INTEGRATED PEST MANAGEMENT

Unit 2 Section 3 Lesson 9
Hopper Hunt

Focus Areas: Pest Control Methods - Cultural; Economics, Science, Math

Focus Skills: Conduct a scientific simulation, analyze and evaluate data

Level of Involvement: MAXIMUM

University of Connecticut
College of Agriculture and Natural Resources
Cooperative Extension System

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Objectives

* To understand the migration and the life cycle patterns of a key alfalfa pest, the potato leafhopper (PLH)
* To determine the economic threshold and the extent of economic injury levels
* To understand how the stage of crop development and other factors influence thresholds
* To determine a pest population by sampling technique
* To compare sampling results to the economic threshold and determine management action

Essential Question

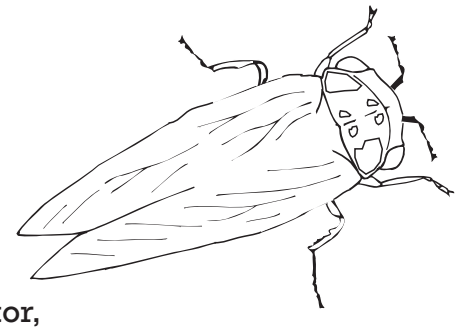
How do farmers determine when to institute pest control methods to crops?

Essential Understanding

Determination of when to use pest control methods is based upon mathematical calculations of pest populations and growth of crop.

Background

Read Background for Hopper Hunt



Adapted from *Hopper Hunt: IPM Decision-Making in Alfalfa* by E.G. Rajotte, Coordinator, Pennsylvania IPM Program. Used with permisiion.

Dedicated to Reducing Pesticides

IPM INTEGRATED PEST MANAGEMENT

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Unit 2 Section 3 Lesson 9: Hopper Hunt

Vocabulary

Economic Injury Level (EIL) the pest population density where the cost of control equals the value of the damage prevented if a control treatment is applied

Economic Threshold (ET) the EIL minus some portion of the pest density that accounts for reaction time of the farmer

forage food for animals, especially when taken by browsing or grazing

legume plants having fruits that are dry pods that split when ripe, such as beans and clover

profit income minus expenses. Therefore, profit can be increased either by increasing the income, decreasing the expenses, or both.

sampling a statistical procedure that allows the estimation of population density by counting only a portion of the population in a very structured way. Counting only a tiny portion of the population saves time and provides acceptably accurate population estimates for decision-making purposes.

Unit 2 Section 3 Lesson 9: Hopper Hunt

Challenge

Determine which fields of simulated alfalfa need pest control action taken!

Logistics

Time: 45 minutes
Group size: 4 to 30
Space: a classroom

Materials

Background for Hopper Hunt *

10 paper grocery bags

Supplement Hopper Hunt: IPM Decision-making in Alfalfa *

Handout 1 Potato Leafhopper Economic Threshold Chart for Established Stands of Alfalfa *

Handout 2 Potato Leafhopper Worksheet *

Handout 3 Directions for IPM Field Analysis and Assessment for Hopper Hunt Analysis *

Overhead 1 Example of Potato Leafhopper Analysis *

Overhead 2 Directions for IPM Field Analysis *

Supplement Field Crop Alert - Potato Leafhopper *

* single copy provided

Preparations

1. Make copies of the supplement Hopper Hunt: IPM Decision - making in Alfalfa for Bags A and B and cut out individual cards. The paper bags represent the alfalfa field (Bag A) and the number of PLH (Bag B). Each bag (field) will be sampled, so enough bags are needed to present several pest/crop scenarios. The bags can be decorated by drawing an alfalfa plant on the side.

Preparations (continued)

2. On the side of bag A indicate the projected price per ton that is expected for the alfalfa in that field. Also indicate the cost of an insecticide spray, if one should be needed, for that field.

3. Place 20 alfalfa height cards in Bag A and 20 number of PLH cards in Bag B. Staple each set of A : B prepared bags together.

4. Prepare either an overhead or individual copies of Handout 1 Potato Leafhopper Economic Threshold Chart for Established Stands of Alfalfa .

