Pflanzenschutz in den Tropen und Subtropen

095 - Insecticidal effect of abamectin and abamectin +methylene blue on pistachio psylla (*Agonoscena pistaciae*) in maximum ultraviolet index condition

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Common pistachio psylla (*Agonoscena pistaciae*) is one of the most important pests on pistachio trees. However, one physical factor that reduces the efficiency of pesticides in pistachio garden is ultraviolet radiation. This research studied the effect of ultraviolet radiation on efficiency of abamectin and abamectin+ methylene blue in maximum UV index condition (UV index>10) on A. pistaciae. The solution of methylene blue in isopropyl alcohol was used as a UV protectant in this experiment. The maximum recommended dose of abamectin as well as abamectin+ methylene blue were sprayed on the same leaves of the pistachio trees in the experimental garden with the highest UV index condition. After ten days, the number of the laid eggs and the nymphs of the pest per leaf were recorded. The mean numbers of laid eggs per leaf were 2.70 ± 0.25 and 0.60 ± 0.16 in abamectin and abamectin+ methylene blue treatments, respectively. There was a significant difference between two treatments. The mean numbers of the nymphs (N_1-N_4) of the pest per leaf were 6.00 ± 0.50 and 3.40 ±0.36 in abamectin and abamectin+ methylene blue treatments, respectively and a significant difference was observed between the treatments. The mean populations of the last nymphal stage (N_5) per leaf were 1.70 ± 0.52 in abamectin and 0.70 ± 0.08 in abamectin+ methylene blue treatments with the significant differences

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096 - Effect of two mineral compounds on common pistachio psylla, *Agonoscena pistaciae* Burckhardt and Lauterer (Hemiptera:Psyllidae) population

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The common pistachio psylla, *Agonoscena pistaciae* Burckhardt and Lauterer (Hem: Psyllidae), is a key pest in pistachio orchards in Iran. Due to the negative effects of insecticide use, many researchers have been considering other ways to control this pest. In the current study, the alternative solutions based on the use of mineral compounds including lime sulfur (2000 ppm) and calcium nitrate (2000 ppm)+ non-ionic surfactant (500 ppm) has been tested in two gardens with different environmental condition. The percentage increase in population density of nymphs per leaf was recorded 12 days after treatment. The results indicated that both treatments led to decrease population growth density in compared with control [in the first garden: lime sulfur (232.73 ± 31.71 %), calcium nitrate+ non-ionic surfactant (250 ± 56.69 %), control (489.44 ± 42.58 %) as well as

in the second garden: lime sulfur (362.34±58.82 %), calcium nitrate+ non-ionic surfactant (515.79 ± 36.07 %), control (602.56 ± 62.32 %)]. These results revealed that there was a significant difference between both treatments with control whereas there was no significant difference between two treatments. According to present results, these mineral compounds had potential to be employed effectively, against *A. pistaciae*.

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097 - Effect of ZnO and TiO_2 nanoparticles with *Melia azedarach* L. ethanolic extract on control of greenhouse whitefly, *Trialeurodes vaporariorum*

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The greenhouse whitefly, *Trialeurodes vaporariorum,* leads to decrease the host plants performance and produce crops. In this study, the effects of ZnO and TiO_2 nanoparticles (50:50 wt. %) mixed with *Melia azedarach* L. (Meliaceae) ethanolic extract with 25 µg/ml concentration were investigated on the mortality pupae of greenhouse whitefly. These compounds were sprayed on the pupas of the pest on bean plants, and the control treatment was treated with ethanol. The results showed that, there is meaningful difference between extract and extract with nanoparticles. Moreover, there is meaningful difference between nanoparticles and extract with nanoparticles. The highest percentage mortality of pupas was related to the extract treatment with ZnO and TiO_2 nanoparticles (76.73 ± 4.11 %). In general, one of the best methods to improve the performance of pesticides is the one step-using of ZnO and TiO_2 nanoparticles with *Melia azedarach* L. ethanolic extract.

