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Toxicity of Different Pesticides on *Tetranychus urticae* Koch (Tetranychidae: Acari) and *Scolothrips longicornis* Priesner S(Thysanoptera: Thripidae) on Cucumber Under Laboratory Condition

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Abstract. This study was conducted to evaluate the efficacy of five pesticides residue toxicity abamectin 1.8 ec, bifenazate 48 sc, hexythiazox 10 wp, fenbutatin oxide 55 sc and biopesticides tondexir 80 ec against two spotted spider mite *Tetranychus urticae* and the predator *Scolothrips longicornis* under laboratory condition. The results showed that bifenazate to be the most effective pesticides against the mite. The pesticides residue of bifenazate, abamectin and hexythiazox caused high mortality of two spotted spider mite through rates that ranged between 89.59 to 100% and this was significantly greater than the control. Furthermore, the results also showed pesticide residues of the tondexir very low mortality ratios 5.33 and 9.33% respectively after 7 days of the treatment. Hexythiazox and bifenazate were toxic to the predator up to two weeks after treatment and the mortality rates caused in low and high rates was 68.07, 78.33% and 39.55, 37.88% respectively. The result showed the mortality on leaf disks treated with tondexir, fenbutatin oxide was not significantly than control on untreated leaf disks at any time after application.

Keywords: pesticide, *Tetranychus urticae,* cucumber, *Scolothrips longicornis*

Introduction

Cucumber (*Cucumis sativus*) is one of the most important nourishing vegetables in Iraq, which was cultivated on 95281 dunams and the productivity around 138353 tons (Central statistical organization, 2020). The crop is exposed to the attack of a large number of pests such as insects and mites, which caused a huge losses in the yield. The two spotted spider mite *Tetranychus urticae* (Acari: Tetranychidae) has been considered as one of the most serious insect attacking cucumber during the fall and spring seasons (Abu-Duka and Mohammadali 2021, Park and Lee, 2007). Many pesticides have been recommended to control *T. urticae* but there is a problem in controlling spider mite due to their ability to rapidly develop resistance to acaricides after only a few appli-cations (Herron *et al*., 1993). However, this should be replace by other acaricides such as Spirodiclofen and Envidor (Bostanian *et al*., 2003). Furthermore, the insecticides amitraz and abamectin has been used to control *T. urticae* on many crops (Ay *et al*., 2005). Therefore, *Scolothrips longicornis* is a specialist predator on the two spotted spider mite. *S. longicornis* occurs in the middle east, India and north America. In Iraq, this species is a commonly recorded predator of spider mites in outdoor bean, cucumber, cotton and eggplant (Alasady and Al-Ghadban 2018). However, the aim of this study was to evaluate the efficacy of five pesticides residue toxicity against *T. urticae* and *S. longicornis* under laboratory condition.

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Material and Methods

The pesticides residue toxicity against two spotted spider mite *T. urticae* and to the predator *S. longicornis* were studied during the growing season 2018/2019. Five insecticides acaricides of different chemical groups were selected. The experiment was carried out at the agricultural research station and the laboratory of the college of agriculture, University of Kerbala/Husseinia, Karbala, Iraq.

Table 1. Pesticides toxicity tested on *T. urticae* and *S. longicornis*

Trade name	Common name	Chemical group	Dosage rates/L.	Company
Vapcomic 1.8% EC	Abamectin	Avermectin	0.50 mL, 0.70 mL	VAPCO, Jordan
Acramite 48% SC	Bifenazate	Carbazate	0.25 mL, 0.35 mL	Arysta, Belgium
Nissoriun 10% WP	Hexythiazox	IGR	0.30 g, 0.50 g	Nippon Soda, Japan
Tondexir 80% EC	Garlic and pepper extract	Botanical pesticides	2 mL, 3 mL	Kimia Sabzaver, Iran
Torque 55% SC	fenbutatin oxide	Organotin	0.75 mL, 1.00 mL	BASF, Germany

Residual toxicity to *T. urticae*. *T. urticae* colonies are maintained on cucumber at 28 °C and 16:8 h (L: D). Cucumber seeds super alfaris variety are growing in plastic pots. The individuals used to initiate the mites colony are collected from infested leaves of *Cucumis sativus* growing under greenhouse conditions. All treatments were applied to whole cucumber plants using a hand sprayer 2L capacity. The treatments of plants was carried out after 1, 3, 7, 14 and 21 days after application. Entered the data after correcting the proportion of treatment mediated mortality Abbott, (1925). The data were analyzed and the mean was compared with the least significant difference (LSD) at 0.05.

