International Journal of Agriculture Innovations and Research
Volume 2, Issue 5, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received : 11/03/2014 | Accepted on : 27/03/2014 | Published : 02/04/2014

The Effect of Some Biorational Insecticides on Trialeurodes Vaporarioum in Laboratory and Greenhouse Conditions

Maryam Farnisi
Deptt. of Plant Protection, Khorasgan Branch, Islamic Azad University, Isfahan, Iran

Alireza Jalalizand
Deptt. of Plant Protection, Khorasgan Branch, Islamic Azad University, Isfahan, Iran
arjalalizand@yahoo.com

Jahangir Khajehali
Deptt. of Plant Protection, College of Agriculture, Isfahan University of Technology

Shahin Gavanji
Young Researchers and Elite Club, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

Abstract **– Greenhouse whitefly (*Trialeurodes vaporarioum*) is one of the most important pests of farms, gardens, and greenhouses which reduce the quality and quantity of yield. This insect is controlled by chemical poisons or biological factors. Sensitivity of mature insects in laboratory and sensitivity of eggs and nymphs in greenhouse were evaluated against acetamipride, pyriproxyfen, buprofezin, azadirachtin and flufenoxuron pesticides. Bioassay method for mature insects was dipping method. In greenhouse, mentioned pesticides were used as five treatments of a completely randomized design (200, 40, 64, 2500, and 500 ppm, respectively) with three replications. Each experimental unit had three pots of same age plants of tomato. In bioassay method, LC50 amount of pesticides were determined as 75.17, 57.14, 33.22, 631.2, and 59.7 ppm, respectively. The highest and the least mortality of nymphs were belonging to acetamipride (66.59%) and Pyriproxyfen (52.07%) whereas for eggs were belonging to acetamipride (67.03%) and flufenoxuron (56.03%). According to results, buprofezin and acetamipride are recommended as the best poisons for greenhouse whitefly.**

Keywords **– Trialeurodes Vaporarioum, Bioassay, Flufenoxuron, Acetamipride, Buprofezin, Azadirachtin, Pyriproxyfen.**

I. Introduction

Whitefly is common pests which weaken plants and reduce their yield by feeding from their nectars. This pest also causes honeydew and virus transmission which are really important in green house [1]. Many methods (chemical or non chemical) have been used for controlling this pest [2]. But due to high usage of pesticides, some reports have been announced about resistance of pest against organic phosphorus pesticides, carbamates, and artificial pyrethroids [3,4]. Biorational pesticides are from third generation pesticides which are found typically in nature or are artificial materials. Therefore, they have low toxic, side effects, slightly toxic residues in the environment, and have little cytotoxic effects on natural enemies of aphids [5]. Acetamipride (trade name mospilan) is a systemic pesticide with contact and alimentary effect [6]. Horowitz and coworker studied this pesticide for controlling cotton honeydew (Benisia tabaci) in laboratory Fang and coworker studied acetamipride toxicity on whitefly [7, 8]. flufenoxuron is from chitin synthesis inhibitors with contact and alimentary effects[9,10]. El-ghar and coworker studied this growth regulator's effect on cotton honey dew and showed that it had low effect on immature insects of this pest. Buprofezin is also from chitin synthesis inhibitors [10]. Heydari investigated pyriproxyfen, buprofezin, and phenpropatrin pesticides and results showed that buprofezin controlled larval and pupal stages of whitefly [11]. Pyriproxyfen is a growth regulator (Juvenile-like hormone) for insects which prohibits their evolution and transformation with impaired juvenile hormone balance [12]. Ashtari studied the effects of pyriproxyfen on various stages of Bemisia tabaci life and the role of citowett oil in increasing its efficiency [13]. His results showed that nymph, Larva, and egg stages are sensitive stages of pest's life, respectively. Azadirachtin has anti-nutritional repellency properties and causes molting disorders and following immature insect and death [14]. Santos and coworker investigated effects of margosa seed extract (azadirachtin) on aphid and showed that it made 60 and 100% mortality of nymphs in two high concentrations [15]. Considering that whitefly is one of the most important greenhouse pests which have been resistant to many pesticides and because of desirable effects of biorational pesticides, this study was done to investigate the mortality effect of these pesticides and also determining LC_{50} amount of them.

