INSECT RESISTANCE

Understanding Dispersal by Western Corn Rootworm: Effects of Larval Density on Flight and Effect of Flight on Female Reproduction

DESCRIPTION

Knowledge of insect dispersal is of critical importance for models of insect resistance and evolution. Evidence suggests that many western corn rootworm (WCR) remain close to their natal field, while others may disperse much further, something not considered in current models. What determines residents and long-dispersers is unknown. In this project, we used laboratory flight mills to characterize WCR flight performance as a function of larval rearing density. Stress from larval crowding often induces facultative long-distance dispersal of adult insects. In addition, we examined the effects of flight activity on female reproductive capacity.

Our results suggest that females emerging from high density populations in cornfields (e.g., non-Bt fields, or Bt fields with a growing resistance problem) are more likely to disperse and disperse farther than those emerging from low density populations (e.g., Bt fields with susceptible population). This phenomenon could affect the rate of resistance evolution and spread from a hotspot in the landscape. We found no evidence that increased flight activity decreases fecundity.

HOW THIS IS DIFFERENT THAN RELATED RESEARCH

Long-distance flight behavior of an insect is inherently difficult to observe and characterize. Flight mills provide a means to directly test developmental and physiological consequences of flight that cannot be obtained in field studies. Larval crowding is a well-known variable that affects WCR mortality and efficacy of most control tactics, and may increase dispersal behavior. The reproductive consequences of variable dispersal behavior may in turn have a significant influence on future larval densities in a colonized field. The results will have an immediate impact on modeling and other risk assessment efforts by industry, EPA, and university scientists.

MEMBER BENEFITS

Applications of improved understanding of dispersal behavior of WCR adults include

- Parameterizing resistance development models
- Refining resistance mitigation approaches.
- Data will inform risk assessment studies of future transgenic WCR-protected corn varieties.

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