Residual toxicity to *S. longicornis*. *S. longicornis* was collected from farms in two different governorates including Karbala and Baghdad. Then, they were placed into 30 × 40 × 30 cm glass cages. The cages contained arthropod-free cucumber plants *Cucumis sativus*. Cages were kept under incubator condition 28 °C, 16:8 h (L: D) photoperiod. Prey were not given to the mites for 24 h prior to the experiment. The treatments in Table 1, were applied to whole cucumber plants with a hand sprayer 2 L capacity. Twenty 10 cm² diameter leaf disks were excised from the treated plants after 24 and 72 h. Once significant mortality was recorded, the cuttings were also taken at 7 and 14 days after treatment. A single adult *S. longicornis* was placed into each cell containing a treated leaf disk. The housing unit was then sealed and the *S. longicornis* was exposed to the acaricide residue for 24 h. After 24 h, the predator was scored as dead or alive. Dead was assigned to the insect if no movement was detected after prodding. Temperatures during the experiment averaged 24 °C. The data were analyzed and the mean was compared with the least significant difference (LSD) at 0.05.

Results and Discussion

The duration of pesticides residue and the toxicity was varied among the tested compounds.

T. urticae. The results showed that pesticide residues of vapcomic, acramite and hexythiazox caused very high mortality of adult females of the two spotted spider mite at rates that ranged from 89.59 to 100% after one day of treatment was significantly greater than the control. However, there was statistically different effectiveness of pesticide residues torque compared with pesticide abamectin despite the high mortality rates exhibited by 73.48 and 81.78% respectively. The contrast has shown pesticide residues of the tondexir very low mortality ratios 13.07 and 33.3% respectively and differ significantly from all pesticides used in the treatment. After 3 days, remained toxicity for certain pesticide residues of the vapcomic and Acramite very high mortality ranging caused 91.47 to 100% whereas decreased toxicity of pesticide residues hexythiazox at concentrate of 0.3 and 0.5 g/L. Compared to the first day mortality from 74.95 and 83.99% respectively. *T. urticae* mortality from hexythiazox residues was not significantly greater than the abamectin and bifenazate. The toxicity of each pesticide residues fenbutatin oxide and tondexir which decreased dramatically they caused 43.67, 65.33% and 9.99, 20.46% respectively. The result showed different significantly greater than the pesticides in application abamectin, bifenazate and hexythiazox. After 7 days continued very high toxicity of each pesticide abamectin and bifenazate to the adult of the two spotted spider mite *T. urticae*. The result showed mortality ratios of 85.3, 93.7% and 81.5, 95.7% respectively and was different statistically from the pesticide fenbutatin oxide and tondexir, decreased toxicity to 18.9, 31.9% and 5.3, 8.4% respectively. After two weeks, bifenazate at concentrate 0.35 mL/L, residues caused 83.47% mortality to adult *T. urticae* compared with 2.99% mortality in the control. *T. urticae* mortality from abamectin residues was not significantly greater than the bifenazate.

***S. longicornis*.** The result showed the mortality on leaf disks treated with fenbutatin oxide at concentrate 0.75, 1.0 mL/L and tondexir at concentrate 2, 3 mL/L was

not significantly greater than untreated leaf disks at any time after application. Mortality of *S. longicornis* from exposure to residues of bifenazate and hexythiazox was significantly different than observed in the controls 1, 3, 7 and 14 days after application (Fig. 2).

