RESEARCH LABORATORY TECHNICAL REPORT

Biological Control

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Biological control, or biocontrol, is a method for managing pest populations and the damage they cause through the use of their natural enemies. The term “natural enemies” refers to organisms that provide suppression of pest populations and includes predators, parasitoids, pathogens, and competitors of the pest species. Effective biocontrol begins with an in-depth understanding of the biology and ecology of the pest species and the biocontrol agents being utilized. When this information is known, biocontrol can be a highly effective component of a larger integrated pest management (IPM) program. The primary types of biological control include classical, augmentation, and conservation.

Classical Biocontrol

Classical biological control focuses on the management of exotic pests. When these are introduced to a new geographic range, they may leave behind natural enemies that would keep the population in check within the native range. Natural enemies within the new range may provide some control, but when it is insufficient, researchers will attempt to identify natural enemies from the pest’s home range that could be introduced in the new area. Some intentional introductions have been successful while others have caused negative environmental side effects.

Augmentation Biocontrol

The Bartlett Tree Experts practices augmentation biological control. This aims to increase the population of naturally occurring natural enemies in a given area through the release of additional individuals. For augmentation to be effective, knowledge of the pest and natural enemy or enemies is required. These details include basic biology, interactions with each other and other organisms in the landscape, and environmental preferences and tolerances. Advanced planning and careful

Figure 1: Lacewing larvae (larger) feeding on aphids

monitoring to ensure the timely release of individuals is critical. Natural enemy species such as lacewing larvae, lady beetles, and predatory mites are known to provide pest suppression (Figure 1). Determining which enemy is appropriate for a given pest and environment is an important consideration in augmentation biocontrol (Figure 2). If the local environment can support the population, repeatedly introducing small numbers of a natural enemy may boost pest regulation throughout the season. Alternatively, releasing a large number of individuals at one time can rapidly reduce a pest outbreak. In both strategies, pest regulation is not permanent and multiple applications may be needed over time.

Figure 2: The predatory mite (red arrow), *Neoseiulus*, feeds on a preferred prey, spruce spider mites (white arrows)

Conservation Biocontrol

Conservation biological control refers to the preservation of existing natural enemies within a landscape. This focuses on creating and managing habitat to encourage recruitment and long-term persistence of natural enemies resulting in the continuous regulation of pest populations. Generally, habitats with greater plant diversity, density, and structural complexity (Figure 3A) are more likely to attract and support natural enemies than less complex landscapes (Figure 3B). Incorporating a variety of flowering species with different growth forms promotes the continued presence of natural enemies by providing food (nectar and pollen) and shelter. When they are necessary, it is also important to select and apply products with minimal negative impacts on beneficial species.

Biocontrol and Integrated Pest Management

Biological control is only one management tool within an IPM program. Proper cultural practices (e.g., irrigation, mulching, fertilization), mechanical and physical controls (e.g., removing diseased plant material), and the responsible use of chemical control are other critical elements. Balanced within the IPM framework, the use of biological control can provide an effective and environmentally sensitive approach to the management of landscape pests.

Figure 3: Residential landscapes with high (A) and low (B) plant diversity, density, and structural complexity

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