Science of Life Explorations

Biological Control and Beneficial Insects

IPM uses Biological Control
When is something a pest? A pest is what we call living things that are causing problems, such as insects or weeds in our garden.

Something that is a pest in our house, like ants, may not be pests outside. Sometimes, a pest is also something that is simply in the wrong place. When a ladybug is outside in the garden, we call it a beneficial. When it is in our house, is it a pest? We’ll talk more about that later.

Let’s review the IPM way of dealing with pests:

**IPM Step #1 - Learn to identify properly**

Before you decide you need to get rid of that bug you saw on your plant, make sure you know if it’s a pest or not.

Remember, some insects are good for our plants and gardens because they act as pollinators or they help reduce the insects that do cause harm. We call them BENEFICIALS.

**IPM Step #2 - Learn the life cycle and biology**

Because of the life cycle of pests, there is usually a time when your treatment will work best. If you treat at the wrong time, it may not work, and it may be a waste of time and money.

**IPM Step #3 - Sample and monitor the environment**

This means, don’t treat the pest until you are sure there are enough to be a problem. It’s important to know its lifecycle and biology and what other insects might be around. You may find a vegetable pest in your garden. Do you know if there are beneficial insects there also? Many pests have NATURAL ENEMIES that will help you reduce your pests. We are going to learn about them in this lesson.
IPM Step # 4 - Determine an action threshold

There are always going to be pests, like insects, diseases and weeds in and around your home and yard. When you have learned about the pest, you will also learn when to do something about them.

*Remember, you should not use pesticides. Only adults can use pesticides, and they should only use them when they have read the label carefully and have decided it is necessary.*

If you have learned about the pest you will know when you can ignore it or when you should act to control it. You will also have to decide how many you can TOLERATE. This is called TOLERANCE. Some insects can be pests at certain times of the year. When you understand the pest, you might know that although it is a problem now, it might be gone in a few days, if you wait. Do you have the tolerance to wait?

IPM Step # 5 - Choose tactics

The first TACTICS (actions) you consider should be the safest ones. Always think of the IPM pyramid. Use tactics from the green zone first (Go Safely).

For example: Don’t spray a bug when you can use a fly swatter!

or

Don’t treat the whole lawn when you only have grubs in one small area.

IPM Step #6 - Evaluate results

Keep track of what worked and didn’t work. If you always have problems with pests in the same place, at the same time every year, it’s time to make a change.
What is BIOLOGICAL CONTROL?

In all ecosystems, plants and animals have relationships with each other and the environment. For example, plants and animals are subject to attack by other living things. This helps controls their numbers.

One way we can use the natural process in nature to help us, is to encourage natural enemies of pests. Sometimes our actions reduce both BENEFICIAL and pest insects. Unfortunately the pest POPULATION usually increases faster than the beneficial population.

Some people think that all insects are pests. That’s not true. Let’s think about the important work insects do in our environment. Some insects help us by pollinating plants. Pollinators help plants in the process of reproducing or making new plants. Not only are more plants nice to look at and good for our environment, but they are the basis of our own food chain.

One reason insects are successful is because they are adaptable. Some even adapt to insecticides and become resistant to the effects of the insecticide. So we are going to learn about a way of dealing with pest insects called BIOLOGICAL CONTROL. This often helps farmers and gardeners use less pesticide.

What is a NATURAL ENEMY?

You know that honeybees are pollinators and so we call them beneficial insects. But a honeybee is not a natural enemy of other insects. Part of using biological control is learning about NATURAL ENEMIES.

Natural enemies are PREDATORS, PARASITOIDS* and PATHOGENS. We’ll learn about them one at a time. The important thing to learn is that some insects and organisms are enemies of pests and we can help them do their jobs. When this happens, we call it biological control. (* say para-sit-toyds)

Sometimes insects that are BENEFICIALS can become pests when they seem to be in the wrong places. We’ll learn about how sometimes helpful insects such as ladybugs and wasps can become pests. But remember - when we learn about and try to understand insects, we will see that most insects are helpers.

Now we’ll learn how biological control works!
What is a PREDATOR?

You probably have heard the word predator before. We often think of predators as large animals like lions or birds like hawks. But even tiny insects can be predators of other insects.

Two insect predators you should know are:
- the ladybird beetle (ladybug)
- the lacewing.