After 3 days, bifenazate and hexythiazox resulted in the significantly higher mortality of *S. longicornis* than the untreated control. The high rates of bifenazate and hexythiazox caused a mortality rate of 96.79, 93.07% respectively. The mortality rates for the low rate of bifenazate and hexythiazox were 89.49, 88.47% respectively. The abamectin residue was significantly different than control treatment. Moreover, 1, 3 and 7 days after application, it was significantly different than the bifenazate and hexythiazox the high and low rate of abamectin was 37.33, 30.89% respectively.

At 7 days after treatment, the mortality caused by the low and high rates of bifenazate was 71.33, 89.78% significantly different from the mortality in the untreated controls and significantly higher than the other treatments. The high rate of hexythiazox 75.88% also caused a significantly different mortality rate compared to the control treatment. Neither rate of abamectin caused a not significantly different mortality rate when compared to the torque. 14 days after treatment, a mortality rate caused by bifenazate and hexythiazox in low and high rates was 68.07, 78.33% and 39.55, 37.88% respectively.

The result showed that abamectin and bifenazate residue caused mortality to *T. urticae* adults. This is consistent with Dybas (1989) who has found that abamectin has attributable the relatively high stability

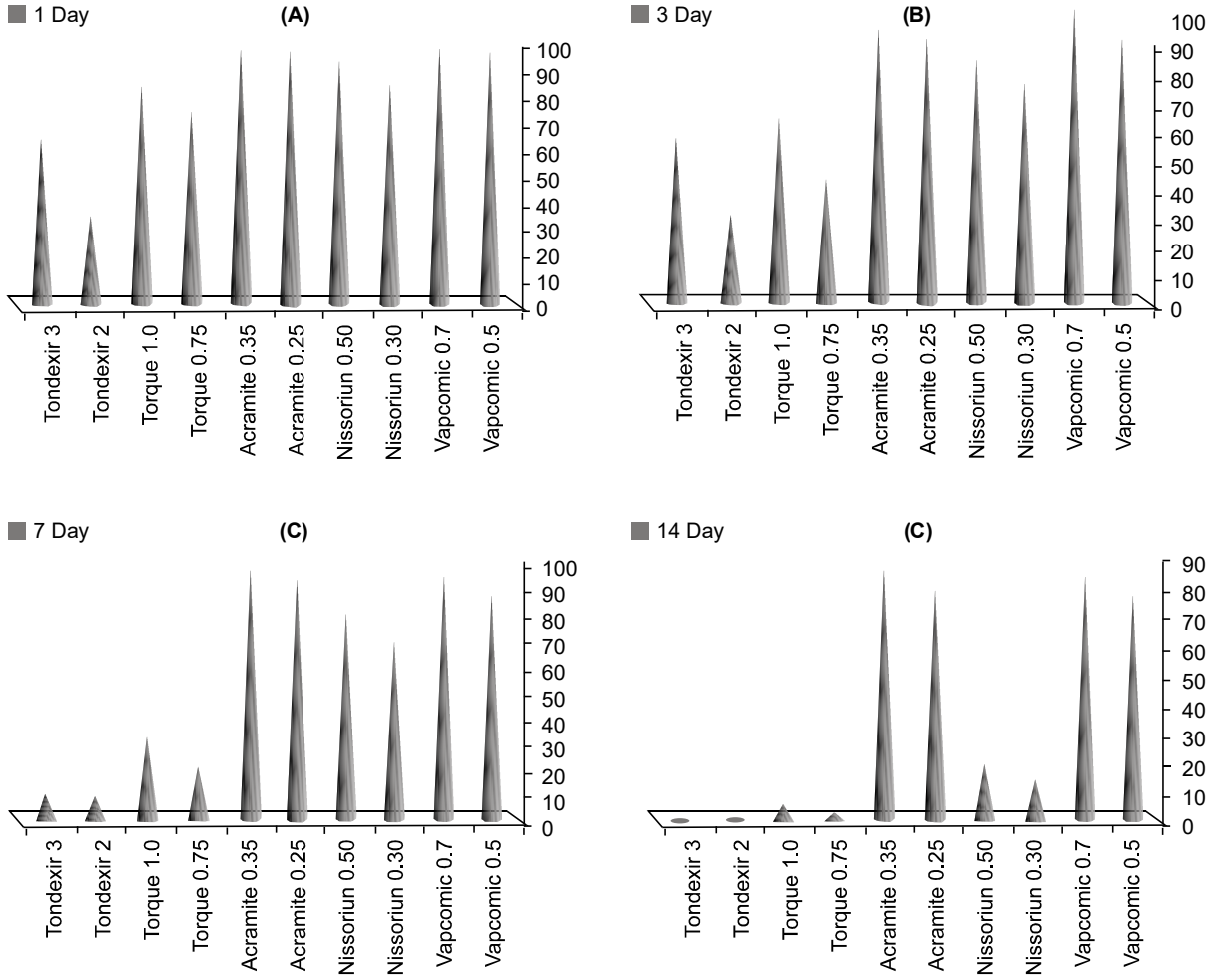

Fig. 1. Showed residual toxicity to two spotted spider mite *T. urticae* in dependent of the time of application **(A)** one day **(B)** 3 days **(C)** 7 days **(D)** 14 days.

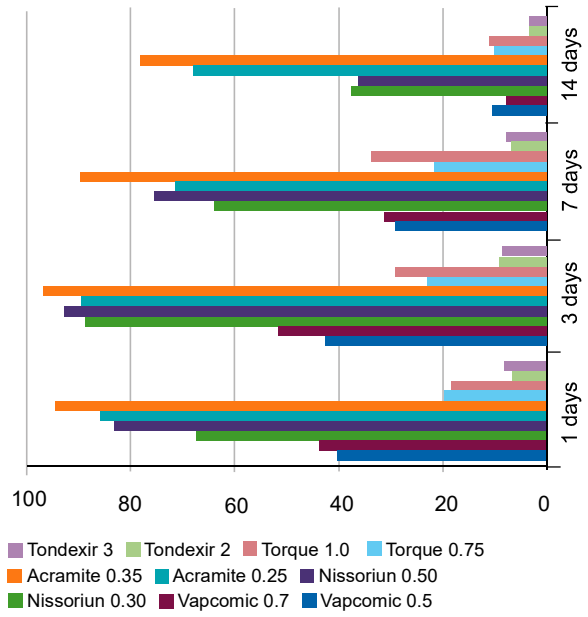