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098 - Insecticidal, antifeedant and growth-inhibition properties of the methanolic extract from Persian Lilac, *Melia azedarach*, against the Diamondback Moth, *Plutella xylostella*

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Insecticidal, antifeedant and growth-inhibition properties of methanolic extract from Persian Lilac, *Melia azedarach*, against 3rd instar larvae of *Plutella xylostella* were assessed using the methods of topical, dipping and feeding. All tests were performed under the

temperature of 25 ± 1°C, relative humidity of 60 ± 5 %, photo period of 16:8 (light:dark), and the concentration of the extract was 15 mg/cc dissolved in water. In topical tests, the corrected mortalities of insecticidal activities after 24 h, 48 h, and total 10 days treatments were 6 ± 2.4 %, 0 %, 22 ± 2.3 %, respectively. Topical tests showed that 78 % larvae pupated and 72 % of moths emerged, while in controls 98 % larvae pupated and 96% of moths emerged, and in total, insects treated with *M. azedarach* passed their developmental stages by one day delay in comparison with controls. In dipping test, the corrected mortalities after 24 h, 48 h, and total 10 days treatments were 0 %, 8 ± 3.7 %, 19 ± 2.8 %, respectively. This test demonstrated that 78 % larvae pupated and 66 % of moths emerged, while in controls 94 % larvae pupated and 86 % of moths emerged. Through dipping tests, insects dipped in *M. azedarach* passed their developmental stages by 1.5 days delay compared with controls. In antifeedancy test, 3rd instar larvae fed 40.80±2.5% and 11.89 ± 1.76 % of leaves treated with *M. azedarach* extract and water (control), respectively. These results show that *M. azedarach* has both potent antifeedant and growth-inhibitor effects but less mortality effects on *P. xylostella.*

099 - Effect of four ethanolic plant extracts on hatching time of Orius horvathi (Reuter) (Heteroptera: Anthocoridae)

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One of the important tools in IPM program is using of natural enemies for pest management. In the last years, several studies have conducted on the predatory flower bugs *Orius* spp. (Heteroptera: Anthocoridae). The predatory bug have many characteristics of ideal biological control agent, i.e., high searching efficiency, an ability to increase more rapidly when prey is abundant, a density-dependent decrease in fecundity resulting from interference and the ability to aggregate in regions of high prey density. So, finding compounds that have fewer effects on natural enemies is very important in IPM program. Using plant- based compounds is a recommended method. Most of the compounds have no toxic effect or low toxicity to non-target organisms and mammals and are less dangerous to the environment. The present research aimed to study effect of four ethanolic plant extracts (*Cercis siliquastrum* L., *Calendula officinalis* L., *Peganum harmala* L., *Melia azedarach* L.) on hatching time of *O. horvathi* (Reuter). The four plant extracts had no significant effect on hatching time of *O. horvathi.* The highest mean (5.38 ± 0.16) was related to *M. azedarach* treatments and the lowest mean (5.28 ± 0.11) in the control recorded. The result suggested integration of the ethanolic plant extracts and releasing eggs of the predator can cause effective control of pests.

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100 - The effect of two herbal ethanol extracts and two essential oils on hatching percentage and hunting behavior of *Chrysoperla carnea*

