control

Control methods can be divided conveniently into three categories:

(1) Physical and mechanical control

(2) Environmental sanitation

(3) Insecticidal control

2.8.1 Physical and mechanical control

Flies can sometimes be prevented from entering buildings by covering doors and openings with plastic screening having a mesh size of 3–4 strands per centimeter (i.e. 2–3 openings per cm). Screening can be costly, but may be worthwhile in hospitals and restaurants. Although screening can reduce fly nuisance, flies will continue to breed locally and enter unscreened houses (Service, 2012).

Air currents, such as the air barriers found in the entrances of some shops, and fans mounted over doorways may reduce the number of flies entering premises. Placing curtains of vertical, often colored, strips of plastic or beading in doorways also helps to keep out flies. Restaurants, food stores and hospitals often mount ultraviolet light-traps on walls to attract flies, which are then killed by an electric grid. Commercially available sticky tapes ('fly-papers'), incorporating sugar as an attractant, can be relatively effective, although unsightly, and in catching flies (Service, 2012)

2.8.2 Environmental sanitation

This aims at reducing house fly populations by minimizing their larval habitats that is source reduction. For example, domestic refuse and garbage should be placed either in strong plastic bags with the openings tightly closed, or in dustbins with tight-fitting lids. When possible there should also be regular refuse collections, preferably twice a week in warm countries, to prevent eggs laid in the garbage developing into adults. If household refuse cannot be collected it should be burnt or buried. Unhygienic rubbish dumps, often found in towns and villages, provide ideal breeding places for house flies, and should be removed. Instead refuse should be placed in pits and covered, daily if possible, with a 15 cm layer of earth; when the pits are more or less full they must be covered with 60 cm of compacted earth. This depth of final fill is required to prevent rodents burrowing into the rubbish pits (Service, 2012).

2.8.3 Chemical control

Insecticide resistance develops very quickly in house flies. Worldwide they have become resistant to the organophosphates, pyrethroids and carbamates. Although resistance to insect growth regulators (IGRs) is not presently a problem it has nevertheless been reported in some situations, such as in southwestern Turkey. In the absence of known resistance, insecticides such as bendiocarb (carbamate), malathion (organophosphate) and pyrethroids such as permethrin and cypermethrin can be used. However, the risk of developing resistance is increased if the same compound is used on the adult flies and their larval habitats. Also, the speed of becoming resistant is greater with residual sprays than with other treatments aimed at adult flies (Ref….. The WHO warns against the intensive use of pyrethroids for residual spraying. Larvicides Insecticides can be directed against the larvae by spraying the insides of dustbins, as well as refuse and garbage heaps, manure piles and other breeding sites. IGRs such as diflubenzuron, cryomazine or pyriproxyfen are also used. Commercial aerosol spray cans or small hand sprayers can be used indoors to kill adult flies. Aerosol applications and space-spraying have virtually no residual effects: consequently treatments have to be repeated, and this can be costly. Furthermore, this approach does little to alleviate the source of the fly nuisance. Outdoor aerosol applications or aerial ULV spraying with pyrethroids can give effective control in and around dairies, farms, markets and recreational areas. Usually, however, only temporary relief from flies is achieved, because outdoor spraying does not usually kill indoor-resting flies, prevent their reinvasion from outside the treated area, or prevent the emergence of new flies from breeding places. According to the WHO, pyrethroids are best avoided so as to minimize pyrethroid resistance: see above.) Residual insecticides should remain effective for 1–2 months, but this depends on local conditions. Outside walls of houses and cattle sheds can also be sprayed with residual insecticides, but in dairies carbamates should be avoided. The duration of insecticidal effectiveness varies from a few weeks to a few months. The outsides of dustbins and adjacent walls should also be sprayed to deter gravid (egg-laden) flies from ovipositing in dustbins and other nearby breeding places (Service, 2012).

Toxic baits Dry baits consist of sugar mixed with bran or crushed corncobs, or some other inert carrier treated with insecticides can be used but lethal solid bait which can be scattered on floors or placed in trays; they need to be replaced about every two days. Liquid baits commonly comprise 10% sugar solution and an insecticide. This is placed in a glass bottle inverted over a saucer-like receptacle so that as the bait evaporates more flows in from a reservoir, as in automatic feeders for poultry. The most commonly used insecticides in both dry and liquid baits include propoxur and diazinon. The house fly sex pheromone can be added to baits to make them more attractive (Service, 2012).