Fig. 2. Showed residual toxicity to *S. longicornis* in dependent of the time of applications.

to possession of pesticides this group (avermectin) Trans laminar property or local systemic and rapid ability to penetrate the tissue paper and then configure the reservoir of the active ingredient inside the tissues. Tulali and Mohammadali (2021) showed that abamectin could be reduced the population of two spotted spider mites to 79.8% after 21 days of the treatment. Acramite provided quick and long term suppression of two spotted spider mite populations. There was not any resurgence in the number of mites during the 21 days period of the application. Other studies have found no short term resurgence in mite populations after application in the field (Ya-Ying *et al*., 2017). Bifenazate is a mitochondrial cytochrome b toxicant that affects the production of ATP by acting as an uncouple at the site of ATP synthase (Van Leeuwen *et al*., 2008). The mortality of *S. longicornis* caused by fenbutatin oxide and tondexir residues one day after treatment achieved the lowest among the tested pesticides compared with the bifenazate, hexythiazox and abamectin. Our results were consistent with other studies of fenbutatin oxide on *S. longicornis* to be the promising candidate for use in integrated mite management programs where *Scolothrips* is the major natural enemy (Al- dahwi, 2008). Ahmed *et al*. (2015) found that hexythiazox had the highest toxicity to the predator *S. longicornis* at a concentration of 0.40 mL/L. Under laboratory conditions. El-Esnawy (2006) showed that abamectin was the most effective acaricides on *T. urticae* and had the highest toxicity on its predator *S. longicornis*.

