EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
TOXICOLOGY & PEST CONTROL

F

ISSN
2090-0791

WWW.EAJBS.EG.NET

Vol. 14 No. 2 (2022)

www.eajbs.eg.net

Citation: *Egypt. Acad. J. Biolog. Sci.* (F.Toxicology& Pest control) *Vol.14(2)pp 171-181 (2022)*
DOI: 10.21608/EAJBSF.2022.272777

Egypt. Acad. J. Biology. Sci., 14(2):171-181(2022)

Egyptian Academic Journal of Biological Sciences
F. Toxicology & Pest Control
ISSN: 2090 - 0791
http://eajbsf.journals.ekb.eg/

Toxicological and Biological Studies of Some Pesticides from Different Groups on Red Mite, *tetranychus urticae.* Under Laboratory Conditions

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ARTICLEINFO
Article History
Received: 30/9/2022
Accepted: 28/11/2022
Available:3/12/2022

***Keywords*:**
Fenpyroximate, Lufenuron, Spinosad, and Mineral oil, *Tetranychus urticae*.

ABSTRACT

The Laboratory study was conducted to estimate the poison and natural aspects of, fenpyroximate, Lufenuron, Spinosad, and KZ oil against egg and adult stages of, *Tetranychus urticae*. The results showed that fenpyroximate showed was very effect, flowed by Lufenuron, Spinosad and kz- oil to egg and adult stages of *Tetranychus urticae* with LC50 0.86, 1.28, 4.41 and 218.79 ppm to eggs and 1.44, 2.42, 6.72 and 462.18 ppm to adult. The tested insecticides reduced egg deposit and egg hatchability of *Tetranychus urticae* compared to control treatments. Lufenuron, fenpyroximate were the foremost effective against *Tetranychus urticae* to deposit and egg hatchability while Spinosad and Mineral oil was the smallest amount effective.

INTRODUCTION

The spider mite, Tetranychus urticae is considered one of the topmost common pests in the world and it's responsible for significant yield damages in numerous economically essential crops in several fields and hothouse conditions (Adesanya *et al.*, 2021). *Tetranychus urticae* attack certain hosts such as food crops, vegetables, fruits, and ornamentals. (Shukla, 2021), including Damage can be classified as direct or indirect (Santamaria *et al*., 2020), The direct extend from small spots on the top side of the flake due to chlorophyll reduction, and defoliation, indeed necrosis in leaves and small stems, or indeed plant death. Indirect of feeding may include a reduction in transpiration and photosynthesis and can lead to flake color changing from natural to white and constantly appertained to as bronzing, causing loss of quality and yield or death of host plant (Park & Lee, 2002). In addition, diminutives can transmit some pathogenic fungi, bacteria, and contagions and fit systemic toxic substances into the factory that effect of vital processes. Multitudinous of strategies include natural and chemical treatments have been applied to control *T. urticae*, particularly in defended crops (Badawyetal., 2018; El-Saiedyetal., 2008; Wang *et al.* 2015). A variety of commercially available acaricides have been used analogous as abamectin, bifenazate, chlorfenapyr, clofentezine, cyflumetofen, dicofol, etoxazole, fenpyroximate, hexythiazox, propargite, pyridaben, spiromesifen, and spiromesifen (Dekeyser, 2005;VanLeeuwenetal., 2015). Also, Tetranychus urticae is one of the foremost polyphagous species and could be a major pest in multitudinous cropping systems worldwide

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(Nauenetal., 2001). *T. urticae* can increase population in suitable host and climat econditions.T. urticae outbreaks in agricultural ecosystems end in large profitable loss, particularly in greenhouses where mite populations can reach truly high viscosity, thanks to the favorable temperature and vacuity of excellent quality food during the time. Acaricides are extensively used for mite control in greenhouses stations and cornucopia of othercropping systems. Their high reproductive eventuality and truly short life cycle, combined with the frequent operations of acaricides generally demanded to keep up mite populations below profitable thresholds, grease the event of resistance during this species (Stumpfetal., 2001). There is an adding interest by natural conditions which are derived from and microorganisms (Isman, 2006; Isman *et al.*, 2007) because they generally gave the print to be safer of manufactured conditions. The mineral oils employed in this study were of the alternate order after the precise biopesticide and therefore the conditions cyhalothrin in their bane to *T.urticae*. In general, oils are known to be physically effective on various. The mineral was estimated again against the various stages of mite by other authors and indicated to achieve success (Rizk *et al*., 1999, Gamieh *et al*., 2000). (Said *et al*., 2002).