Newer insecticidal compounds are spinosad (a bio-pesticide originating from soil bacteria) and imidacloprid and thiamethoxam (both neonicotinoid pesticides that recently have devastated honey bee populations when used against agricultural pests) (Service, 2012)

2.8.4 Economic Threshold:

The threshold density for determining when to control flies depends on the area where the control measures are to be taken. In general, at homes the threshold is very low and control actions are taken with few flies. The complaint threshold density of the house fly at waste management sites may be 150 individuals per flypaper per 30 minutes. House flies are monitored with baited traps, sticky ribbons, or spot cards on livestock facilities. Spot Cards are by 5-inch white index cards attached to fly resting surface. A minimum of cards should be placed in each animal facility and left in place for seven days. A count of 100 or more fecal or vomit spots per card per week indicates a level of fly activity and a need for control. (Bishoff *et al*., 1915).

2.2 NeemAzal-T/S

2.2.1 Introduction

NeemAzal is a trademark of Trifolio-M GmbtH, Lahnau, Germany, NZ trademark of sustain - Ability Ltd, Motueka. NeemAzal is a broad spectrum botanical insecticide derived from the Neem seed kernel; it contains 10g/litre azadirachtin in the form of an emulsifable concentrate (EC). Neem tree is considered to be one of the most promising trees of the 21 century. It has great potential in the field of pest management, environment protection and medicine. In Sudan (Siddig, 1993) reported that Neem seed water extracts at1Kg/1Liter of water repelled foliage pest of potato including *B. tabaci*, *Aphis gossypii* and *J. lybica* and yield increased to 5 ton/ ha. (Mohammed, 2002) Singh (1993) reported that 0.001% concentration of neem seed kernel extract caused absolute feeding detergency against the desert locust *Schistocerca gregaria*. While 0.05% concentration was needed for some effects on the migratory locust *Locusta migratoria*. The larvicidal activity of different fraction of neem leaves showed that two fractions of 1% petroleum either extract NPZI and NPZII produced respectively 100% and 80% mortality in 24 hour on the fifth instar larvae of mosquito (Sharmma, 1993). (Goudegnon, *et al*., 2000) studied the comparative effects of deltamethirn and neem kernel solution treatment on Diamond back moth. The moth populations were 10 times larger in deltamethrin plots, than in neem plots after treatment. The neem extracts could influence over 200 species of insects, many of which are resistant to synthetic pesticides; these include insects from order Diptera, Coleoptera, Lepidoptera, Orthoptera (Dhawan and Patniaik, 1993).(Soliman, 2005) reported remarkable effect of NeemAzal – T/S® on survival of the greater wax moth larvae. Also Elawad (2006) found that NeemAzal T/S® was more effective against 2^{nd} and 4^{th} larvae of African bollworm (*Helicoverpa armigera*).Neem seed contains a number of chemical compounds the most important of which are Azadirachtin and Salannin in the triterpenoid fraction

(Siddig, 1991) Other active compounds contained in the seed kernel are Salannin 4-epoxyazaradion,Gedunin, Nimbinen and Dimethyl nimbinen (Jones *et al*., 1989).Azadirachtin was first isolated in 1968, and is thought to be the most bioactive ingredient found in the neem tree; however, such speculation may be due to it having been investigated more thoroughly than the other compounds. Azadirachtin, one of the more than 70 compounds produced by the neem tree, acts mainly as an insect growth regulator, but also has anti-feedant and oviposition (egg-laying) deterrent properties (Quarles, 1994 and Thacker, 2002). There is evidence that other compounds found in neem have insecticidal attributes (Stark and Walter, 1995).

2.2.2 The Efficacy of Neemazal -T/S for controlling insects pests

The efficacy of NeemAzal-T/S was tested against more than 120 species of insects and mites from Acarina , Coleoptera , Diptera ,Heteroptera Hymenoptera ,Lepidoptera ,and Thysanoptera .The results show ,that NeemAzal is effective against free feeding sucking and biting pests , such as caterpillars , beetles, mealy bugs , aphid , whitefly , leaf miners , thrips , and spider mites. (Ahmed, 2001) reported that NeemAzal increased the yield of okra and obtained significant reduction of number of aphids, whitefly, bollworms and flea beetles. On tomato NeemAzal increased the yield by 38% over the control. It reduced the number of leaf miner and whitefly significantly, while it reduced the number of aphids by only 10% under the control. On onion, the product increased the weight of onion by 15% over the control, a reduction by (21%-26%) of the number of thrips was also recorded. Neem formulations with rich azadirachtin contents such as NeemAzal were more effective than low azadirachtin formulations in suppressing bollworms incidence and also was more effective than the conventional insecticide endosulfan, and increasing yield of seed cotton (Gupta, 2002).

