

# [Sub-lethal effects of insecticides on habrobracon hebetor](https://assignbuster.com/sub-lethal-effects-of-insecticides-on-habrobracon-hebetor/)

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### Age specific fecundity

The age specific fecundity values of H. hebetor exposed to sub-lethal doses of either Vertimec, Proteus or Sirinol. All insecticides caused decrease in age specific fecundity in compared of the control. Other than control, in both contact and digestive assays, the highest age specific fecundity was recorded in wasps treated with Sirinol. Additionally, wasps treated with either Vertimec or Proteus exhibited shorter oviposition period than control, while the oviposition period was not affected by Sirinol.

### Life expectancy

The life expectancy (ex) of H. hebetor in response to contact exposure to insecticides. The numerical values for ex in contact assay were: 31. 92, 33. 03, 31. 03, and 34. 95 for wasps treated with Vertimec, Proteus, Sirinol, and control, respectively. Also, shows the life expectancy of wasps treated in digestive method with insecticides. The numerical values for ex were estimated at 24. 85, 29. 94, 33. 84, and 35. 88 for Vertimec, Proteus, Sirinol, and control treatments, respectively. The life expectancy of H. hebetor decreased in comparison with control as a result of both contact and digestive exposure to all insecticides.

### Discussion

The Mediterranean flour moth, E. kuehniella, and the Indian meal worm, P. interpunctella, are among the most serious pests of stored products in the Middle East including Iran. Such as Helicoverpa spp that are serious pests of different crops in southern Iran that caused economic damage on Pistachio and greenhouse plants. Varieties of techniques, such as physical, genetic and biological methods, have been developed as alternatives to chemical pesticides for control of these pests. Although used of these techniques are not expected to eradicate the pest population, decrease the dose of pesticide and replace them with the specific insecticide is necessary (Smith 2005). In this study, the sub-lethal effects of three insecticides on biological parameters of H. hebetor were investigated under laboratory conditions. Adult H. hebetor are strong fliers with large-scale searching ability and can simultaneously affect several species of stored product pests with respect to their wide host range (Strand et al. 1989). They are capable of penetrating into stored products and parasitizing wandering larva before adult emergence, potentially reducing the spread of moth infestations within a facility (Scholler 2010).

The intrinsic rate of increase (rm) was determined as 0. 220, 0. 211, 0. 227, and 0. 231 (female/female/day) for wasps treated with sub-lethal concentration of Vertimec, Proteus, Sirinol, and control, respectively. These results indicate that the sub-lethal concentration of all insecticides have resulted in decreasing the rm of treated wasps. Consistent with these results, in a previous study the rm value of H. hebetor exposed to sub-lethal concentration of two Azadirachtin formulations (Neem Guard and BioNeem) and Cypermethrin was estimated at 0. 16, 0. 14, and 0. 15 female offspring per female per day, respectively (Abedi et al. 2014) in comparison in control (0. 18). In another study, the rm value of these wasps treated with sub-lethal concentration of Azadirachtin, Flonicamid, Thiacloprid and Thiocyclam was determined as 0. 24, 0. 23, 0. 22, and 0. 21 eggs per day, versus 0. 26 eggs per day in control (Fooladi et al. 2015). Similarly, Rafiee-Dastjerdi reported a decrease in rm in H. hebetor when the wasps were treated with sub-lethal concentration of Indoxacarb, Imidacloprid, and Deltamethrin (Rafiee-Dastjerdi et al. 2012).

In the present study, a decrease in the finite rate of increase (λ) and the net reproductive rate (R0) of H. hebetor was observed following insecticide treatment. In accordance with these results, other authors have also reported decrease in these indices when the wasps were treated with insecticides (Amir-Maafi and Chi 2006; Rafiee-Dastjerdi et al. 2012; Abedi et al. 2014; Fooladi et al. 2015; Mahdvi et al. 2015). The mean generation time (T) values of H. hebetor in response to contact exposure to either Vertimec ®, Proteus® or Sirinol, compared to control were estimated at 18. 10, 18. 51, 19. 76, and 19. 22 days, respectively.

These results indicate that the generation time of H. hebetor was shortened in both Vertimec and Proteus treatments in comparison with control. Given that these insecticides did not affect the pre-adult development time of the wasp, a decrease in adult longevity may have contributed to shortened generation time. Similarly, to these results, Fooladi reported a significant decrease in the mean generation time of H. hebetor in response to exposure to either Azadirachtin, Flonicamid, Thiacloprid or Thiocyclam ( Fooladi et al. 2015). The age specific fecundity of H. hebetor was negatively affected by all insecticides that used in this research, compared with control. However, more intense effects were observed in wasps treated with Vertimec and Proteus Vertimec and Proteus decreased more than Sirinol the adult longevity of H. hebetor.

Altogether, the results of the current study indicate that sub-lethal concentration of three selected insecticides has negative effects on life table parameters of H. hebetor, the plant-derived insecticide, Sirinol®, have the less toxicity effects on H. hebetor by LC50 and HQ index (Table 1). Based on the results of this research and the low negative effects of Sirinol®on H. hebetor, Sirinol® can be recommended for controlling of leaf pest, such as Helicoverpa spp, in IPM programs.

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