Current Projects on Biological Control of Pests of Fruit and Vegetables

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Note: work reported here is done cooperatively with Dave Ferro, Ron Prokopy, Ruth Hazzard, and Rolando Lopez.

Introduction

Biological control has significant potential for application against pests of fruit and vegetables because many (about 50% for vegetable pests in MA) are introduced pests, making the use of classical biological control very logical (Van Driesche and Carey, 1987). Barriers exist however to the implementation of biological controls for some of these pests. These barriers include: (1) Biological control projects require significant amounts of time, money and effort. This is true whether the crop is a major or minor one in terms of acreage. Some vegetable pests cannot be addressed through biological control in Massachusetts simply because we lack sufficient crop acreage at risk to justify the effort (e.g. pests of carrots). Some low acreage but high value crops, however, may still be suitable for the application of biological controls if their key pests are ones with high biological control potential (e.g. asparagus stem miners). (2) Pests which attack the eatable part of the crop (i.e., are direct pests) are often less suitable as targets for biological control because natural enemies may be unable to reduce pest densities low enough to completely resolve the problem (e.g. cabbageworm on cabbage but not on broccoli). In such cases, biological control may still be a significant part of a larger IPM system in which biological control is supplemented by microbial pesticides or other non-disruptive methods.

Current Projects in Massachusetts

1. Apanteles rubecula/imported cabbageworm. The Chinese parasite Apanteles rubecula was imported into MA in 1988 and established at a few locations in the state. It kills larvae of the pest, imported cabbageworm, earlier in the larval development and grown larvae. The parasite is, however, still very limited in its distribution and increasing the number of locations with established populations is one of the project's main goals at this stage. The Deerfield farm plot is the original release site for this parasite and the site of an ongoing study of the parasite's effect on the pest. Releases of laboratory-reared parasites were made at three additional farms in the CT River Valley this year.

2. Tarnished plant bug parasite introduction project. This project was started in 1990 by Dan Cooley and associates in the Department of Plant and Soil Sciences and I became involved this year to provide technical help in assessing results of colonization efforts made so far. The goal of project is to move a European species of hymenopteran parasite (Peristenus digoneutis) from PA (where the USDA has previously established it) to MA. Collections of parasitized bugs were made in PA in 1990 and 1991. Samples taken in 1992 suggest that the parasite may have established, as rates of parasitism at the Deerfield farm (by strawberry plots) were 40-60%, much higher than

the 10-30% rate expected from pre-existing native parasites. Proof of establishment has to wait till 1993 because samples taken this year are in diapause and must be reared through the winter to obtain adult specimens for identification.

3. Trichogramma ostrinae from China for ECB. This egg parasite of the European corn borer was collected in China from the Asian corn borer and released in MA in 1991 with the intent of establishing permanent populations (i.e. to use the species as a classical biological control agent). Dave Ferro recovered Trichogramma sp. parasites from sentinel eggs masses of ECB deployed at the release sites this spring, but species identifications are not yet available. Ruth Hazzard is also evaluating augmentative releases of this parasite.

4. Tachinid parasites of Colorado potato beetle larvae. Rolando Lopez, a Ph.D. student of Dave Ferro, has just completed a three year study aimed at better defining the importance of these flies as naturally occurring mortality agents of CPB larvae. Results indicate that in most years files kill 30-40% of CPB larvae on a generational basis, revealing them to be more significant than previously recognized.

5. Apple blotch leafminer parasite conservation methods. This study was done in 1989 and 1990 in conjunction with Ron Prokopy and is currently finishing the analysis and publication stage of the project. The goal of the work was to evaluate if Second Stage IPM methods in apples would improve the rate of parasitism of leafminers by native species of hymenopteran parasites, especially the eulophid wasp Sympiesis marylandensis, in commercial apple orchards throughout the state. In most cases, parasitism levels were higher in Second Stage IPM blocks, but only modestly so (4-8% over regular IPM methods). Reductions in leafminer populations in Second Stage blocks, however, were larger (about a 40% reduction compared to portions of growers orchards not near the Second Stage blocks).