5. Make individual copies of Handout 2 Potato Leafhopper Worksheet and Handout 3 Direcions for IPM Field Analysis and Assessment for Hopper Hunt Analysis. (one worksheet for every two members of the group).

Activity

Introduction

1. Review the background information and vocabulary.

2. Inspect the decision tables and through directed questioning, lead the group to observe the trends in Economic Thresholds (Handout 1).

3. **As plant height increases, the Economic Threshold increases.** Younger plants are much more sensitive to insect damage. Damage to a young plant will significantly decrease the value of the plant (yield and quality) and reduce the farmer s income from that alfalfa field. Older plants can tolerate more insects and will not lose as much value, so older plants (=taller) have a higher Economic Threshold. In other words, the farmer can let PLH populations get to higher levels in older plants before he/she has to control them. In addition, the most cost-effective action against the pest may be early harvest if crop maturity is close enough .

Activity

Introduction (continued)

4. **As the price of alfalfa hay increases, the Economic Threshold decreases.** A given amount of damage by PLH to high priced alfalfa will decrease the value of the crop more than that same amount of damage to low priced alfalfa. The price of the hay is determined by the marketplace, so the farmer will have to guess what the price of alfalfa might be at the time he/she wants to sell it.

5. **As the cost of control (insecticide application) increases, the Economic Threshold increases.** In terms of profit, an expensive control cost can result in lower profit unless the value of the crop is also high to compensate for it. If the alfalfa price does not justify the high control cost, then the Economic Threshold is allowed to rise, allowing more PLH to exist in the field before action must be taken.

Involvement

Explain to group: to learn how this works, we will sample an alfalfa field and decide if we need to take action against PLH. Ideally, this exercise should be done in an alfalfa field in midsummer, but we are providing an alternative - The Paper Bag Alfalfa Field!

1. Form teams of two. One team member will do the sampling and the other will record data.

2. Distribute Handout 2 Potato Leafhopper Worksheet , Handout 3 Directions for IPM Field Analysis and Assessment for Hopper Hunt Analysis and a set of paper bags A and B to each team. Review directions.

3. The sampler retrieves a card from bag A and reads the number to the recorder, who records the number in the plant height column of the data sheet. Repeat five times.

4. The sampler reaches into bag B, pulls out one card and reads the number to the recorder, who records the number on the PLH portion of the worksheet. Repeat five times.

Involvement (continued)

5. Distribute Handout 3 analysis sheets or show an overhead of the same information. Check for understanding using Overhead 1 Example of Potato Leafhopper Analysis and Handout 1 PLH Economic Threshold Chart . Walk the group through the analysis:

   a) Compute means (averages) for both PLH samples and plant height samples.

   b) Based on average plant height, hay price and control cost, find the appropriate Economic Threshold in Handout 1.

   c) Compare mean PLH count obtained from the sample with the Economic Threshold.

   d) If the sample mean is equal to or greater than the Economic Threshold, then the farmer should apply an insecticide. If the sample mean is less than the Economic Threshold, then the farmer does nothing and should sample again next week.

6. Each team analyzes their results to determine if action is needed and writes their recommendation on the Potato Leafhopper Worksheet.

Follow Up

Discussion

As you can see, there is no hard and fast answer for how many pests are too many? The answer is always It depends! Discussions with participants can center around the variables that determine real-world decisions that impact farming.

1. Have each team describe their sampling results and ET comparisons.

2. Ask about what actions the farmer should take given the sampling results.

Discussion (continued)

3. How should the farmer s action change if: alfalfa hay prices rise/fall, insecticide prices increase/decrease?

4. What if the same sampling results were found in a younger/older crop?

5. In addition to pesticides, what other tactics can be used against PLH in an IPM program?

Assessment

Evaluate the teams analyses and recommendations.

Follow Through

Focus Area: Language Arts
Focus Skills: Interviewing techniques

1. Invite a local farmer or nursery owner, recommended by a Cooperative Extension agent, to speak to the group on the topic of methods he/she uses to determine pest intervention.

2. Allow time for a question and answer session.

3. Exchange bags (fields) and have groups repeat steps 1 through 4 of **Involvement** and analyze their results along with a recommendation.

