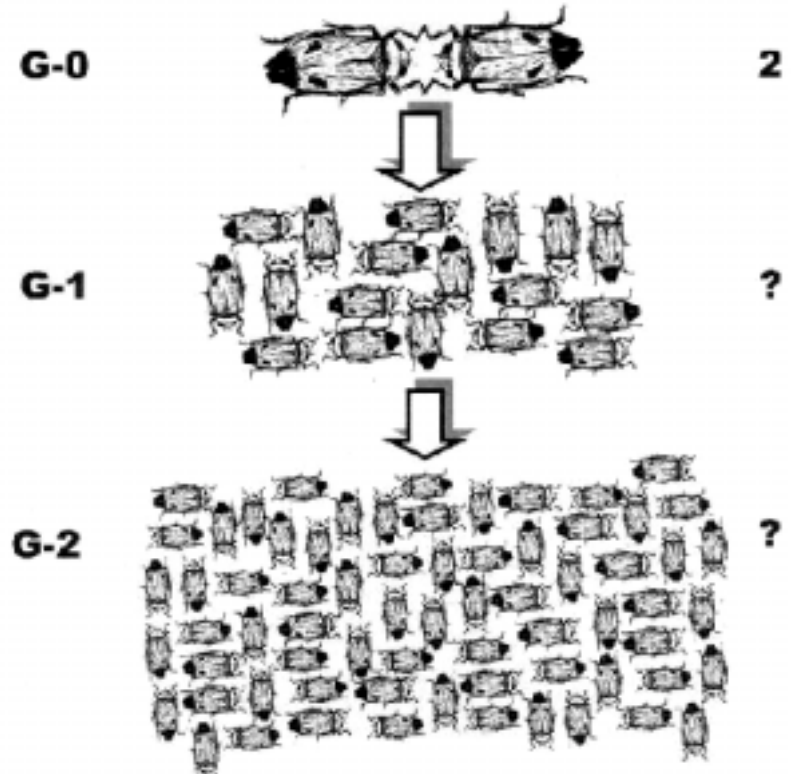


INSECT POPULATION GROWTH

Background

Insect population growth is affected by many factors. These could be genetic factors, food supply (quantity, quality, access), weather, natural enemies, and farming practices.

Normally, more than 98% of insects die before they reach maturity due to controlling factors in the ecosystem. This is important because insects have an extremely high capacity to reproduce and would consume a rice field within a short period of time without such natural controls.



Assuming there is sufficient food in the environment, what are the most basic biological factor that determine the growth of a population of any insect?. We will use a “Biological Model” to investigate this question of biotic potential. A model is a simple representation the employs a few simplifying assumptions.

Objective

We should be able to understand the relative level of controlling factors at work in the rice field to prevent large outbreaks of pest insects.

Times: 120 minutes.

Materials: Large seeds (like bean), large paper.

Procedures

□ Preparation

Start the discussion by asking:

- How many species of potential pest insects have we found in the rice field?
- How many eggs can be produced by one female during her lifespan?
- How long does it take from egg to adult for this species?
- Why do we not find populations of these insects in the field as high as these numbers seem to indicate?

□ Action

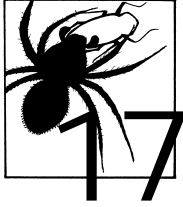
- Small groups should be given a potential pest insect to analyze
- Each group should write down the information about the lifecycle and reproduction characteristics of their insect
- Give each small group a supply of seeds
- Starting with the first generation “0” of two insects, have the groups calculate the number of insects in the next 4 generations based on their reproduction characteristics and the time it takes for this to happen. Let each seed represent one insect. Make a graph of the population increases. Calculate the weight of the population in the 4th generation if each insect weighed 0.1 grams. Compare this to the potential rice production.

□ Discussion

- Why can you not find the same level of insects that you have calculated using your seeds? What are all the factors responsible for preventing the population from reaching such high levels?
- What happens if one factor is missing? What if more than one factor is missing? How do pest explosions happen? How can they be prevented?
- What management practices can have an impact on this?
- How does resurgence happen after spraying for pest insects?

