Effects of Newer Insecticides on the Natural Enemy *Deraeocoris brevis* (Uhler) (Hemiptera: Miridae)

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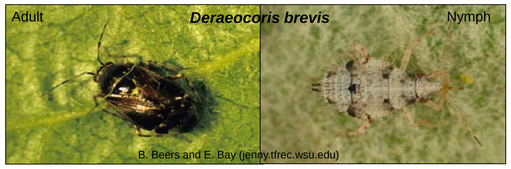


Figure 1: Materials for bioassay arena


Figure 2: Assembled glass arena

Abstract

This study focused on lethal and sublethal effects of cyazypyr, rynaxypyr, spinetoram, novaluron and lambda-cyhalothrin on the natural enemy *Deraeocoris brevis* (Uhler) in the laboratory using nymphs (second-instars) and adults (males and females). Each insecticide was tested using concentrations that were equivalent to the high label rate (1x) and 1/10th of that amount (0.1x) dissolved in 100 gallons of water. Lambda-cyhalothrin was acutely toxic to both nymphs and adults at both rates, while both rates of novaluron were acutely toxic to nymphs. Cyazypyr, rynaxypyr and novaluron caused less mortality to adults while rynaxypyr and spinetoram were less toxic to nymphs. Fecundity and fertility of adult females were affected by the high rates of novaluron and spinetoram. The high rate of spinetoram negatively affected the survival of nymphs. Spinetoram treated males had lower longevity. Cyazypyr caused some mortality to nymphs and affected their survival.

Introduction

Deraeocoris brevis (Uhler) (Hemiptera: Miridae) is a widely distributed natural enemy in apple and pear orchards in western United States and Canada (Kelton 1982, Westigard et al, 1968). It is one of the most important predators of pear psylla [*Cacopsylla pyricola* (Forster)] (Hemiptera: Psyllidae) (Westigard et al, 1968). Insecticides used in tree fruit orchards are frequently targeted for codling moth (*Cydia pomonella*) control. These insecticides can directly affect natural enemies causing mortality (lethal effects) or can indirectly affect their development, longevity, and reproduction (sublethal effects). The Food Quality Protection Act of 1996 (US EPA, 1996) has resulted in the loss or restricted the use of key organophosphorus insecticides. Although, newer, reduced–risk and OP-replacement insecticides are currently used for codling moth control, their impact on natural enemies has not been well studied. This study focused on lethal and sublethal effects of cyazypyr, rynaxypyr, spinetoram, novaluron, and lambda-cyhalothrin on *D. brevis*.

Materials and Methods

Nymphs (second instars) and adult males and females were exposed to insecticides and distilled water (control) through multiple routes. Insects and glass arenas were treated using a Potter spray tower (for contact and residual exposures, respectively). Food (*Ephestia kuehniella* Zeller eggs) was drenched, green beans (moisture source) and cheese cloth lids were dipped in each treatment (for ingestion and residual exposures, respectively). Treated adult males and females were paired in the arenas. Mortality, fecundity, fertility and longevity were evaluated for adults. Nymphs were monitored daily for mortality, development, survival and subsequent adult sex ratio. Sublethal effects were evaluated for surviving insects. All experiments were carried out in environmental growth chambers at 23°C, 60% RH and 16:8 (L:D)h. Data were analyzed using SAS (SAS Institute, 1999).