II. Method and Materials

Whitefly were collected from research greenhouses of university and mature insects were transferred to net cages. To this, leaves containing immature stages of insects were studied and after removing all stages except larva were transferred to wooden cages 100*100*100cm dimensions. Pots of tomato (*Lycopersicon esculentum*, Dafnis variety) from the same age were located in cages as host plant. Mature insects appeared from larva after a few days and were established on tomato leaves. The colony was kept at 26±2°c temperature, 75±5% humidity, and 16 hours photo period (L: D).In bioassay tests five compounds stamipride, flufenoxuron, pyriproxyfen, azadirachtin and buprofezin were used. In primary tests ten concentrations of poisons were selected considering recommended concentrations of them, and then concentrations with 10 to 90% mortality were selected for final test. Distilled water was used as carrier in poison solutions. Matures experiment was done according to Liu & Stansly methods (1995). Tomato leaves (with triple leaflets) were located in poison solutions for five seconds

and then were dried by air and located in glass vials of penicillin filled with 10ml of water. Vials were put in the center of plastic cups and fifteen one-day old white fly were transferred from cages on them. The cups were covered with net and incubated for 24 hours with 26±2°c temperature and 6% relative humidity. This experiment was done for one control and five treatments with four replications. White flies which didn't show any response to touch with needle were known as dead. For greenhouse experiments, spraying was done on infected pots using recommended concentrations of acetamipride (200ppm), flufenoxuron (500ppm), pyriproxyfen (40ppm), buprofezin (64ppm) and azadirachtin (2500ppm) as a completely randomized design with one control, five treatments and three replications. Each experimental unit had three pots from the same age. Spraying was replicated again after four and seven days. In each count, a leaf was sampled randomly, transferred to laboratory and alive or dead nymphs (extant in behind of leaves) and eggs were count using binocular. Instar nymphs which were dried and scaly were considered as dead. Also, mature insects which were dead in time of molting were count as nymphal mortality [16].

A. Analysis

Obtained data were analyzed using SAS program and means were compared using Duncan's multiple ranges test at 5% probability level. Mortality percentages of eggs and nymphs in greenhouse were normalized using arc sinus method. Lethal concentration for 50% of population was determined in bioassay tests. Preprobit program was used for probit analysis and graphs were drawn using Excel program.

III. Results and Discussion

Probit analysis of data obtained from bioassays with acetamipride, pyriproxyfen, azadirachtin, buprofezin, and flufenoxuron determined lethal concentration (LC50) of these pesticides as 75.17, 57.14, 631.2, 33.22, and 59.7 ppm, respectively. Studies of Pirmoradi and coworker showed 114, 52.62, 91.21, 888.15, and 143.72 ppm for imidacloprid, thiamethoxam, dinotefuran, spiromesifen, and endosulfan [17]. Liank reported 3.13, 2.63, and 2.78 ppm for imidacloprid, abamectin, and deltamethrin. Panaahi found that LC_{50} was 0.2 ppm for oberon. Differences can be ascribed to various host plant and therefore differences in dietary and sometimes difference in photoperiod. Also, it can be because of poison, poison auxiliary materials, factory, synergistic ingredients, method of bioassay test or internal factors like genus, size, age, species, growth stage, resistant or sensitive colony, or external factors including temperature, moisture, chemical materials of test, purity of materials, additives or formulation. Dose-response graph was drawn for stamipride and flufenoxuron. Considering the results, the highest sensitivity of mature insects was against flufenoxuron.

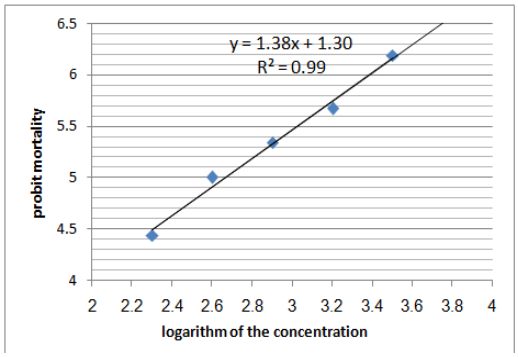

Fig.1. Linear regression of probit mortality of *Trialeurodes vaporarioum* treated with Azadirachtin in the lab.