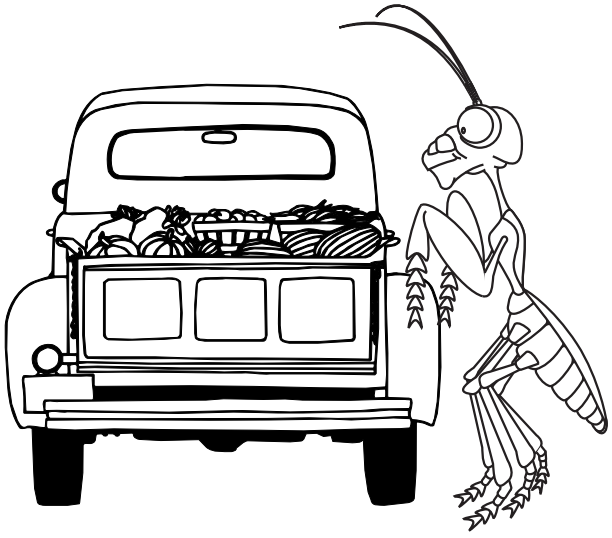
Unit 2 Section 3 Lesson 9: Hopper Hunt

Resources

Internet Websites

PA IPM web site: http://paipm.cas.psu.edu/

IPM in the Northeast: http://www.nysaes.cornell.edu/ipmnet/index.html



Unit 2 Section 3 Lesson 9: Hopper Hunt

Background for Hopper Hunt

Alfalfa is an important forage crop to the Northeast. As a deep-rooted perennial, alfalfa is very beneficial in farmers crop rotations. A legume, alfalfa can fix nitrogen (convert nitrogen from the air into nitrogen to be used by the plant as a nutrient) and thus is an important protein source for dairy cattle. Depending on the year and location, alfalfa can be cut 3 or more times per year.

The potato leafhopper is the most destructive insect of alfalfa in the northeastern United States. It causes significant yield losses, reduces alfalfa quality (especially protein content), and contributes to reduced longevity of stands. In new seedings, the pest can cause serious stand losses and weak plants.

The pest injures alfalfa plants by inserting its beak-like mouthparts into the cells that surround the phloem tissue and sucking out the cell contents. This causes the cells to swell around the phloem, pinching it shut and preventing carbohydrate movement in the plant. Injured plants are stunted and have yellow V shaped areas at the tips of leaves (hopperburn). In severely injured fields, plants may drop their leaves. Once plants are stunted by leafhoppers, they will not grow until after the alfalfa is cut.

Although potato leafhopper infestations can cause severe injury to alfalfa, only a percentage of fields need to be treated each year. Because of weather patterns and the population growth characteristics of the pest, very few fields have worrisome infestations in some years. Other years, these factors lead to severe infestations. This variation in threat by the pest makes it advantageous for farmers to scout their fields and determine the need for control. This exercise is designed to teach potato leafhopper scouting methods and how to determine if control is needed. In most crops, and most seasons, pest insect species that feed on the crop will be present at some point in the plant life cycle. However, just because the pest is present does not necessarily mean that the farmer needs to take action against the pest. How does the farmer know when the number of pests in his/her crop is too many? Is this number the same every year in all fields?

To help farmers decide when there are too many pests, the concept of the **Economic Injury Level** (**EIL**) is used. The EIL allows the farmer to compare the value of the damage the number of pests in the field might do to the crop with the cost of taking action against the pest. In other words, is the cost of taking action (e.g., spray) more or less than the value of crop lost to the pest if no action is taken? The point where the cost of control equals the value of loss is called the EIL.

Background for Hopper Hunt

There is one more concept that is important. Given that we can calculate the EIL, by the time the farmer determines that the pest population is approaching unacceptable levels and finds the time, equipment and help he/she needs to take action, the pest population has had a chance to exceed the EIL and eat into the farmer s profit. To account for this management lag, another measure, the **Economic Threshold** (**ET**), sometimes called the **Action Threshold**, has been calculated to account for the farmer s reaction time.

These thresholds are pre-calculated by researchers, so all the farmer has to do is take a proper sample of the pest to answer the question: Are we above or below the Economic Threshold for pest X?

