

How Many Pests Are There?

Lesson 3

“What should I do? I found a pest!” After finding an unwanted organism or disease in the greenhouse, it must be scientifically determined if action needs to be taken to manage the pest. Routine scouting for pests and monitoring their populations are the foundations for making your integrated pest management (IPM) plan successful. This lesson has students routinely scouting for pests they identified in the previous lesson. They will also have the opportunity to employ different monitoring techniques.

Suggested Level(s):

Grades 9-12

Subject(s):

Environment & Ecology; Science & Technology; Reading, Writing, Speaking & Listening

Standards:

Environment & Ecology

4.5 Integrated Pest Management

Science & Technology

3.7 Technological Devices

Reading, Writing, Speaking & Listening

1.8 Research

Skills:

Problem solving, Researching, Analyzing

Technology Connection:

Internet Resources, Spreadsheet/Database Software

Materials:

See “Getting Ready” section

Time Consideration:

Scouting and monitoring should take place at least once a week until plants are sold. Several weeks of scouting is needed to analyze data.

Objective(s):

Students will

- develop a scouting/monitoring system for a specific pest found in the greenhouse
- implement their scouting/monitoring system in the greenhouse and record appropriate data
- create a scouting report form using spreadsheet/database software
- analyze data they collect about their specific pest
- critique the scouting/monitoring system they used

Assessment Opportunities:

Have each student individually write up how they monitored for their specific pest and then analyze how that technique worked. Items to consider/include:

- Name of specific pest
- Biology/behavior of pest
- How they scouted/monitored this pest
 - Supplies needed, how set up, how often monitored, where monitored, information recorded
 - Provide sample scouting form
- Analyze if the monitoring technique they chose worked
 - What worked well with this technique
 - What would you change if doing it again
- Summarize what they learned about the pest, its population and effects on plant health during the monitoring time.

Background:

In order to produce high-quality crops, it is vital to detect pest problems early, before plants are severely injured. Scouting for pests and monitoring their population levels are important components of a successful IPM plan. Scouting is not something that happens only once. Greenhouse crops should be inspected at least once a week, more often if a pest problem is suspected. Scouting techniques used will depend on the pest species present but may include visually inspecting plants, sticky cards/traps, pheromone traps and baits. Not all plants are scouted. The size of the greenhouse will help determine the number of plants inspected. As a guideline, inspect plants randomly or in a zigzag pattern stopping in at least 10 spots for every 1,000 square feet.

Certain resources can make scouting for pests easier. A hand lens that had at least 10x power or greater is extremely useful when identifying small pests, observing for pest activity, and looking at plant damage. Colored sticky cards or traps capture flying pests for easier identification and can serve as a guide to monitor populations. Flagging tape can be used to mark areas that have a high pest population or to mark where biocontrols may be released. If pest species and/or plant samples are to be collected, vials, plastic bags, forceps, labels and a marking pen are useful. Knowing the minimum and maximum temperature in the greenhouse, the soil pH and the soluble salts in the soil is also valuable information to keep plants healthy and when trying to determine problems with crop plants.

All of the scouting information needs to be recorded on a scouting report sheet. The report should be filled out during every scouting experience. Thoroughly recording data and observations during scouting will lead to a better understanding of what is happening in the greenhouse and when pest management techniques need to be utilized. At the very least, the greenhouse temperature (min/max), plant health, growth and development, root health, number of pests on plants (include life cycle stage) and the counts from sticky cards should be recorded on the scouting report.

Using the data collected during routine scouting, population levels can be monitored. Over time, this information can be useful when determining the economic threshold (ET) for a specific pest. In some agricultural areas, ETs have been established for some pests, but many greenhouse crops do not have an established ET. The ET will be discussed in Lesson 4.

Getting Ready:

1. This activity can be done individually, in pairs, or in small groups depending on the number of students, what pests were discovered in the previous lesson, and the teacher's discretion. The lesson is written for groups.
2. Gather appropriate monitoring materials for specific pests found in the greenhouse. May include but not limited to: sticky cards (yellow, blue), hand lens (10x or greater), ruler, forceps, insect collecting vials, flagging tape, potato slices, blank paper (or scouting report form*), spoons to collect soil samples, plastic bags, pH meter, min/max thermometer.