Conclusion

The mortality on leaf disks treated with tondexir and fanbutatin oxide was not significantly than control on untreated leaf disks at any time after application.

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Conflict of Interest. The authors declare that they have no conflict of interest.

References

Abbott, W.S. 1925. A method of computing the effectiveness of an insecticide. *Journal of Economic Entomology*, **18:** 265-267.

Ahmed, Y.M., El-Adawy, A.M., Mostafa, A.M.A., Hafez, R.I. 2015.Side effect of some acaricides on three predators of *Tetranychus urticae* Koch. *Journal of Applied Plant Protection*, **4:** 31-36.

Abu-Duka, A., Mohammadali, M.T. 2021. Study of the effectiveness of pesticides thiamethoxam and acetamiprid against cabbage aphid brevicoryne brassicae and measure the residue of acetamiprid against cabbage using HPLC. *Plant Cell Biology and Molecular Biology*, **22:** 123-129.

Al- dahwi, S.S. 2008. The influence of Some Integrated Management Practices for the Control of the Two Spotted Spider Mite *Tetranychus urticae* Koch (Acari: Tetranychidae) on Cotton. *PhD thesis*, pp. 164, University of Baghdad, Baghdad, Iraq.

Alasady, M., Al-Ghadban, Z. 2018. New recorded of thrips species and seasonal fluctuation of some thrips on cucumber in the field during the Autumn season in Iraq, **12:** 109-116.

Ay, R., Sokeli, E., Okelie, E., Karaca, I. 2005. Respons to some acaricides of the two-spotted spider mite *Tetranychus urticae* Koch from protected vegetables in Sparta. *Turkish Journal of Agriculture*, **29:** 165-171.

Bostanian, N.J., Trudeau, M., Lasnie, J. 2003. Management of the two spotted spider mite *Tetranychus urticae* (Acari: Tetranychidae) in eggplant fields. *Phytoprotection*, **84:** 1-8.

Central statistical organization, 2020. Field and vegetable crop production, 2018.

Dybas, R.A. 1989. *Abamectin use in crop protection*, pp. 287-310, Springer, NY, USA.

El-Esnawy, B.A. 2006. Selectivity of certain acaricides on the predator *Scolothrips longicornis*: *Egyptian Journal of Applied Sciences*, **21:** 767-774.

Herron, G., Edge, V., Wilson, L., Rophail, J. 1993. Clofentezine and hexythiazox resistance in *Tetranychus urticae* Koch. in Australia. *Experimental and Applied Acarology*, **17:** 433-440.

Park, Y.L., Lee, J.H. 2007. Seasonal dynamics of economic injury level for *Tetranychus urticae* (Acari: Tetranychidae) on *Cucumis sativus* L. *Journal of Applied antomology*, **131:** 588-592.

Tulali, S.H., Mohammadali, M.T. 2021. Bio efficacy of abamectin against two spotted spider mite *Tetranychus urticae* and their residue in fruit cucumber under greenhouse condition. *Plant Cell Biotechnology and Molecular Biology*, **22:** 137-144.

Van Leeuwen, T., Vanholme, B., Van Pottelberge, S., Van Nieuwenhuyse, P., Nauen, R., Tirry, L., Denholm, I. 2008. Mitochondrial heteroplasmy and the evolution of insecticide resistance: non-mendelian inheritance in action. In: *Proceedings of the National Academy of Sciences of the United States of America*, pp. 5980-5985.

Ya-ying, L., Xiao, F., Guo-hao, Z., Yi-qing, L., Han-qiu, C., Huai, L., Jin-jun, W. 2017. Sublethal effects of bifenazate on life history and population parameters of *Tetranychus urticae* (Acari: Tetranychidae). *Systematic and Applied Acarology*, **22:** 148-158.

Zhang, Z., Sanderson, J.P. 1990. Relative toxicity of abamectin to the predatory mite *Phytoseiulus persimilis* (Acari: Phytoseiidae) and two spotted spider mite (Acari: Tetranychidae). *Journal of Economic Entomology*, **83:** 1783-1790.