To calculate Economic Threshold you must:

1. know how to identify the pest
2. know how to sample the crop environment to assess level of infestation
3. know stage of crop development and how that relates to severity of damage
4. know approximate economic threshold levels
5. consider how the action threshold may vary with the stage of crop development, value of the crop and the cost of control.

To learn how this works, we will use alfalfa as the crop and potato leafhopper (PLH) as the pest. In actual practice, from May until final alfalfa harvest in the fall, PLH are sampled using sweep nets.

Background for Hopper Hunt

To sample, the farmer walks across the alfalfa field sweeping the net in front of him/her, skimming the tops of the plants to catch PLH. The number of sweeps and walking direction is predetermined by the sampling protocol. The farmer opens the sweep net and counts the number of PLH in it. The farmer compares the number of PLH caught with the economic threshold value in a decision table (Handout 1). If the number of PLH in the net exceeds the Economic Threshold value, the farmer needs to take action against the pest. If the number in the net does not exceed the Economic Threshold, then the farmer does not need to take any action. This procedure is repeated periodically from the time PLH arrives from their hibernating area in the southern U.S. (usually in May) until the final harvest.

The decision tables containing the Economic Thresholds (Handout 1) allow a decision to be made under different conditions including various plant heights, prices of alfalfa hay per ton and costs of an insecticide application per acre. These conditions relate measures of crop value and control costs as they affect the profit derived from the alfalfa field. In general, farmers try to maximize profit.

Unit 2 Section 3 Lesson 9: Hopper Hunt

Handout 1

Potato Leafhopper Economic Threshold Chart for Established Stands of Alfalfa

Cost of an Insecticide Application Per Acre

Crop Value	$8.00	$10.00	$12.00	$14.00	$16.00	$20.00
Height Category I - 0 to 4 inches						
$60	0.4 PLH	0.5	0.6	0.7	0.8	1.0
$80	0.3	0.4	0.5	0.5	0.6	0.8
$100	0.3	0.3	0.4	0.4	0.5	0.6
$120	0.2	0.3	0.3	0.4	0.4	0.5
$140	0.2	0.2	0.3	0.3	0.3	0.4
$160	0.2	0.2	0.3	0.3	0.3	0.4
Height Category II - 5 to 8 inches						
$60	0.7 PLH	0.8	1.0	1.0	1.3	1.7
$80	0.6	0.6	0.8	0.9	1.0	1.3
$100	0.4	0.5	0.6	0.7	0.8	1.0
$120	0.3	0.4	0.5	0.6	0.7	0.8
$140	0.3	0.4	0.4	0.5	0.6	0.7
$160	0.3	0.3	0.4	0.3	0.5	0.6
Height Category III - 9 to 12 inches						
$60	2.0 PLH	2.4	2.8	3.0	3.9	5.0
$80	1.8	1.9	2.2	2.7	3.0	4.0
$100	1.2	1.5	1.8	2.1	2.4	3.0
$120	0.9	1.2	1.5	1.8	2.1	2.4
$140	0.9	1.0	1.2	1.5	1.8	2.0
$160	0.8	0.9	1.0	1.2	1.5	1.8

Unit 2 Section 3 Lesson 9: Hopper Hunt

Handout 2

Potato Leafhopper Worksheet

Sample Number	Plant Height	Number of PLH
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
Total	_____	_____
Average (total/5)	_____	_____

Price of alfalfa hay at harvest _____

Cost of insecticide application _____

Economic Threshold (from Handout 1) _____

Recommendation:

Overhead 1

Example of Potato Leafhopper Analysis

If the plant height is 10 inches and the five potato leafhopper (PLH) cards add up to 9.2, the sample average is 1.8 PLH. The value of the field (bag) is $140 and it will cost $16 to apply pesticides to control the leafhoppers. Refer to Handout 1 Potato Leafhopper Economic Threshold Chart for Established Stands of Alfalfa for the economic threshold.

Find the appropriate height category, in this case Height Category III, 9 to 12 inches. If the PLH sample mean is equal to or greater than the Economic Threshold (1.8 is equal to our average; therefore, the farmer should apply pesticides). The farmer is right at the Economic Threshold level in this example.