The current study was to evaluate the toxicity and biological effect of certain insecticides including (fenpyroximate and Lufenuron, Spinosad and mineral oil against the egg and adult stage of the two- spotted spider mite *T.urticae.*

MATERIALS AND METHODS

Culture Technique:

The culture of the two- spotted mite, *Tetranychus urticae* colonies were attained from overran cotton plants from Be sueif governorate and reared under laboratory conditions for multitudinous generations on cotton plants, down from any contamination with pesticides before starting the trials, cotton plant were it was planted in pots, each pot contains about 6 seeds from of cotton until grow, after about 15 days from seed planting were overran by culture of Tetrany chus urticae by transferred from old to immature plants by cutting heavily overran leaves into small sections which were also placed on new plants. Adult famale of Tetranychus urticae were collected from stock societies and allowed to lay eggs overnight on cotton plant leaves, Groups of plants bearing eggs laid within a 24 hours period were transferred to small plant after 16 h oviposition. The eggs and adult were collected for experimental use. The culture was kept at 25. 2 0C under 16 hours photoperiod to encourage plant growth, and 70 R.H. and 16 hrs l. Brush (No. 0) was used to transfer eggs and adult from one plant to another.

Chemicals Used:

Match Lufenuron 5 % EC
Ortus 5% E.C., Fenpyroximate
Tracer Spinosad 24 % SC
Mineral oil (KZ 95% EC)

Preparation of Discs:

By cutting cotton leaves using scalpel Cotton leaf discs were placed small pieces of cotton leaves are placed on a surface of cotton fibers pad -soaked by water in petri dishes.

Toxicity of Tested Insecticides:

Toxicity of Tested Compounds to Adults of Two-Spotted Mite *T.urticae*

A study the toxicity of tested insecticides to *T.urticae* adults was evaluated by leaf pieces dip technique in step with Siegler (1947). Insecticides were diluted to certain concentrations (ppm) in water. Four replicate each concentration it has five discs of cotton leaves were dipped in each concentration for five seconds and left to dry. Then 10 adults of *T.urticae* were transferred to every disc and kept under controlled conditions of 25+20C & 65+5 R.H. Mortality counts were made 24,48 and 72 hours after treatment. Correction mortality was made by using Abbott's formula (1925). Data were plotted on log dosage-probit papers and statistically analyzed by the strategy of Finney (1952). LC50 and slope values were calculated according to Finney (1971) and using Ldp line software according to Bakr (2000).

Toxicity of Tested Compounds to Eggs of Two-Spotted Mite *T.urticae* :

Toxicity of Tested compound to Eggs of Two- Spotted Mite *T.urticae* ten adult famale were placed on cotton leaf discs (2 cm diameter) on wet cotton hair in a petri dish and allowed to put eggs, The petri dish was incubated for 24 hrs at 25 ± 2⁃C and 70 ±5R.H. also adults were removed from the leaf discs. The formulated compounds were diluted to certain concentrations (p.p.m), each concentration contain four replicates each have five discs of cotton leaves, ten eggs of *T.urticae* laid within a 24 hours period were transferred with gentle agitation to discs and immersed in each insecticides concentrations for five seconds and left to dry. Untreated discs were immersed in water. The tested eggs were kept at controls, in a chamber of about 25 ± 2⁃C and 70 ±5R.H. Eggs that had not hatched were recorded as" dead. Egg mortality was calculated as Egg mortality = (a/b) × 100 while (a) unhitched eggs, (b) number of total eggs counted before treatment. Mortality was calculated and correction by using Abbott's formula (1925). LC50 and slope values were calculate according to Finney (1971)

To study the biological aspects, each treatment was replicated four times, include five discs of cotton p To study the biological aspects, Each treatment was replicated four times, include five discs of cotton plants leaves were dipped in each LC50 concentration for five seconds and left to dry, ten adult female mites *T.urticae* of recognized age were put on each disc, amount of eggs laid was estimated separately discs. After that, the adult female spider mites were removed, and the eggs laid were counted on each leaf disc at 24, 48, and 72 hours later and kept under controlled conditions of 25+20C & 65+5 R.H. The total number of eggs hatched was counted four days after egg deposition.

RESULTS

Results in Table (1) indicate that fenpyroximate become the main toxic component, followed by lufenuron, spinosad and kz-oil to eggs of Twith LC50 values of 0 .86, 1.28, 4.41 ppm, and 218.79 ppm respectively. However LC_{50} were 1.44, 2.42, 6.72 and 462.18 ppm on T.urticae, respectively.