Results
1. Lethal Effects to Adults

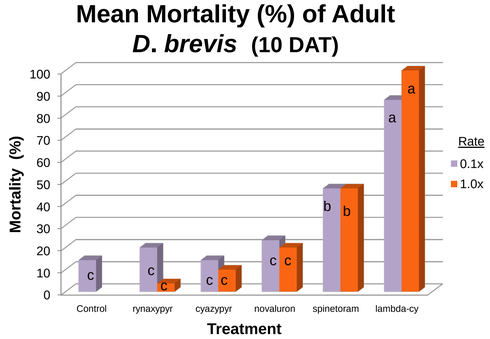

Figure 3 P ≤ 0.05

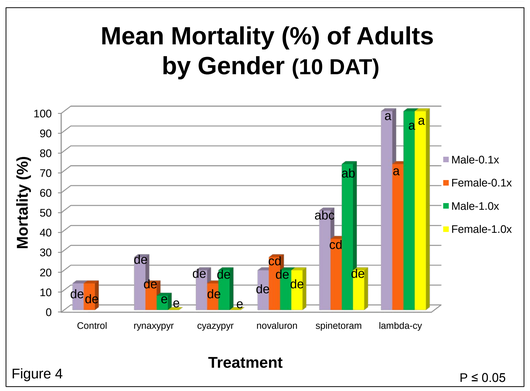

Figure 4 P ≤ 0.05

2. Sublethal Effects to Adults

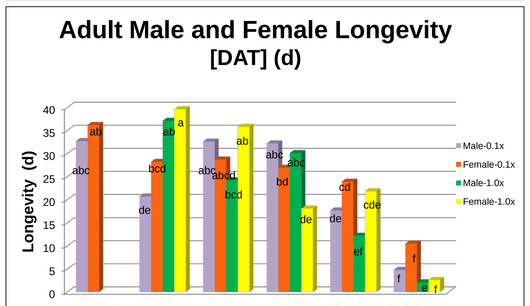

Figure 5 P ≤ 0.05

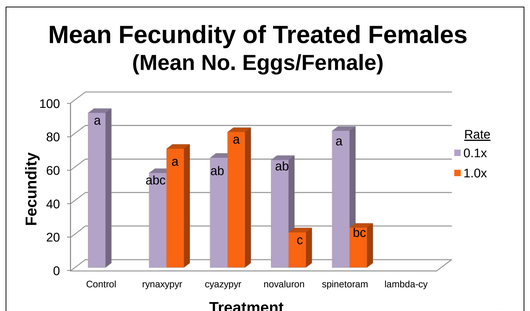

Figure 6 P ≤ 0.05

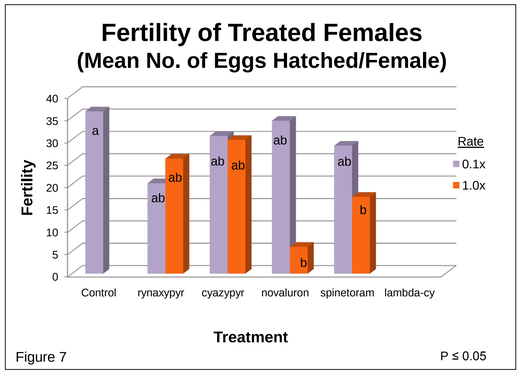

Figure 7 P ≤ 0.05

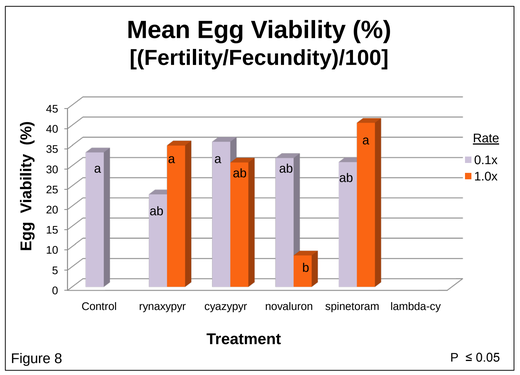

Figure 8 P ≤ 0.05

3. Lethal Effects to Nymphs

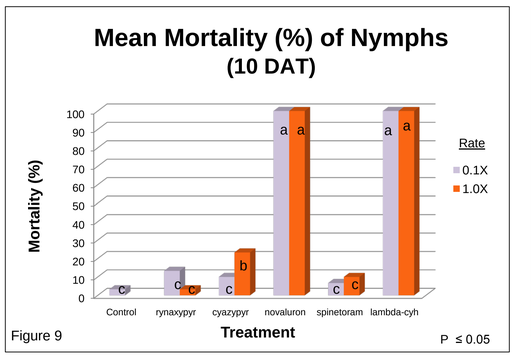

Figure 9 P ≤ 0.05

4. Sublethal Effects to Nymphs

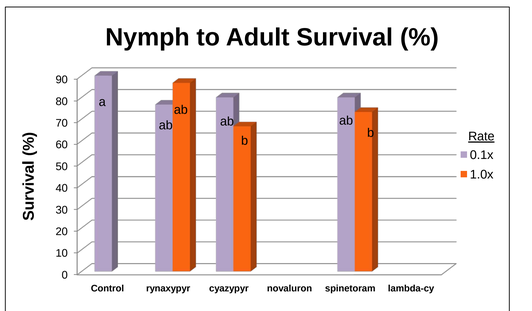

Figure 10 P ≤ 0.05

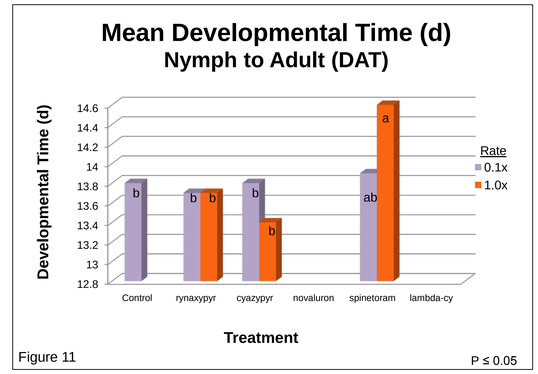

Figure 11 P ≤ 0.05

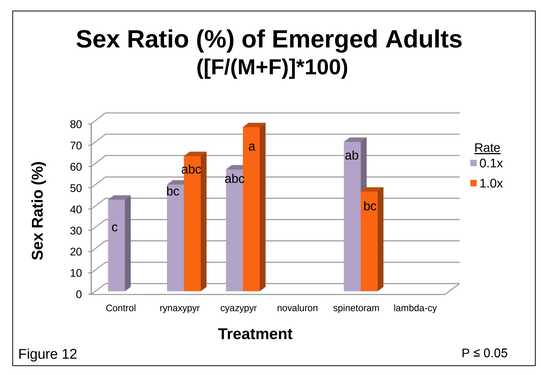

Figure 12 P ≤ 0.05

Conclusions

- **Lambda-cyhalothrin:** High mortality to both adults and nymphs
- **Novaluron:** High rate affects fecundity and fertility of females and both rates caused high mortality to nymphs
- **Spinetoram:** Moderately toxic to adults and shortens male longevity, high rate affects fecundity and fertility of females and survival of nymphs
- **Cyazypyr:** High rate caused some mortality to nymphs and affected nymph to adult survival

Acknowledgments

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References

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