Unit 2 Section 3 Lesson 9: Hopper Hunt

Supplement

Hopper Hunt: IPM Decision-making in Alfalfa

Field 1. Write on outside of bag: "Value = $140.00, Pesticide Cost = $16.00"

Bag A

Field 1 Plant Height 7	Field 1 Plant Height 7	Field 1 Plant Height 8	Field 1 Plant Height 9
Field 1 Plant Height 10	Field 1 Plant Height 10	Field 1 Plant Height 10	Field 1 Plant Height 11
Field 1 Plant Height 11	Field 1 Plant Height 11	Field 1 Plant Height 12	Field 1 Plant Height 12
Field 1 Plant Height 12	Field 1 Plant Height 12	Field 1 Plant Height 13	Field 1 Plant Height 13
Field 1 Plant Height 13			

Bag B

Field 1 PLH # 1.5	Field 1 PLH # 1.5	Field 1 PLH # 1.6	Field 1 PLH # 1.8	Field 1 PLH # 1.8
Field 1 PLH # 1.8	Field 1 PLH # 1.9	Field 1 PLH # 1.9	Field 1 PLH # 2.0	Field 1 PLH # 2.0
Field 1 PLH # 2.3	Field 1 PLH # 2.7	Field 1 PLH # 2.7	Field 1 PLH # 2.9	Field 1 PLH # 3.1
Field 1 PLH # 3.3	Field 1 PLH # 3.7	Field 1 PLH # 3.8	Field 1 PLH # 3.9	Field 1 PLH # 4.0

Hopper Hunt: IPM Decision-making in Alfalfa

Field 2. Write on outside of bag: "Value = $60.00, Pesticide Cost = $20.00"

Bag A

Field 2 Plant Height 8	Field 2 Plant Height 8	Field 2 Plant Height 9	Field 2 Plant Height 9	Field 2 Plant Height 9
Field 2 Plant Height 9	Field 2 Plant Height 10	Field 2 Plant Height 10	Field 2 Plant Height 10	Field 2 Plant Height 10
Field 2 Plant Height 11	Field 2 Plant Height 11	Field 2 Plant Height 11	Field 2 Plant Height 11	Field 2 Plant Height 11
Field 2 Plant Height 12	Field 2 Plant Height 12	Field 2 Plant Height 12	Field 2 Plant Height 13	Field 2 Plant Height 13

Bag B

Field 2 PLH # 3.7	Field 2 PLH # 3.9	Field 2 PLH # 3.9	Field 2 PLH # 4.2	Field 2 PLH # 4.3
Field 2 PLH # 4.6	Field 2 PLH # 4.7	Field 2 PLH # 4.9	Field 2 PLH # 4.9	Field 2 PLH # 5.0
Field 2 PLH # 5.0	Field 2 PLH # 5.1	Field 2 PLH # 5.3	Field 2 PLH # 5.5	Field 2 PLH # 5.5
Field 2 PLH # 5.8	Field 2 PLH # 5.8	Field 2 PLH # 6.0	Field 2 PLH # 6.1	Field 2 PLH # 6.3

Unit 2 Section 3 Lesson 9: Hopper Hunt

Supplement

Hopper Hunt: IPM Decision-making in Alfalfa

Field 3. Write on outside of bag: "Value = $80.00, Pesticide Cost = $14.00"

Bag A

Field 3 Plant Height 1	Field 3 Plant Height 1	Field 3 Plant Height 1	Field 3 Plant Height 1	Field 3 Plant Height 1
Field 3 Plant Height 1	Field 3 Plant Height 1	Field 3 Plant Height 2	Field 3 Plant Height 2	Field 3 Plant Height 2
Field 3 Plant Height 2	Field 3 Plant Height 3	Field 3 Plant Height 3	Field 3 Plant Height 3	Field 3 Plant Height 3
Field 3 Plant Height 4	Field 3 Plant Height 4	Field 3 Plant Height 5	Field 3 Plant Height 5	Field 3 Plant Height 6

Bag B

Field 3 PLH # 0.1	Field 3 PLH # 0.1	Field 3 PLH # 0.2	Field 3 PLH # 0.2	Field 3 PLH # 0.2
Field 3 PLH # 0.3	Field 3 PLH # 0.3	Field 3 PLH # 0.3	Field 3 PLH # 0.3	Field 3 PLH # 0.4
Field 3 PLH # 0.4	Field 3 PLH # 0.4	Field 3 PLH # 0.5	Field 3 PLH # 0.5	Field 3 PLH # 0.5
Field 3 PLH # 0.5	Field 3 PLH # 0.6	Field 3 PLH # 0.6	Field 3 PLH # 0.7	Field 3 PLH # 0.8