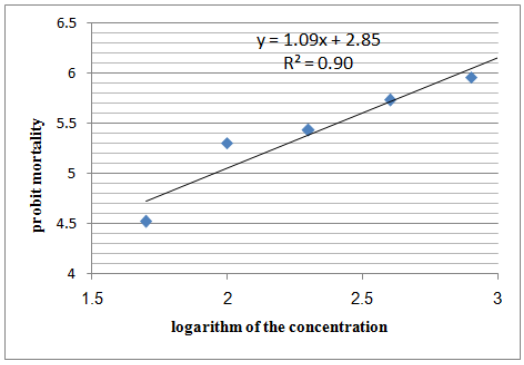

Fig.2. Linear regression of probit mortality of *Trialeurodes vaporarioum* treated with pyriproxyfen in the lab.

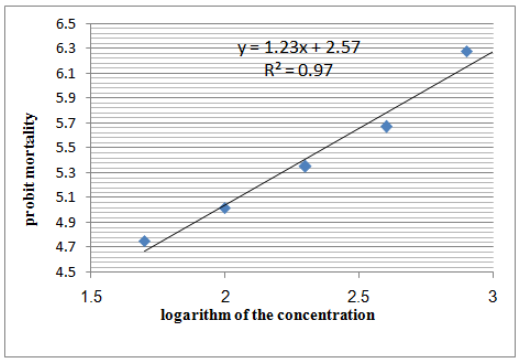

Fig.3. Linear regression of probit mortality of *Trialeurodes vaporarioum* treated with flufenoxuron in the lab.

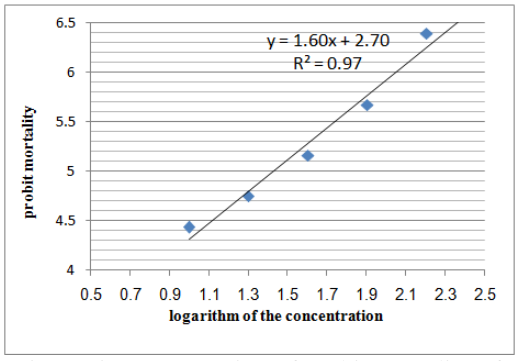

Fig.4. Linear regression of probit mortality of *Trialeurodes vaporarioum* treated with buprofezin in the lab.

Mortality of matures was increased by higher concentrations of pesticides so that the highest mortalities in 50, 100, 200 and 400 ppm concentrations of flufenoxuron were 40, 51.66, 63.33, 75 and 90% and in 80, 160, 320 and 640 ppm concentrations of acetamipride were 36.66,60,66.66,78.33,98.33.

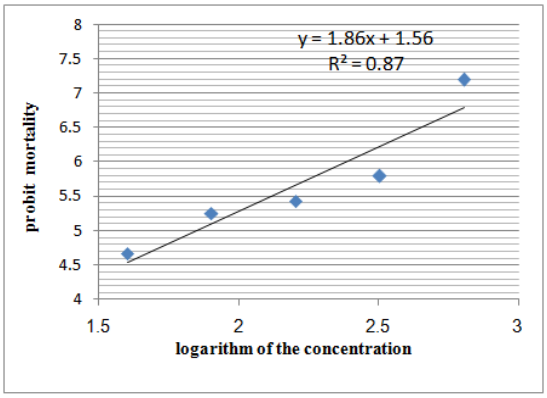

Fig.5. Linear regression of probit mortality of Trialeurodes vaporarioum treated with acetamipride in the lab.