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One of the best cases in the IPM, is using of plant materials accompanied with the natural enemies. Since pistachio is one of the most important crops in Iran and considering that *Agonoscena pistaciae* is its key pest in Iran, Controlling the pest with the least damage to the environment and human health is of great importance. In my previous researches, the positive effect of two ethanol extracts of *Tribulus terrestris* and *Tagetes erecta* (20 mg / ml) and two essential oils of *Mentha pulegium* and *Rosmarinus officinalis* on common pistachio psylla have been shown. In the present research, the effect of these plant materials has been studied on *Chrysoperla carnea*, as the predator of the pest. Spraying and fumigation methods were used for extracts and essential oils, respectively. The results obtained from the examination of these plant materials on percentage of hatching eggs of green lacewing showed no significant difference between *M. pulegium* (72 ± 2.91%) and control (69 ± 3.75 %) and, the eggs under the influence of *R. officinalis* essential oils were hatched more than 50% (56 ± 3.05 %). Regarding the extracts, none of the used herbal extracts had significant difference with control treatment, and these extracts did not show a negative effect on the percentage of hatched eggs. In another research for finding the effect of these materials on the predation behavior of 5-day larvae, the results showed that the number of *Aphis fabae* hunted by the green lacewing larvae treated with ethanol extracts of *T. terrestris*, *T. erecta* and ethanol as control were 21 ± 0.94, 20.5 ± 0.86 and 72 ± 91.2, respectively, while the number of black aphids hunted by larvae treated with *M. pulegium* extracts oil was 19.7 ± 0.65, *R. officinalis* 19.3 ± 0.74, and control was 19.3 ± 0.55 which showed no significant difference between any of the treatment and controls.

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101 - The acaricidal effect of absolute ethanol and isopropyl alcohol on *Tetranychus urticae* Koch females

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The two-spotted spider mite, *Tetranychus urticae* Koch (Tetranychidae: Acari) is one of the most important pests of crops, ornamental and greenhouse plants. The present research studied the mortality effect of linear alcohols including absolute ethanol and isopropyl alcohol with 100 and 500 ppm in water on females in laboratory conditions: 25 ± 1 ° C, relative humidity 50 ± 10 percent, 16:8 light. Distilled water was used in control treatment. The experiment was conducted through spraying test method. The results showed that there is no significant difference in mortality percentage between absolute ethanol-500 ppm- (28.72 ± 5.67%) and isopropyl alcohol (500 ppm) and with the control treatment.

While there is a significant difference between isopropyl alcohol (500 ppm) with the most mortality percent (39.67 ± 7.46 %) and the control treatment. There is a significant difference between the control treatment and the two alcoholic compounds in 100 ppm: while there is not any significant difference between isopropyl alcohol (35.61 ± 6.62 %) and absolute ethanol (31.21 ± 5.71 %). Totally, alcohol isopropyl is more lethal than absolute ethanol but it is not a significant difference. Therefore, such compounds have the necessary potentiality to control the pests instead of chemical pesticides.

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102 - Sublethal effects of garlic extracts on hatching rate and hatching time of *Tetranychus urticae* Koch (Acari: Tetranychidae) eggs

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Two spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) is a polyphagous and cosmopolitan pest with more than 1200 host plant species. The uses of broad-spectrum pesticides in agriculture have caused development resistance of the pest to more than 80 acaricides in 60 countries of the world. In the past two decades, plant metabolites have received much attention as pests control agents on the insect and mite pests of greenhouse. In this study, sublethal effects of garlic (*Allium sativum*) extracts including ethanol and acetic acid extract on hatching rate and hatching time of the eggs of *T. urticae* were investigated for 10 days. Experiment were carried out at laboratory condition, 25 ± 1°C, 50 ± 10 % humidity and under a photoperiod of 16L:8D h. Bioassay tests were performed by spraying test method by special sprayer. The acari colony was reared on the *Phaseolus vulgaris* leaves. To obtain garlic extracts via conventional extraction way. The means of the hatching rate (%) for garlic ethanol extract, garlic acetic acid extract, acetic acid and ethanol were recorded 92.29 ± 2.01, 95.62 ± 1.43, 95.75 ± 0.81 and 99.13 ± 0.31, respectively. Data analysis revealed that the garlic ethanol extract had the highest and ethanol had significantly the least sublethal effects. Moreover, to investigate the effect of garlic extracts on the hatching time concentration 10 mg/ml of extracts were prepared. There was a significant difference between treatments. The highest and lowest duration of embryonic development were recorded in ethanol with 6.09 ± 0.03 and acetic acid with 3.87 ± 0.07 days, respectively. Generally, extracts *of Allium sativum* may be considered as a biopesticide to control spider mites.