Data in Table (2) suggested that fenpyroximate becomeed the first toxic compound where gave 73.77% mortality after 24 h of treatments, keep track of by spinosad with 43.55 mortality thereafter kz-oil with 40.75 % mortality and 37.72 % for lufenuron against the egg stage of tetranychid T.urticae comparison with control treatments respectively. whereas fenpyroximate possess a reasonable toxicity to egg phase of T.urticae with 48.75 % and 44.52 % mortality to eggs of T.urticae after 48, 72 h respectively These percent was increased to 55.05, 76.31 %, for lufenuron, 57.35,65.45 for spinosad and 46.70, 70.55% mortality for minral oil after 48 and 72 h to egg stage of T.urticae respectively.

Table 1: Toxicity of some insecticides on adult and eggs of *T. urticae*

Compounds	Eggs		Adults	
	LC_{50} ppm	Slope	LC_{50} ppm	Slope
Fenpyroximate	0.86	0.57±0.123	1.44	0.77 ±0.143
Lufenuron	1.28	1.79±0.157	2.42	1.87 ±0.113
Spinosad	4.41	1.98±0.117	6.72	1.47 ±0.213
Kz-oil	218.79	1.47 ±0.115	462.18	1.57 ±0.313

Table 2: Mortality percent of eggs *T.Urtica* treated with some insecticides**.**

Compound	Mortality % in eggs at indicated day		
	24 hrs	48 hrs	72 hrs
Fenpyroximate	73.77	48.75	44.52
Lufenuron	37.72	55.05	76.31
Spinosad	43.55	57.35	65.40
Kz-oil	40.75	46.71	70.55
Control	12.5	9.5	9.5

Data in Table (3) pointed out that fenpyroximate was the foremost toxic compound to Tetranchus urticae adults with 74.12 mortality after 24h of treatments followed by mineral oil gave 43.12% mortality thereafter lufenuron cause 35.22 mortality and spinosad 32.15 % mortality after 24h, comparison with control respectively, these percentage was decreased to fenpyroximate to 59.45 and 40.12 % mortality 48 and 72 h compared with control respectively. This mortality reached to 71.20, 78.51% mortality for lufenuron, 56.75 75.45 you look after spinosad and 46.70, 56.15 % for kz-oil after 48 and 72 h compared with control treatments respectively.

Table 3: % mortality of spider mite Tetranchus urticae adults after 24, 48 and 72 hrs of leaf disc dipping.

Compound	% Of adult mortality after hours of treatments		
	24 hrs	48 hrs	72 hrs
Fenpyroximate	74.125	59.45	40.12
Lufenuron	35.22	71.20	78.5
Spinosad	32.15	56.75	75.45
Kz-oil	43.12	46.70	56.15
Control	8.5	8.5	6.5

The data shown in Tables (4) indicated that lufenuron caused the best decrease in egg (10.28) compared with the control treatment, followed by fenpyroximate with (16.18) decrease in egg deposition, Spinosad (18.93) decrease in egg deposition and kz-oil (13.87) decrease in egg deposition), compared with 58.16 on egg deposition control of female mites T.urticae. Also, data inside the himself table showed lufenuron give rise to the better lowering in egg deposition comparison with the control treatment (82.32%) in egg deposition, followed by fenpyroximate with (72.18%) reduction in egg deposition, spinosad (57.45%) reduction in egg deposition and kz- oil (41.76%) reduction in egg deposition), compared with control of female mites.T.urticae. Also, data in the selfsame table denote that all pesticides caused a lessening in egg hatchability in compareson with the control treatment, whilst, lufenuron was the most better insecticides which decreased egg-hatchability of T.urticae with (69.88%) of egg hatchability followed by fenpyroximate gave (60.96%) reduction in eggs hatchability, spinosad gave (49.12 %) reduction in egg hatchability, while mineral oil, becomed a temperate effectiveness where produced (31.61%) lessening in egg hatchability of T.urticae**.**

Table 4: late effects of some different pesticides on T.urticae.

Compounds	Mean No. of eggs deposited	%Hatchability
Control	58.16+0.0a	90.61
Lufenuron	10.28+0.46d	69.88
Fenpyroximate	16.18+0.30e	60.96
Spinosad	18.93+0.64f	49.12
KZ oil	13.87+0.46g	31.61

