## 3.4 INTRODUCTION AND RELEASING OF NATURAL ENEMIES

### INTRODUCTION, RELEASE, AND ESTABLISHMENT OF EUROPEAN *PERISTENUS* SPP. ON MIRID PLANT PESTS IN NORTH AMERICA

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The tarnished plant bug, *Lygus lineolaris* (Palisot), and western tarnished plant bug, *L. hesperus* Knight, important pests of numerous crops, are widely distributed east and west of the Rocky Mountains, respectively. The alfalfa plant bug, *Adelphocoris lineolatus* Goeze, a Palearctic species, infests alfalfa in the eastern U.S. and Canada. Native natural enemies attacking these pests are ineffective. Nymphal parasitoids of *L. rugulipennis* and *A. lineolatus* were imported from Europe. Candidates for control of the *Lygus* pests included two polyvoltine species, *Peristenus digoneutis* (Loan) and *P. stygicus* (Loan), and a univoltine species, *P. rubricollis* (Thomson). The latter and *P. adelphocoridis* Loan, another univoltine species, were candidates for control of *A. lineolatus*. Although earlier attempts to establish parasitoids were unsuccessful, intensive efforts in the 1980's resulted in the establishment of *P. digoneutis* in New Jersey. Successful biocontrol of *L. lineolaris* in alfalfa was achieved, and *P. digoneutis* had spread throughout much of the northeastern U.S. by 2000. Recent studies suggest that its action decreases damage by *L. lineolaris* in apples and strawberries. Beginning in 1998, *P. stygicus* and *P. digoneutis* were released in California, where both species became established. Though it is too early to claim successful biocontrol, substantial annual increases in parasitism were noted in 2000-2002. Both *P. rubricollis* and *P. adelphocoridis* were released against *A. lineolatus* in Delaware, but neither became established. Several years later, *P. conradi* Marsh, a thelytokous species closely resembling *P. rubricollis* (and presumed to have been released with it) was recovered at the release site.

### EFFICACY OF TRICHOGRAMMA EVANESCENS IN CONTROLING ERIAS INSULANA

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The field of *T. evanescens* in controling *E. insulana* was evaluated through releasing 50000 parasitoids/week in three consecutive releases during 2nd and 3rd generations of the pest. The result of releasing the parasitoid for one time was not tongible, while that of two releases helped to reduce infestation level from 8.8% to 6.3% and to 4.1% for three releases at the end of 2nd generation. At the end of generation, percentage of infestations reached 2.5% of the control. The results of both generations indicated that infestation level at the end of the season reached 14.1%, 4.7% and 2.5% for one, two and three consecutive releases in each generation.

### HOST SPECIFICITY CONSIDERATIONS IN THE IMPORTATION OF ARTHROPOD PARASITOIDS

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In classical arthropod biological control, a high level of host specificity in natural enemies is desirable and should be sought during foreign exploration. Potential environmental risks of evaluation of the ecological host range of arthropod biological control agents have usually seemed negligible, but recent concern about the impact on biodiversity and natural ecosystems of alien species has changed this opinion. In response to these concerns, field host and natural enemy surveys in the area of origin provide an opportunity to obtain information about the diversity of host species that live in different kinds of habitats and to assess the host ranges of their associated parasitoids. This information can then reveal much about the degree of host specificity that particular parasitoids in the area of origin might have. This information which would be logistically very difficult to obtain by laboratory testing, can provide initial guidance about which parasitoids might be specific enough to consider using as biological control agents for introduction into a foreign environment. On top of this, phylogenetic hypotheses for host and parasitoid groups can provide valuable insight when interpreting the significance of host range data. The use of ecological information obtained in habitats in the area of origin will reduce the number of native host species that must be tested under quarantine conditions prior release in the area of introduction. In addition, field surveys for target and non-target hosts in the proposed area of introduction are necessary to assess the diversity of host species present so that only appropriate non-target species will be collected in selected habitats and reared for testing in the laboratory.

### FOREIGN EXPLORATION FOR BIOLOGICAL CONTROL AGENTS: CURRENT ISSUES AND PROBLEMS

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Successful foreign exploration for biological control agents has traditionally been dependent on a variety of different factors. These include knowledge of the pest area of origin, matching of similar climates, taxonomic support and knowledge of pest and natural enemies, selection of appropriate genotypes or host races, pre-release efficacy evaluations and assessments of host range. A survey of recent programs of explorations resulting in successful introductions shows that these considerations remain important, but advances in molecular biology have given researchers new methods to address these questions. The need for accurate knowledge of host range has assumed even greater importance in recent years to meet the requirements for comprehensive risk assessments of off-target potential. At the same time, foreign explorers face many new operational difficulties in collecting and transporting biological control agents as new regulations have proliferated in recent years. In the past, importation regulations were largely concerned with ensuring protection against introductions of invasive species. This remains a key issue, but many additional regulations impact foreign exploration. These are the result of evolving concerns for biodiversity, endangered species conservation, and proprietary rights to genetic resources, and of enhanced levels of security during transportation and at the point of introduction. Close coordination between explorers, regulatory officials, air transport services and customs offices is now more important than ever before.