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103 - Sublethal effects of Diatomaceous earth on hatching rate and hatching time of Two-spotted spider mite, *Tetranichus urticae* Koch (Acari: Tetranichidae), eggs in the laboratory condition

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Two-spotted spider mite, *Tetranichus urticae* Koch (Acari: Tetranichidae) is one of the most important polyphagous pests of agricultural crops, with worldwide distribution that often causes economic damages. In this study, the tests were conducted in fifteen replication with more than 50 eggs in each replicate in three treatments. Treatments are 1000 and 500 ppm of diatomaceous earth (DE) water suspension and distilled water (control). In petri dishes containing 0.7% agar, a healthy bean leaf placed. Then a number of fertile female mites were transmitted in each leaves. Petri dishes were maintained in a growth chamber at temperature of 25 ± 1°C, light period of 16:8 (light: dark) and 50 ± 10 rate of humidity. After 24 hours, the adults were removed and laid eggs were counted and then sprayed with DE1000 ppm, DE500 ppm and distilled water. The number of hatching eggs was counted, 24 hours after, spraying; this record was done for ten days. Data were analyzed with Fisher LSD test, in Stat plus software at level of 5 %. The mean of the hatching rate for DE1000 ppm, DE500 ppm and distilled water were 94.83 ± 1.07, 96.45 ± 1.08 and 96.71 ± 1.18. There was no significant difference between these three treatments in hatching rate and there were significant difference between treatments for hatching time. The highest and lowest hatching time were recorded for DE500 ppm (3.98 ± 0.07) and distilled water (3.72 ± 0.06).

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104 - The effect of diatomaceous earth water suspension on infestation of pomegranate fruit moth, *Ectomyelois ceratoniae* Zeller (Lep., Pyrallidae)

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Pomegranate fruit moth (PFM), *Ectomyelois ceratoniae* Zeller (Lep., pyrallidae), is a destructive pomegranate pest in Iran. The larvae stage of this pest causes damage to pomegranate fruit by reducing the quantity and quality of the pomegranate yield. Several different methods including biological, mechanical and chemical controls have been investigated on *E. ceratoniae*, however, the efficacy of them were not proven. In the present study, the effect of three different mixtures including diatomaceous earth, and diatomaceous earth in combination with organosilicon also non-ionic surfactant in two pomegranates orchards in Ferdows area, South Khorasan province, were tested and compared. The results showed significant differences between treatments in harvest time. The average of healthy fruits in the control treatment were 46.59 % and 46.29 % while in the diatomaceous earth treatment, the level of non-infested fruits were 91.31 % and 94.60 %, in the first garden and second garden, respectively. The average of damaged fruits, egg laying in crown and infestation rate were assessed in different treatments and compared to the control.

The results showed, by applying studied agents in pomegranate crown and entire tree, the pest damage was considerably decreased.

105 - Insecticidal effects of small green fruit and leaves aqueous extracts of *Melia azedarach*, extracted by microwave-assisted extraction on *Aphis fabae* nymphs

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Regarding the low risk of botanical pesticides for humans and environment, and also their capability to control a large range of pests, it seems beneficial and necessary to consider these compounds in integrated control plants. Considering the importance of applying new and safe pesticides in the integrated pest management, the effects of plant extracts on *Aphis fabae* Scopoli (Hemiptera: Aphididae) were studied. In this study, the insecticidal effects of small green fruit and leaves extracts of *Melia azedarach* Linnaeus (Sapindales: Meliaceae), extracted by Microwave-assisted extraction (MAE) in 30 and 50 seconds, were considered on 1-2 days-old nymphs of *A. fabae*. The results indicated that there was a significant difference between small green fruit and leaves extracts of *M. azedarach* on the mortality of 1-2 days-old nymphs of *A. fabae* ($P \geq 0.0002$). Also, this two extracts showed a meaningful difference in the percentage of mortality caused by black bean aphid nymphs with control (water). Generally, the highest percentage of mortality effect was caused by small green fruit extract, extracted by MAE during 30 seconds ($61.23 \pm 4.32\%$).

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