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The Side Effects of Insecticide Efficient Biocidals to Benificial Insects

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Abstract: Unawares usage of biocidals effects not only natural resources, environment and human health but also can damage beneficial insects which suppresses pests. Herein, the side effects of insecticide efficient biocidals to important beneficial insects was handled and measures on sustainable biocidal usages was discussed. The side effects of Deltamethrin, Azadirachtin, Spinosad and *Bacillus thuringinensis* biocidals to certain important beneficial insects were evaluated with literature data. Negative effects on natural enemies of biocidals can vary greatly depending on type of insect and active substance of biocidals. Besides the effects of death of the biocidal products in the natural enemies, negative effects at reproductive decline, reduced life expectancy, behavior of finding hosts and prey were determined experimentally in many studies. Many insecticides efficient biocidals which permitted to use in sustainable agriculture, caused to considerable side effects was also demonstrated in literature. Four biocidals used commonly were handled in this compilation. The maximum side effects to beneficial insects were determined in Spinosad followed by deltamethrin and azadirahtin.The minimum side effects to beneficial insects were determined in *Bacillus thuringiensis*. Today the use of biocidals to solve the pest problem seems obligatory. However, taking into consideration as the only option the use of biocidals to solve the pest problem isn't the right approach. Many environmentally biocidals that are currently in use indicates significantly side effects. Side effects to beneficial insects should be taken into consideration in sustainable biocidal usages. As a result of biological and behavioral studies, insecticides which indicate low side effects to beneficial insects will be proposed for sustainable pest control. So, protection of beneficial insects in ecosystem will be provided and so it will contribute to environment a sustainable pest control. Biocidal product usage needs expertness, for this reason required trainings should be given to biocidal operators.

Key Words: biocidal products, insecticide, beneficial insects, side effect

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1. INTRODUCTION

Pesticides are constitutes significant amount of biocidals. Unawares usage of biocidals effects not only natural resources, environment and human health but also can damage beneficial insects which suppresses pests. Biocidals effects also non target organisms. Trichogrammatidae family are the most important beneficial insect group used in biological control by mass rearing in laboratory conditions. After mass production in laboratory, these insects relaease the ecosystems. Herein, the side effects of insecticide efficient biocidals to important beneficial insects was handled and measures on sustainable biocidal usages was discussed.

2. BENEFİCİAL INSECTS-TRİCHOGRAMMATİDAE FAMİLY

Trichogrammatidae family are the parasitoids of the various insects. They attacks the eggs of these insects. There are 100 genera and 850 species of Trichogrammatidae family in the world. Identification of Trichogramma species are quite difficult due to their small stature and the absence of obvious distinguishing morphological characters. Trichogrammatidae family are the endoparasitoids of eggs Lepidoptera, Hemiptera, Coleoptera, Thysanoptera, Hymenoptera, Diptera and Neuroptera orders. Trichogrammatidae family species are very effective natural enemies which used in the world.

3. GROUPS OF INSECTICIDE EFFICIENT BIOCIDALS

The side effects of Deltamethrin, Azadirachtin, Spinosad and *Bacillus thuringinensis* biocidals to certain important beneficial insects were evaluated with literature data.

Deltamethrin is a synthetic pyrethroid pesticide that killls insect through dermal contact and digestion.

Azadirachtin is a botanical insecticide. Neem products are derived from the seeds of the neem tree, *Azadiracta indica*, grown from India to Africa. The primary insecticidal extract is azadirachtin. it can act as an insect repellant, an anti-feedant (interferes with feeding), and growth regulator.

Spinosad is a microorganism based insecticide. Metabolites of Saccharopolyspora spinosa, a soil-inhabiting bacteria that is fermented, are the basis for this new class of insecticide. Spinosad is composed of spinosyns A and D. The fermented product is very toxic to caterpillar pests such as cabbageworm, cabbage looper, diamondback moth, armyworm, and cutworm, as well as fruit flies such as spotted wing drosophila. Spinosad can act on a susceptible insect's stomach and nervous system.

Bacillus thuringiensis is a microorganism based insecticide. Bacillus thuringiensis (Bt) is a naturally-occurring bacterium that feeds on the larval stages of insect pests such as mosquitoes, Colorado potato beetles, and cabbage loopers. Bt. var.

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kurstaki feeds on Lepidopteran larvae, known as caterpillars, commonly found on vegetables and fruit. Under natural conditions when a caterpillar ingests Bt, the bacterium releases a toxin within the insect's gut, and the toxin degrades the stomach lining, causing the insect to die. Different strains of Bt are effective against specific pests, so take care to choose the Bt product that targets the pest you need to control.