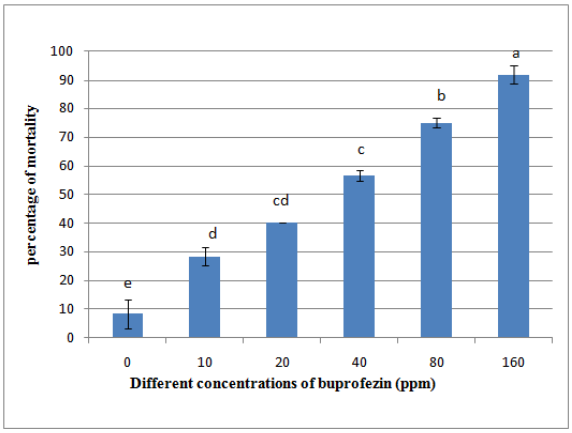

Fig.6. The percentage of mortality of mature *Trialeurodes vaporarioum* in the effect of different concentrations of buprofezin 24 hours after treatment.

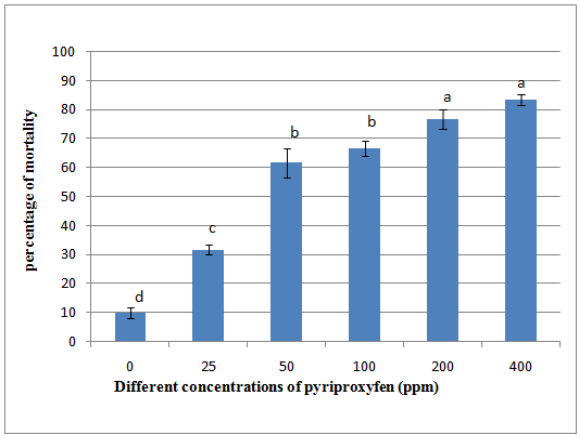

Fig.7. The percentage of mortality of mature *Trialeurodes vaporarioum* in the effect of different concentrations of pyriproxyfen 24 hours after treatment.

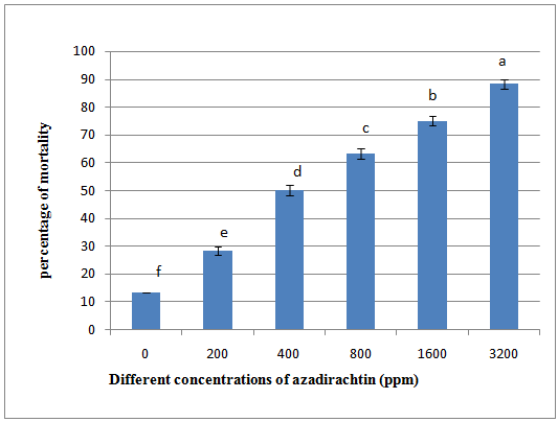

Fig.8. The percentage of mortality of mature *Trialeurodes vaporarioum* in the effect of different concentrations of Azadirachtin 24 hours after treatment

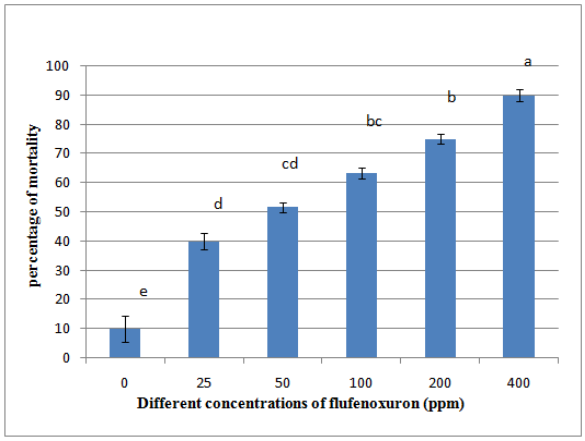

Fig.9. The percentage of mortality of mature *Trialeurodes vaporarioum* in the effect of different concentrations of flufenoxuron 24 hours after treatment

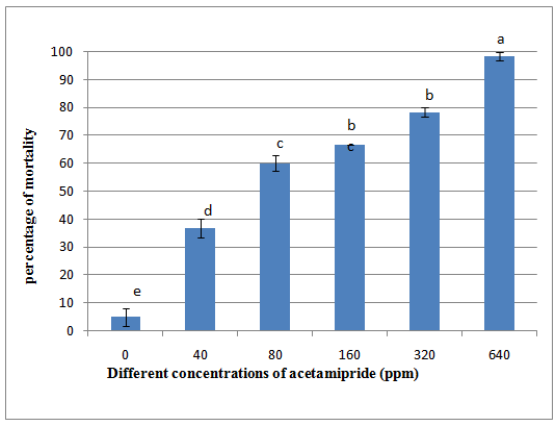

Fig.10. The percentage of mortality of mature *Trialeurodes vaporarioum* in the effect of different concentrations of acetamipride 24 hours after treatment.

