Integrated Pest Management (IPM): Biological Control (published 2024-09-14)
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This is part four of a multi-part series on Integrated Pest Management (IPM).

Biological control is an Integrated Pest Management (IPM) approach that seeks to minimize the impact of pests while reducing reliance on chemical pesticides. This method uses natural enemies of pests to control their populations, creating a more balanced ecosystem and sustainable agricultural practices.

Unlike chemical methods that directly kill pests, biological control methods aim to enhance or introduce natural organisms to keep pest numbers in check. The fundamental principle is to exploit the natural interactions between organisms to reduce the impact of pests. Biological control involves using natural predators, parasitoids, pathogens, or competitors to manage pest populations.

Predators are organisms that hunt and consume pests, and they control pest populations by reducing their numbers. Common predators used in biological control include ladybugs, lacewings, and predatory beetles. Ladybugs are effective against aphids, consuming large quantities throughout their lifespan. These predators can be introduced into crops where pests are prevalent, or they can be encouraged to thrive naturally by maintaining habitat diversity.

Parasitoids are insects that lay their eggs on or inside other insects. The developing larvae feed on the host, eventually killing it. This method is highly specific, targeting particular pest species while leaving other beneficial insects unharmed. An example of this is the braconid wasp, (*Cotesia congregates)* that targets the tomato hornworm (*Manduca quinquemaculata)*. These tiny wasps lay their eggs on the hornworm, which then hatch into larvae that feed on the inside of the hornworm. They then develop rice-like cocoons on its back, which not only kill the hornworm, but also lead to the development of the next generation of wasps.

Pathogens are microorganisms such as bacteria, fungi, or viruses that infect and kill pests. One well-known pathogen is *Bacillus thuringiensis (Bt),* a spore-forming bacterium that is harmful to various insect larvae. When applied to plants, *Bt* acts specifically against plant eating larvae (like caterpillars), reducing their numbers without impacting other organisms.

A common garden larvae that feeds on a variety of plants such as beans, broccoli and other brassica crops is the cabbage looper (*Trichoplusia ni*). When applied as a liquid spray the *Bt* is ingested by the insect during feeding. Once inside the caterpillar's digestive system, the *Bt* releases toxins, causing the caterpillars to stop feeding, and slowly starve to death.

Competitors are organisms that compete with pests for resources such as food or habitat. By introducing or enhancing the presence of these competitors, pest populations can be naturally suppressed. Homeowners with ponds or decorative water features often observe an increase in mosquito populations. An effective biological competitor for mosquito larvae is the Gambusia or "mosquito fish," (*Gambusia holbrooki*). These predacious pisces are very effective in reducing the mosquito larvae numbers before they take flight in search of a blood meal.

The benefits of using biological controls are obvious. They are generally more environmentally friendly compared to chemical pesticides. They help maintain ecological balance and biodiversity by targeting specific pests without harming beneficial organisms. They have the capacity to provide long-term pest management solutions. Once established, these natural enemies can provide ongoing pest control, reducing the need for continuous intervention.

Most importantly, the integration of biological control reduces reliance on chemical pesticides, minimizing potential negative impacts on human health and the environment. This reduction is especially crucial for managing pest populations in organic farming systems.

While biological control has many benefits, it also presents certain challenges. Many biological control agents are highly specific to their target pests. This means that introducing the wrong control organism can be ineffective or even detrimental. Therefore, careful research and selection are essential to ensure the appropriate match between the control agent and pest.

One of the most challenging aspects of biological control is that you are required to maintain a habitat that allows the control agent to become established and persist in the environment. It is important to emphasize that biological control is most effective when integrated with other IPM strategies, such as cultural and mechanical controls. Relying solely on biological control may not always provide adequate pest management, particularly in cases of severe infestations.

So, there's an overview of biological control methods that every home gardener can implement. While some aspects can be challenging, it is extremely rewarding to wean ourselves off of pesticides, and manage pests by partnering with Mother Nature. Until next time, keep workin' th' dirt!

Resources

"Integrated Pest Management (I.P.M.) for Cabbage Looper," https://hgic.clemson.edu/factsheet/integrated-pest-management-i-p-m-for-cabbage-looper/

"Tomato Hornworms in Home Gardens," https://extension.umn.edu/yard-and-garden-insects/tomato-hornworms

"Aphids and Their Management in Home Gardens," https://extension.unr.edu/publication.aspx?PubID=3230

"Eastern Mosquitofish, *Gambusia Holbrooki*, for Control of Mosquito Larvae," https://edis.ifas.ufl.edu/publication/FA202

For more information about gardening, visit UTHORT's YouTube site for helpful videos: https://www.youtube.com/channel/UCjS3d1IklH1OZ1Z2qPvhgfQ

Or Washington County's YouTube site: https://www.youtube.com/@utextensionwashingtoncounty

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