4. RESİDUES OF BİOCİDALS TO *TRİCHOGRAMMA* SPP.

The percent survival of adult *T. bourarachae* exposures with deltamethrin to pomegranate leaves after 1 day 2 day and 6 day are respectively %9.09, %19.25 and %0. The survival of adult *T. evanescens* exposures with deltamethrin after 1 day 2 day and 6 day are respectively %4.23, %20.22 and %40.6.

The percent survival of adult *T. bourarachae* exposures with *B.t* to pomegranate leaves after 1 day 2 day and 6 day are respectively %93.59, %89.6 and %92.61. The survival of adult *T. evanescens* exposures with deltamethrin after 1 day 2 day and 6 day are respectively %72.03, %87.73 and %80.64.

Furthermore the study shows that mortality (%) from egg to adult of 3 *Trichogramma* species treated with deltamethrin, *B.t* and spinosad solutions during immature life phases are toxic at spinosad and deltamethrin than *B.t.* Adult *Trichogramma* survival was significantly affected by spinosad and deltamethrin treatments. In fact, whatever the day after insecticide treatment; *B. thuringiensis* actions on all studied *Trichogramma* species were comparable with those of the control, whereas deltamethrin and spinosad continued to be harmful to adults during the first, the second and even the sixth day after insecticide pulverisation. *Trichogramma* development stages survival on *E. kuehniella* eggs was significantly affected by chemical treatments. Spinosad and deltamethrin were the most toxic compounds. Even though B. thuringiensis 70 g hl-1 formulation was found to be harmless to all the development stages of the tested *Trichogramma* species, *B. thuringiensis* 100 g hl-1 formulation was characterised as slightly harmful only to T. bourarachae prepupae stage. [1]

An other study the effect of Spinosad on adult *T. chilonis* was observed in glass vials. The vials were dipped in different concentrations of Spinosad and left to dry. A single *T. chilonis* was introduced to it. After 24 hrs the mortality of *T. chilonis* was observed. The effect of Spinosad on adult *T. chilonis* was found extremely toxic as it gave 100% mortality within 15 minutes of exposure. In addition the study also shows that percent parasitism, emergence time and adult longevity were found higher in control as compared with all concentrations of Spinosad. Highest concentration of Spinosad (0.2%) reduced the percent parasitism, emergence time and adult longevity as compared with all other concentrations. The highest concentration,

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T. chilonis took maximum time for emergence which gradually decreased by decreasing the concentrations of Spinosad. Due to the toxic effect the adult longevity was least at highest concentration while maximum adult longevity was recorded in control. Spinosad adversely affect the *T. chilonis* behavior. Significantly lower distance (16.22cm) was covered by the parasitoid when treated with 0.005%. While it traveled 25.4 cm when treated with 0.001%. Similar pattern can be observed in the pause time and average velocity showing that the higher concentrations affect parasitoid behavior and search ability. [2]

The emergence rate *Trichogramma evanescens* with spinosad for all treatments was very low (3-5%) and the emerged adults died within 6-12 hrs after emergence. There was no emergence for the parasitoid treated with spinosad one, two or four days after parasitism. [3]

An other study, mortality (%) of adult *Trichogramma papilionis* to fresh azadirachtin film compared was found %25. The study shows that parasitism capasity of *T. papilionis* is decreases which treated *T. papilionis* eggs, larvae and pupae to azadirachtin. Azadirachtin was the least toxic and harmless that gave only 13.33% mortality with 15.62% reduction in parasitism of *T. papilionis* at 0.5 RD; while it was moderately toxic and slightly harmful that yielded 26% adult mortality with 37.84% reduction in parasitism at RD. [4]

5. CONCLUSİON

Negative effects on natural enemies of biocidals can vary greatly depending on type of insect and active substance of biocidals. Besides the effects of death of the biocidal products in the natural enemies, negative effects at reproductive decline, reduced life expectancy, behavior of finding hosts and prey were determined experimentally in many studies. Many insecticides efficient biocidals which permitted to use in sustainable agriculture, caused to considerable side effects was also demonstrated in literature. Four biocidals used commonly were handled in this compilation. The maximum side effects to beneficial insects were determined in Spinosad followed by deltamethrin and azadirahtin. The minimum side effects to beneficial insects were determined in *Bacillus thuringiensis*.

Today the use of biocidals to solve the pest problem seems obligatory. However, taking into consideration as the only option the use of biocidals to solve the pest problem isn't the right approach. Many environmentally biocidals that are currently in use indicates significantly side effects. Side effects to beneficial insects should be taken into consideration in sustainable biocidal usages. As a result of biological and behavioral studies, insecticides which indicate low side effects to beneficial insects will be proposed for sustainable pest control. So, protection of beneficial insects in ecosystem will be provided and so it will contribute to environment a sustainable pest control. Biocidal product usage needs expertness,

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