B. Greenhouse experiments

Results of greenhouse experiments in various sampling times showed significant differences between treatments at 5% probability level. The highest average mortality of eggs in whole experiment period (6, 13, and 20 days after treatment) was belonging to acetamipride (67.03%) whereas flufenoxuron had the least (56.03%).

International Journal of Agriculture Innovations and Research
Volume 2, Issue 5, ISSN (Online) 2319-1473

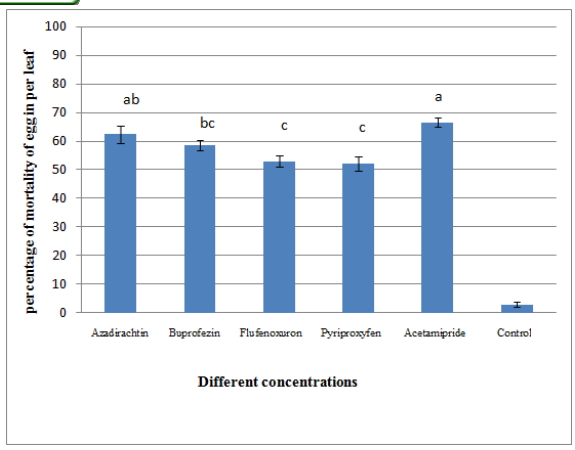

Fig.11. The average of percentage of mortality of egg *Trialeurodes vaporarioum* in all course of the experiment after treatment with recommended dose of flufenoxuron, buprofezin, pyriproxyfen, azadirachtin, acetamipride in per leaf acetamipride showed also the highest nymph mortality (66.59%) while flufenoxuron had the least (58.55%).

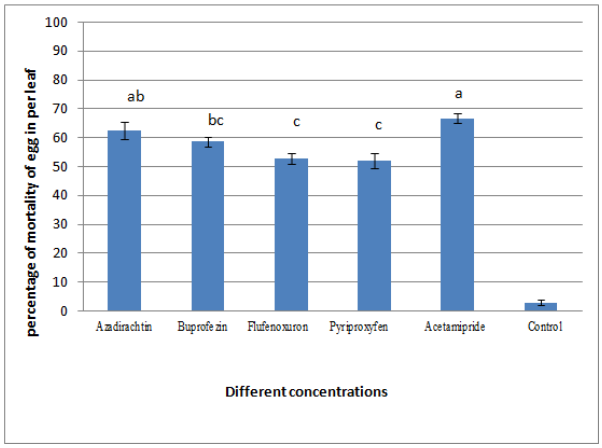

Fig.12. The average of percentage of mortality of nymphal *Trialeurodes vaporarioum* in all course of the experiment after treatment with recommended dose of flufenoxuron, buprofezin, pyriproxyfen, azadirachtin, acetamipride in per leaf.

Results of this study are not in agreement with study of Moazzeni and coworker for effects of imidacloprid, Sirinol, and tondaxir on whitefly [9]. Differences can be ascribed to various host plant and therefore differences in dietary and sometimes difference in photoperiod. Also, it can be because of poison, poison auxiliary materials, factory, synergistic ingredients, method of bioassay test or internal factors like genus, size, age, species, growth stage, resistant or sensitive colony, or external factors including temperature, moisture, chemical materials of test, purity of materials, additives or formulation. This amount of mortality by treatments can be due to morphological reasons which causes continue in growth and development and transition to larvae. It seems that thicker wax coverage and also larger volume to area ratio in nymphal instars are the reasons of more resistance or tolerance of them.

IV. Conclusion

On the whole, we can conclude that acetamipride in greenhouse and buprofezin in laboratory can control white fly effectively. After using these pesticides, insect population will decrease and will be controlled well finally.