* The lesson is written for the students to create their own scouting report form. If preferred, a template can be provided for the students and this step in the lesson can be eliminated.

Doing the Activity:

1. As a class:
 - Review the pests and diseases found in the greenhouse from the previous lesson. Discuss how the pests were found (scouting – under leaves, on stems, flying around, etc.).
 - Establish the general details that should be recorded each time the area is scouted (day, time, min/max temperature, location) and more specific details (plant sampled, name of pest found, number of plants sampled, number of pests found per plant, health of plant, injury noticed, etc.). Have students record this list on their blank paper. Be sure to emphasize cultural aspects that should be monitored as well (soil pH, gaps in doors/windows, vents, temperature, humidity, sanitation, water, greenhouse construction etc.)
2. Brainstorm possible ways to monitor for the pests found in Lesson 2. Recall pest biology, behavior, where it was found and other important notes.
3. ➤ Assign each group a specific pest to monitor. Using the Internet and other resources, students should research possible monitor techniques specific for that pest.

4. Have each group of students decide how they want to monitor for the pest they were assigned. They can use a technique they read about or you can provide the option of letting them design their own method. Students need to establish the specifics for monitoring their pest. Suggestions include:

- Supplies needed
- How are they going to monitor (ex. sticky card, potato slice, hand lens, etc.)
- Where are they going to monitor (ex. every plant, in a zig-zag pattern, hang sticky card or place in plant, observe only certain plants, etc.)
- When are they going to monitor (ex. every day, once a week, Tuesdays and Fridays at 3:00pm, etc.)
- What information needs to be recorded (add anything specific to their pest that wasn't in brainstormed list earlier)

5. ↩ Using spreadsheet/database software, each group should design their own scouting/monitoring form they can fill out and add data to each week. The scouting form should contain the items the class decided on and anything specific to the group's pest. The sheet should be printed and carried around during each monitoring session. Data can then be added into the computer to be tracked and analyzed on a regular basis.

6. Once the specifics of monitoring have been established, groups should set up their design and begin the monitoring process. Ideally, monitoring should occur at least once a week to detect problems early.

7. If any cultural or physical problems (hole in screen, gaps in door, etc) were noted on the monitoring sheet, discuss with class and teacher about addressing these issues. Implement any changes necessary and feasible.

8. As students monitor their plants, pests, and record data, they can track changes in pest populations and plant health and injury to the plant. Some plants may have more than one pest or problem affecting them. Some groups may have to work together when tracking the health of the plant.

9. Have each group present their monitoring technique to the class and provide a written description for classmates. In addition, each group should periodically update the entire class about their findings for their specific pest. The entire class should be kept up-to-date, perhaps 1-2 times per month, with happenings in the entire greenhouse.

Enrichment Activities:

1. Design a PowerPoint presentation to illustrate and share scouting results with the class. The presentation can then be made available for viewing on the school or class website.

2. Create an interactive, informative game about the pests in the greenhouse for lower grade levels. Game can be electronic or "hard copy" versions. Invite elementary and middle school teachers to use the game in their classes.

Reading Connection:

"IPM – Scouting and Monitoring for Pests in Commercial Greenhouses" by Mike Schnelle and Eric Rebek. Oklahoma Cooperative Extension, HLA-6711.

<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-1281/HLA-6711web2008.pdf> (accessed on 8/30/10)

“Help Me! Plant sensor could tell when your tomatoes are singing the blues” by Lorraine Chan with files from Jennifer Honeybourn. University of British Columbia Reports. Vol. 53 No. 9.

<http://www.publicaffairs.ubc.ca/ubcreports/2007/07sep06/07sep06.pdf> (accessed on 8/30/10)

“Integrated Pest Management for Greenhouse Crops” by Lane Greer and Steve Diver. National Sustainable Agriculture Information Service. <http://www.attra.org/attra-pub/gh-ipm.html#crop> (accessed on 8/31/10)