Unit 2 Section 3 Lesson 9: Hopper Hunt

Supplement

Hopper Hunt: IPM Decision-making in Alfalfa

Field 4. Write on outside of bag: "Value = $100.00, Pesticide Cost = $8.00"

Bag A

Field 4 Plant Height 4	Field 4 Plant Height 5	Field 4 Plant Height 5	Field 4 Plant Height 5	Field 4 Plant Height 5
Field 4 Plant Height 6	Field 4 Plant Height 6	Field 4 Plant Height 6	Field 4 Plant Height 6	Field 4 Plant Height 6
Field 4 Plant Height 7	Field 4 Plant Height 7	Field 4 Plant Height 7	Field 4 Plant Height 7	Field 4 Plant Height 7
Field 4 Plant Height 8	Field 4 Plant Height 8	Field 4 Plant Height 8	Field 4 Plant Height 9	Field 4 Plant Height 9

Bag B

Field 4 PLH # 0.1	Field 4 PLH # 0.2	Field 4 PLH # 0.2	Field 4 PLH # 0.3	Field 4 PLH # 0.3
Field 4 PLH # 0.3	Field 4 PLH # 0.4	Field 4 PLH # 0.4	Field 4 PLH # 0.4	Field 4 PLH # 0.4
Field 4 PLH # 0.4	Field 4 PLH # 0.4	Field 4 PLH # 0.4	Field 4 PLH # 0.5	Field 4 PLH # 0.5
Field 4 PLH # 0.5	Field 4 PLH # 0.5	Field 4 PLH # 0.5	Field 4 PLH # 0.6	

Unit 2 Section 3 Lesson 9: Hopper Hunt

Supplement

Hopper Hunt: IPM Decision-making in Alfalfa

Field 5. Write on outside of bag: "Value = $160.00, Pesticide Cost = $16.00"

Bag A

Field 5 Plant Height 4	Field 5 Plant Height 4	Field 5 Plant Height 5	Field 5 Plant Height 5	Field 5 Plant Height 5
Field 5 Plant Height 6	Field 5 Plant Height 6	Field 5 Plant Height 6	Field 5 Plant Height 6	Field 5 Plant Height 6
Field 5 Plant Height 7	Field 5 Plant Height 7	Field 5 Plant Height 7	Field 5 Plant Height 7	Field 5 Plant Height 7
Field 5 Plant Height 8	Field 5 Plant Height 8	Field 5 Plant Height 8	Field 5 Plant Height 9	

Bag B

Field 5 PLH # 0.3	Field 5 PLH # 0.3	Field 5 PLH # 0.4	Field 5 PLH # 0.4	Field 5 PLH # 0.4
Field 5 PLH # 0.5	Field 5 PLH # 0.5	Field 5 PLH # 0.5	Field 5 PLH # 0.5	Field 5 PLH # 0.5
Field 5 PLH # 0.6	Field 5 PLH # 0.6	Field 5 PLH # 0.6	Field 5 PLH # 0.6	Field 5 PLH # 0.6
Field 5 PLH # 0.7	Field 5 PLH # 0.7	Field 5 PLH # 0.7	Field 5 PLH # 0.8	Field 5 PLH # 0.8

Unit 2 Section 3 Lesson 9: Hopper Hunt

Names _____ **Handout 3**

Directions for IPM Field Analysis

1. To determine the pest infestation in your field :

   A. Determine the height of your alfalfa crop by drawing **5 cards from bag A.** Record the height on the Potato Leafhopper Worksheet.

   B. Sample the pest population infesting five areas of your alfalfa field by drawing **5 cards from bag B.** Record the numbers of pests on the Potato Leafhopper Worksheet.

