

Research Thrusts

Use of Population/Quantitative Genetics to Determine Rate of Evolution of Genetic Traits

The development of undesirable genetic traits in insect and nematode pest populations can severely affect our ability to efficiently maintain pest numbers below economic thresholds. In fact, it is precisely the ability of pest populations to genetically respond to control measures that keeps agricultural science focused on developing new insecticides, new pest resistant plants, and other new control methods. In large part, it is this problem that has prevented the implementation of truly sustainable IPM programs.

To develop more sustainable agricultural systems, it is important that we gain new insight into the accumulation of undesirable genes in insect populations through use of quantitative genetic theory. With new information it may be possible to design a strategy for how to avoid or delay the development of undesirable genetic traits in insect populations.

Concern exists over ecological hazards if transgenic organisms are released into nature. Possible hazards include local extinction of species and disruption of community stability. Reduced viability might minimize possible adverse ecological effects. On the other hand, transgenic traits created in these organisms may instead have a beneficial effect on some aspect of mating or reproduction.

The Muir group has examined possible outcomes when a transgenic trait increases the mating success of males despite lowering the viability of transgenic offspring. The results predict that the release of a few transgenic individuals into a large population of wild types could result in local extinction of the species in relatively few generations if the transgenic trait simultaneously enhances male mating success and reduces offspring viability. They term this type of extinction the "Trojan gene effect" because the mating advantage provides a mechanism for the transgene to enter and spread in a population, and the viability reduction eventually dooms the population to extinction. Such a conflict between viability and male mating advantages has been theorized to be one of a number of possible conflicts that might serve as a mechanism of desirable genetic (or autocidal) biological control.

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