DISCUSSION

These results agree with numerous investigators. (V numeroussquez & Ceballos, 2009). Cited that the LC_{50} values of chlorfenapyr and abamectin against *T. urticae* was 59.34 and1.50 mg/ L, respectively. (ElKady *et al.*, 2007) reported that the LC_{50} values of Vertemic(1.8 EC) were 9.238 and 7.09 mg/ L after 24 and 48h of exposure, against adult female of T. Urticae. (Ismail *et al.*, 2007) showed that the LC50 value of Vapcomic was 0.34 mg/ L against adult female of T. urticae. (Arain, 2015) indicate that the LC_{50} values of pyridaben were 29.85 and11.34 mg/ L after the alternate and third day of the treatment against adult female of of T. Urtica. (Kumari *et al.*, 2015). cited that abamectin was the most poisonous to the adult female of T. Urtica (LC_{50} = 0.39 ppm) followed by fenpyroximate (5.67 ppm), spiromesifen (12.53ppm), chlorfenapyr (32.24 ppm), propargite(77.05 ppm) and dicofol (146.65 ppm). Hexythiazox was less poisonous to adult female of Tetranychus urticae (EntsarI. Rabeai 2009) showed that lambda- cyhalothrin and spinosad caused the topmost effect against adult female of *T. urticae* with LC_{50} of 4.88 and 6.72 mg/ L, followed by chlorpyrifos, deltamethrin and profenofos (LC_{50} =11.44, 12.86 and 16.47 mg / L and 16.47 mg / L (Osman 1997) indicated that Albulium, KZ oil and Shokrona super were more toxic to adult female of *E.orientalis* than *T.urticae* and the response of mite eggs to the insecticides varied according to their age. (Rizk *et al.*,1999 , Gamieh *et al.*, 2000 and Said *et al.*, 2002) those reported that supermasrona bring about the maximum remaining effect (87.61) against *T.urticae* in cotton plants.(Khairia,M.M., 2019) showed that C50 values of abamectin, buprofezin,Abamectin, chlorfenapyr, hexythiazox were 1, 5, 10, 45, 88 and 100 mg/ l, respectively.(Laila,E.M.S., *et al.*, 2015).Showed that cyhalothrin was the most toxic followed by fenpyroximate to adult female of *T. urticae*, but wormseed was the least toxic.((Saenz de Cabezn,F.J., et al. 2002) reported that no variation in proto- nymphs and deutonymphs were noticed, while rimmature phase were more sensitive than adult female to the LC_{50} of triflumuron (Manal,A.R., *et al.*, 2019).indicated that Abamectin, Thiamethoxam, Fenpyroximate, khaya and pomegranate were poisonous to *T. urticae* and safer for P. persimilis. (Mousa,G.M. *et al.*, 2001) indicated that cottonseed oil have effect and residual against eggs of spider mite *T.urticae* on squash crop.(Keratum 2001) indicated that fenpyroximate was the most potent insecticid against eggs of T.urticae, followed by vertimec. Also, (Ismail *et al.* 2006) showed that abamectin and cypermethrin were the most effective insecticides to egg stage of *T.urticae.* Also (Ismail *et al.*, 2009) indicated that cyhalothrin and abamectin have a private impact on eggs of T.urticae it was the more efficient insecticides, while the mineral oil Nat- 1 was more poisonous to the eggs stage of T.urticae than black cumin. Also, (S enz, FJ. N, *et al.*, 2006). Cited that Triflumuron at