References

[1] P.L. Lo, S.J. Bradley, V.C.Murrell, "Evalution of organically-acceptable pesticides against the green peach aphid (Myzus perrsicae)." *New Zealand Plant Protection journal*, vol. 5(1), 1999, pp: 75-79.

[2] L. Saninno, F. Porrone, C. Biondani, M. Contiero, A. Cersosimo, "Control of tobacco aphids by means of spray." *Il tobacco*, vol. 8, 2000, pp:15-20.

[3] G.B. Wilde, R.A. Shufran, S.D. Kindler, H.L. Brooks, P.E. Sloperbeck, "Distribution and abundance of insecticide resistance green bugs (Homoptera: Aphididae) and validation of a bioassay to assess resistance". *Journal of Economic Entomology*, vol.94, 2001, pp:547-551.

[4] K.Y. Wang, X.B. Kong, X.Y. Jiang, M.Q. Yi, T.X. Liu, "Susceptibility of immature and adult stages of *Trialeurodes vaporariorum* (Hom: Aleyrodidae) to selected insecticides." *Journal of Applied Entomology*, vol. 127, 2003, pp: 527-533.

[5] T.Z. Sheibani, E.A. Pormirza, "Determination of LD50 inhibitors of santez chitin on second Leptinotarsa decemlineata." *Research Journal in in Agricultur sciences*, vol. 4, 2008, pp: 105-113.

[6] H. Izadi, A. Samih, "Introducing of biological antidotest and combined with modern style." *Jahad daneshgahi journal*, vol. 39, 2005, pp: 100-162

[7] A.R. Horowitz, Z. Mendelson, P.G . Weintraub, "Comparative toxicity of foliar and systemic applications of acetamipride and imidaclopride aginst the cotton whitefly Bemisia tabaci." *Bulletin of Entomological Research*, vol. 88, 1998, pp: 42-437.

[8] T. Fang, C. LiSh, X. Kong, K. Wang, "Environment and protection" *Chinese Journal of Pesticide science*, vol. 6(2), 2007, pp: 42-437.

[9] F.N. Pirmoradi, A. Sheikhigorjan, V.A. Bani, S. Emani, "The assessing of stage sensitivity of first instar nymph and mature Trialeurodes vaporariorum to neonicotinoedy insecticides in laboratory conditions. The summery of proceeding of eighteenth plant congress of Iran.: *Institute for plant research journal*, vol. 267, 2010, pp:34-89

[10] G.E. Elghar, S. Sayedi, A.E. Sheikh, H.A. Radwan, "Field tests with insecticides and insect growth regulators to control insect pest of cowpea and its effects on certain beneficial insect." *Archives of phytopatology and plant protection*, vol. 28, 1994, pp:531-543.

[11] A. Heydari, E.A. Pormirza, E.A.Talebi, S. Moharamipoor, "The effect of pesticides of pyriproxyfen, buprofezin, fenpropathrin , on parameters of reproductive Encarsia Formosa." *Entomology Journal of Iran*, vol. 25(3), 2005, pp:17-34.

[12] M.S. Emami, "The effect of juvenile hormone of pyriproxyfen on first instar nymphs of pear psylla (Psylla pyricola)." *Proceeding of the second applied biology*, vol.5, 2004,pp: 52-56.

[13] S. Ashtari, "The effect of pyriproxyfen poison on different stages of biological cotton honeydew Bemisia tabaci, The role of citowett oil on increasing of efficiency." *Science Agriculture-Entomology*. vol.1 , 2002, pp:45-72

[14] F. Naji, B. Hasspieler, D.A. Haffner, K.H. Adeli, Human bioassay to assess environmental genotoxicity development of a DNA repair assay in HepgG2. Cells clinical biochemistry, vol. 27, 1994, pp: 441-448.

[15] T.M. Santos, N.P. Costa, A.L. Torres, A.L. Junior, "Effect of neem extract on the cotton aphid." *Agriculture* vol. 39, 2004, pp: 1071-1076.

[16] F. James, J. Price, J. David, "Effect of natural synthetic insecticides on sweetpotato whitefly Bemisia tabaci (Homoptera: Aleyrodidae) and its hymenopterous parasitoids." *Florida Entomologist,* vol. 74, 1991, pp: 60-62.