2. To determine if action is needed in your field :

   A. Find the average plant height (add the numbers in the Plant Height column and divide by 5).

   B. Find the average for pest infestation (add the numbers in the PLH column and divide by 5).

   C. Check the crop value and cost of pesticide use on Bag A.

   D. Using Handout 1, PLH Economic Threshold Chart, determine the economic threshold (ET):

      1) Find the height category that matches the average height of your plants.

      2) Find the value of your crop within this height category. Highlight with a horizontal line.

      3) Find the cost of pesticide application that matches the dollar value on Bag A. Highlight with a vertical line.

      4) Compare the average obtained in step 2A to the number at the intersection of D2 and D3. If the number calculated in step 2A is equal or greater than the number given at the intersection of D2 and D3, action is needed!

      5) Based on your findings, write a recommendation for pest control in this field.

      6) Review the assessment to make sure you complete all necessary components of the evaluation. Hand your work in on time.

Unit 2 Section 3 Lesson 9: Hopper Hunt

Handout 3

Assessment for Hopper Hunt Analysis

	Possible Points	Points Earned
1. The statistical data is complete.	15	_____
2. The statistical data is neatly presented.	5	_____
3. The mathematical calculations for analysis are accurate.	20	_____
4. The mathematical calculations for analysis are neatly presented.	5	_____
5. The mathematical calculations for analysis are complete.	15	_____
6. The recommendation for action accurately reflects the mathematical analysis.	20	_____
7. The recommendation is clearly presented.	10	_____
8. The recommendation is complete.	10	_____

Total: _____

Unit 2 Section 3 Lesson 9: Hopper Hunt

Overhead 2

Directions for IPM Field Analysis

1. To determine the pest infestation in your field :

   A. Determine the height of your alfalfa crop by drawing **5 cards from bag A.** Record the height on the Potato Leafhopper Worksheet.

   B. Sample the pest population infesting five areas of your alfalfa field by drawing **5 cards from bag B.** Record the numbers of pests on the Potato Leafhopper Worksheet.

2. To determine if action is needed in your field :

   A. Find the average plant height (add the numbers in the Plant Height column and divide by 5).

   B. Find the average for pest infestation (add the numbers in the PLH column and divide by 5).

   C. Check the crop value and cost of pesticide use on Bag A.

   D. Using Handout 1, PLH Economic Threshold Chart, determine the economic threshold (ET):

      1) Find the height category that matches the average height of your plants.

      2) Find the value of your crop within this height category. Highlight with a horizontal line.

      3) Find the cost of pesticide application that matches the dollar value on Bag A. Highlight with a vertical line.

      4) Compare the average obtained in step 2A to the number at the intersection of D2 and D3. If the number calculated in step 2A is equal or greater than the number given at the intersection of D2 and D3, action is needed!

      5) Based on your findings, write a recommendation for pest control in this field.

      6) Review the assessment to make sure you complete all necessary components of the evaluation. Hand your work in on time.

IPM Resources - Penn Jersey Field Crop Alerts

PENN JERSEY EXTENSION PARTNERSHIP

Field Crop Alert

POTATO LEAFHOPPER

Adults

Nymph

Damage

Description: Adult - small (1/8" to 3/16"), wedge-shaped, winged insect that jumps when disturbed Nymph - wingless, light yellow, walks sideways

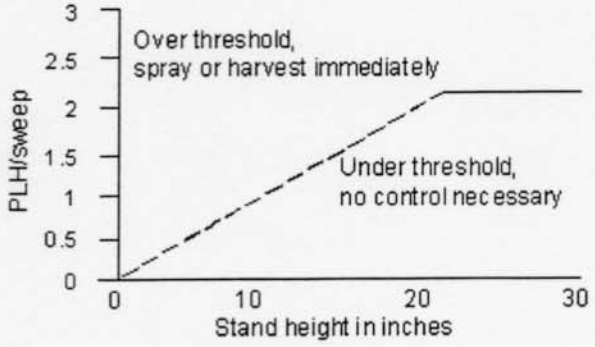
Damage: Leafhoppers cause severe stunting of plants and yellowing or reddening of foliage. Damage starts in wedge-shaped areas of leaf tips. Note: Boron deficiency, "yellow-top", has similar symptoms. Entire leaves at the top of the plant turn yellow or yellow-red in response to boron deficiencies.