LC_{50} prevented eggs that developed to adult stage, also affected the fecundity, reproductive rate ofT. urticae. (S eźn 2002) cited that triflumuron significantly more effective on eggs of the diferent age as inhibition was observed by treated adult female of *Tetranychus urticae* with LC_{50} concentration. (Hosny *et al.,* 2009 and 2010), showed that fecundity was largely reduced by bromopropylate followed by fenpyroximate and dicofol and no significant differences among them were observed Discs treated by Tedion gave a lower number of eggs than on control discs (4.6 and6.5 eggs/ day/ female. Temporary or partial sterilization for adult diminutives exposed to discs treated by pyrethroids might be answerable for small number of eggs laid/ female / day in of their effect on egg hatchintg in *Tetranychus urticae*. (Spadafora and Lindquist 1973) indicated that benomyl at 0.03 a.i. depressed egg hatchability of *T.urticae.* (Laila,E.M.S., *et al.,* (2015), showed that cyhalothrin redused eggs to (30.16) of *T. urticae* after treated with LC_{50} value, while very reduction(67.52) was observed after treatment with LC50 of wormseed extract. (El- Banhawy and Reda (1988) cited that the sensitivity of *T.urticae* egg was increased with adding age for synthetic pyrethroids (cypermethrin at 500 ppm and pyridaphenthion at 10 ppm) while abamectin was effective only on aged eggs. It had been indicated that egg hatchability of *T.urticae* was dropped with an increase period of egg deposit..(Park *et al.,* 1995) showed that abamectin significantly was more effective on the eggs laid by *T.urticae* at (0.06-0.6 ppm), after four days old eggs than old eggs. Abamectin at sublethal concentration (-0.06 ppm) can be important in controling *T.urticae* rates within the integrated pest management. (Laila,E.M.S., *et al.,* 2015) showed that. Cyhalothrin was the foremost effective against *T. Urticae* egg deposit and egg hatchability, while wormseed extract was the smallest amount effective. (Gamieh *et al.,* 2000) reported that hatching of eggs of *T.cucurbitacearum* treated with LC50 mineral oils increased (Spadafora and Lindquist 1973) indicated that benomyl at 0.03a.i. reduced egg hatchability of *T.urticae*.(Amer *et al.*, 2001) reported that KZoil was more poisonous to eggs stage than adult stage of *T. urticae.(Saadoon 2006)* indicated that hatching of *T.cucurbitacearum* eggs dropped being 57.62 and 76.47 after with Vapcomic. Total mortalities of immature stage were (61.66 and45.17) after treated with Challenger and Vapcomic respectivily. On the contrary hand, the duration of immature stages and total life cycle of this mite were dragged when adult femal were treated with LC_{50} of two tested composites compared with control.(Ismail 2007 and 2009) indicated that cypermethrin was veritably poisonous that caused the veritably drop in egg hatchability on discs against eggs stage of *T.urticae* but etoxazole and seed cotton oil were the lowest effective ovicidal action.(We i- dong, 2002) proved that the LC_{50} values of chlorfenapyr and abamectin ranged between 0.122 and7.656 mg/ L against eggs of *T. urticae.* (Van Pottelberge *et al.,* 2009, Kumari *et al.*, 2017) reported that there was a respectable difference between chlorfenapyr, dicofol, fenproximate, hexythiazox, propargite, and spiromesifen against eggs of *T. urticae* using the spray system at the recommended rate (Salman, 2007) cited that abamectin was largely poisonous for eggs at all periods but didn't affect mite fecundity. (Ismail *et al*., 2007) reported that abamectin caused 87% mortality on egg hatching of *T. urticae* at 2.5 mg/L. Also, (Hosny *et al*., 2010) showed that LC_{50} of abamectin was1.05 mg/ L and LC_{50} of chlorfenapyrwas168.11 mg/ L against eggs of *T.urticae* after 24 and 48 h of the treatment with specialized composites, abamectin showed the effect acaricidal against the adult female followed by chlorfenapyr while pyridaben was less poisonous .(Van Pottelberge *et al.*, 2009) reported. that the LC_{50} values were 0.4 mg/ L for abamectin and 156 mg/ L for pyridaben against *T. urticae* adult female. (Herron & Rophail, 2003) set up that the LC_{50} of chlorfenapyr and pyridaben were 0.54 and 0.29 μg/L, against field strain of T. urticae. (Kumari *et al.*, 2017) proved that abamectin was the most poisonous against *T. urticae* adult (LC_{50} = 0.39 mg/ L) by spray system followed by fenpyroximate (LC_{50} = 5.67 mg/ L), spiromesifen (LC_{50} = 12.53 mg/ L), chlorfenapyr (LC_{50} = 32.24 mg/ L), propargite

(LC_{50}=77.05 mg/L), and dicofol (LC_{50}=146.65 mg/L) however, hexythiazox was the least toxic acaricide.

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ARABIC SUMMARY

التا ثير السام والبيولوجي لبعض المبيدات من مجموعات مختلفة على العنكبوت الأحمر tetranychus urticae. تحت الظروف المعملية

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أجريت الدراسة المعملية لتقييم التأثير السام والمتاخر لكل من فينبيروكسميت ، لوفينورون ، سبينوساد ، والزيت المعدني kz oil ضد البيض والمراحل البالغة للعنكبوت الاحمر *Tetranychus urticae*. أظهرت النتائج أن الفينبيروكسميت أظهر أعلى درجة سمية من اللوفينورون والسبينوساد والزيت المعدني لكلا من البيض والمراحل البالغة وكانت قيم ال LC_{50}هي 86. و1.28 و4.41 و218.79 جزء في المليون للبيض و1.44 و2.42 و6.72 و462.18 جزء في المليون للحشرة البالغة كما قللت المركبات المختبرة من كمية وضع البيض وقابلية فقس البيض في *Tetranychus urticae* مقارنة بمعاملات المقارنة. وكان Lufenuron وfenpyroximate المركبات الأكثر فعالية ضد Tetranychus urticae على كمية وضع البيض البيض وقابلية فقس البيض بينما كان Spinosad والزيت المعدني اقل تاثير علي كمية وضع البيض وقابلية للفقس.