The larvae of these two predators hunt down and destroy garden pests!

Job Wanted: I will work in your yard, garden or field to reduce insect pests. I am a hard worker. I only ask that you provide me with a nice place to live: plants for shelter, water, and please use pesticides only when necessary. I will work quietly and efficiently, raise my family and invite my friends. Please hire me, you’ll be glad you did!
PARASITOID. Look up the word parasite in a dictionary or encyclopedia.

A parasite is: ____________________________________________________________

A parasite is usually not a very nice thing. But in the case of a parasitoid insect, this particular natural enemy is doing us a favor. A parasitoid insect usually lays its eggs on or inside a pest insect. As the egg hatches and the immature insect grows, it uses the pest insect as “room and board”. The pest is its HOST.

In this photo, small wasps called Trichogramma ostriniae lay eggs inside the egg masses of a pest (one of the worms you might find in an ear of corn). These tiny parasitoids help reduce pest populations.

Parasitoids are usually smaller than their pest “hosts”.

What is a PATHOGEN?
A pathogen is a disease causing ORGANISM such as some types of bacteria, fungi and virus. Many of these cause sickness in plants, animals and people. However, when they cause sickness in pests, they are helping us.

In this photo a fungus pathogen has attacked this aphid pest and killed it. This is an example of how some pathogens are natural enemies of pest insects and become helpers for us.
beneficials - insects and other organisms that help plants pollinate or help us reduce pests

biological control - the use of natural enemies of pests to reduce their numbers

ecosystem - a part of or all of the natural world in a particular area where all organisms coexist together

host - an insect or other organism that a parasite uses as food or shelter

imported - things that are brought in from another area or country because they don’t naturally occur there or are available there

integrated - using a number of different methods to find the best way to do something

IPM - The short way to say integrated pest management which means learning the best ways to treat, reduce or prevent pests before you act

natural enemies - insects, organisms or animals that act to reduce pests or maintain a population at a balanced level

organism - a living thing (can be a person, a plant, an insect, etc.)

parasitoids - insects that use other organisms as food for their young

pathogens - virus and bacteria that can cause sickness in animals and other organisms including insects

population - the general group or number of any organism or groups of organisms in an ecosystem

predator, predators - animals or other organisms that consume others in the food chain

tactics - the actions you plan and carry out to accomplish something

tolerance, tolerate - learning to accept things or people that you might not be comfortable with by learning about them
For Teachers and Parents:
Pg 1 Although the six steps of IPM have been introduced previously, it is important to review them again. As students gain knowledge of the natural world through these lessons, they will see how IPM uses that knowledge to make educated decisions. The goal of IPM is to find the best (safe, effective and economically sound) way to deal with pests. Remember, pests can be weeds, insects or plant diseases that are causing problems in our gardens, fields and homes. The first reaction to pests should not be reaching for a chemical.

Pg 2 These last three steps will be reviewed in more detail in this lesson. Students will have to consider the concepts of threshold and tolerance in a discussion of the Asian ladybeetle.

Pg 3 Biological Control describes how we as humans, use the predator - prey relationships naturally occurring in nature to assist us in reducing pests. Students should be familiar with the concept of predator and prey. A new concept will be the ideas of parasitoids (insects which parasitize or ‘use’ other insects) and pathogens. Parasitoids are insects that lay eggs on or in other insects or their eggs. When the egg hatches, they larva uses the host as a food source. Needless to say the pest does not fare well. Parasitoids are effective biological control. Pathogens are virus, bacteria and fungal diseases that cause illness and death in pests.

Pg 4 Two important predators are the lacewing and the ladybug. Lacewing adults are fragile looking, but their larvae are ferocious predators.

Pg 5 Pathogens can affect insects, mites, plants and animals as well as humans. Viruses, bacteria and fungi can all be considered pathogens; they are naturally occurring organisms. Pathogens are generally specific to a particular host, meaning one certain microbe may infect a particular group of insects but be harmless to others, including humans. One such bacteria is Bacillus thuringiensis, or Bt. This treatment for larval pests of cabbage crops has been used since the 1960s. It is sprayed or shaken onto plant material and causes illness and death in pests when consumed. Bacillus popilliae is a bacteria that affects Japanese beetles. This naturally occurring bacteria causes grubs to become white as they sicken, hence the common name milky spore disease. It can be purchased for lawn applications.