Life Cycle: Leafhoppers have 3-4 generations per year and migrate into New Jersey and Pennsylvania in late May and early June. They primarily effect new spring seedings and 2nd and 3rd cuttings.

Scout: Begin scouting new seedings around June 1st or when the plants are about 3" tall. Scout 2nd and 3rd cuttings when regrowth is 2-3" high. Scout all fields weekly until they reach threshold and are sprayed or 10 days before harvest. Using an insect sweep net, sweep the alfalfa field at five different sites in a "U" pattern. Complete twenty sweeps at each of the five sites. Sweep 3-4" below the tops of the plants. Avoid windy and rainy days. Count only pale green leafhoppers. Divide the total number of insects found in the 100 sweeps by 100 to obtain the number of leafhoppers per sweep.

Before using any pesticide, always read the label. Use pesticides only at the recommended time and rates. Where trade names are used, no discrimination or endorsement is implied.

For a complete list of pesticides, check the current Agronomy Guide.



What to Use - Recommended Insecticides Apply one of the following:
(revised 6/01)

INSECTICIDE	FORMULATION AND RATE PER ACRE	DAYS WAIT BETWEEN APPLICATION AND HARVEST
Ambush*	2EC – 3.0 to 6.0 fl oz	0
Baythroid*	2E – .8 to 1.6 oz	7
Cygon*	4E – ½ to 1 pt	10
Furadan*	4F – 1 to 2 pt	14-28
Lorsban*	4E – 1 to 2 pt	1 pt – 14/above 1 pt – 21
Malathion	57EC – 1 qt	0
Pounce*	3.2 EC – 4 fl oz	0
Sevin	50 WP – 2 lb	3
Warrier*	1EC – 1.9 to 3.2 fl oz	7

* Restricted-use pesticide

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06/01

University of Connecticut
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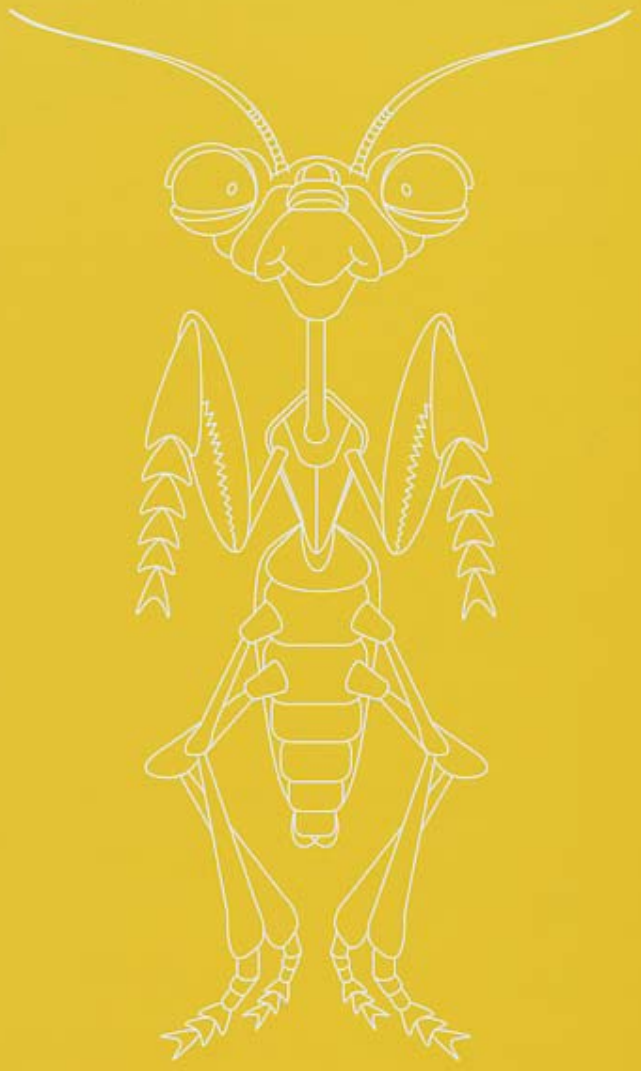
Cooperative Extension System

IPM
INTEGRATED PEST MANAGEMENT



"Hopper Hunt"
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"Field Crop Alert: Potato Leafhopper"
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