2.2.3 Mode of action and toxicological properties of NeemAzal-T/S

NeemAzal is a slow acting, naturally based anti-feeding insecticide, it leads to feeding inhibition (after some hours), reduction of molting (after some days), fecundity and breeding ability reduction (after days, or weeks) Thus, assessments should be done with respect to decrease in damage of the target crop rather than the mortality of the insects .NeemAzal degrade in aqueous systems to half-life within a few days. In addition to the very favorable toxicological properties the rapid degradation of the active ingredient assures the safety of the consumer due to the lack of residues , non - toxic to micro- organisms , aquatic organisms , beneficial , warm blooded animals and etc.(Kleeberg, 2001).

2.2.4 Compatibility of Neemazal -T/S with other bio-pesticides

Cornale (2001) reviewed that NeemAzal-T/S has a limit effect when it was used alone. The efficacy achieved by NeemAzal alone has been found to be from (54% 68%), but when it was tank-mixed with other bio-pesticides such as natural pyrethrum and/or a commercial product based on *Beauveria bassiana* (Naturalis) the efficacy achieved was 90% and above . Also (Elawad, 2006) reported that the combination of Bt. and NeemAzal caused 100% mortality against both 2^{nd} and 4^{th} instars larvae of African bollworm *H. armigera*, while NeemAzal alone gave (97-87%) in same instars, respectively. These results showed that NeemAzal –T/S was effective and highly compatible with many bio-pesticides.

CHAPTER THREE

MATERISLS AND METHODS

3.1 Study location

This study was conducted in the Laboratory of Entomology and Zoology, Department of Plant Protection, College of Agriculture Studies - Shambat, Sudan University of Science and Technology (SUST), in the period of March - April, 2016.

3.2 Insect rearing

The larvae of house fly were brought from Gazira State and reared in the Laboratory. Larvae were feed on artificial media composed of 224 g of bran, 168g chicken meat, 1 spoon malt extract, 1 spoon yeast and 568 ml of water. After 10-14 days the larvae changed to the pupae. The pupae were kept in a plastic cage (20×20×40cm) until adult emergence. The adults feed on the same media and lay their eggs on it. After 5-7 days the larvae were collected for treatment.

3.3 Bioassay test

Three different concentrations (4, 2, 1ml/l) of NeemAzal-T/S were used in this experiment. Ten larvae were placed in treated filter paper inside each petri dish (9cm). Each treatment was replicated three times and every treatment contains on set of control. Larvae mortality was recorded after 2 hrs, 12 hrs and 24 hrs post treatment.

3.4 Experimental design and statistical analysis

Treatment were designed in a completely randomized design and the data was statistically analyzed according to analysis of variance (ANOVA) using Mstatc- C program.LSD test was used for mean separation.

Plate 1. Adults cages

Plate 2. NeemAzal - T/S

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Effect of NeemAzal – T/S against the larvae of house fly (*Musca domestica*)

Results in Table (1) showed that NeemAzal-T/S caused a significant mortality at different concentrations when compared to untreated control. The mortality (%) was gradually increased by increasing of concentration and exposure time. After 1 hour higher concentration 4ml/l induced mortality of 36.7% and continuously increased till reached 100% after 24 hrs. While other concentrations caused mortality % between 26.7- 60 % after 24 hrs post treatment.

These results revealed that NeemAzal-T/S was effective against house fly larvae and it could be used for controlling this insect pest. These results agreed with Elawad (2006) who found that NeemAzal T/S® was more effective against 2nd and 4th larvae of African bollworm (*Helicoverpa armigera).*Also agreed with Ahmed (2001) who reported that NeemAzal T/S was effective against different okra insect pests.

Table 1. Mortality (%) among larvae of house fly (*Musca domestica*) treated with NeemAzal-T/S

Concentration (ml/liter)	**Times after exposure (hours)**			
	2	**12**	**24**	**Mean**
4	36.7(37.14) a	70.0(57.00) a	100(90.00) a	68.9(61.38) a
2	23.3(28.78) a	40.0(39.23) b	60.0(50.85) b	41.1(39.62) b
1	6.7(12.29) b	20.0(26.07) c	26.7(31.00) c	18.1(23.12) c
Control	0.00 b	0.00 d	0.00 d	0.00 d
SE±	4.64	6.38	9.88	6.97
CV (%)	15.93	33.76	8.18	19.29
LSD	12.43	9.17	6.62	9.41

CONCLUSION

From above mentioned results we conclude that NeemAzal -T/S was effective against the larvae of house fly and it could be used as safe bio-pesticides against this important pest.

RECOMMENDATIONS

1- The NeemAzal-T/S can be recommended to be used for controlling the larvae of house fly.

2- Further studies should be done to confirm this results and also to found suitable application techniques.

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