□ Follow up

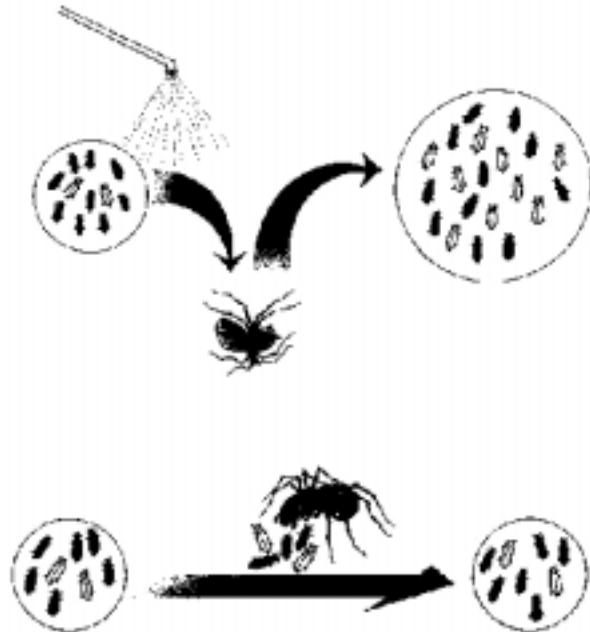
- Rear egg masses of stemborers in an insect zoo. Note what emerges.



RESURGENCE AND RESISTANCE MECHANISM

Background

At any one time in the rice field, it is possible to find all life stages of a particular insect pest. Natural enemies keep these insect pests in control, often with different natural enemies attacking each different life stage of the pest. Although all the insects of one species in the field may appear the same, each one has a different genetic makeup. This makes some insects more or less affected by various environmental qualities / characteristics.



The phenomena of insecticide, induced pest resurgence by brown planthopper (BPH) is based on the fact that early season sprays and granular application of insecticide kill off most of the hundreds of species of natural control agents. While not effecting BPH eggs that remain protected inside the plant. Then, some days later, the young BPH nymphs emerge into an environment that is visually free of mortality factors.

Objectives

We should be able to understand the mechanisms by which both resurgence and resistance occurs and discuss ways to prevent it.

Times: 120 minutes

Materials: Round pieces of paper of various colors. Ruler, large paper, marker pens.

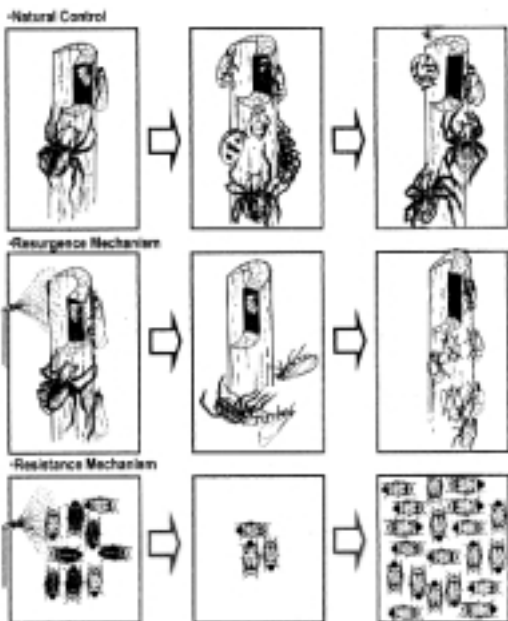
Procedures

□ Preparation

Start by opening the discussion with the following question:

- What do the difference between resurgence and resistance?
- How can the use of pesticides result in resurgence of insect pests?
- How do resistant varieties of rice lose their qualities of resistance?

□ Action



- Make a format with three columns and three rows on a large piece of paper. Put the round pieces of colored paper in the first column, first row. The red color represents BPH adult. Green color is the nymph. The yellow color is the eggmass. Black color paper represents spiders.

- Discuss what happens in the second column, first row after one week of interaction between the BPH and spiders. (Eggs become nymphs, nymphs become adults and spiders eat the adults) Continue to the third column after the second generation.

- In the Second row, first column, put the same organisms as column one row one. Use pesticides to control adult and nymph. Analyze what happens after one week, in the second column. Analyze after

the second generation in the third column.

- In the last row, first column do the same as the first row but assume that red BPH are resistant to pesticide but the green color BPH are susceptible to pesticides. The yellow color BPH can easily feed on all varieties of rice. Use pesticide. Analyze what happens in column two and column three after one and two generations.

□ Discussion

- Explain how resurgence happens.
- Explain how resistance occurs.
- What is the impact of pesticides on secondary pest populations?
- Can you explain how a "pesticide cycle" is created?
- How you observed these occurrences in your area.

□ Follow up

Make another model to explain resurgence, resistance and secondary pests. Make a role play.

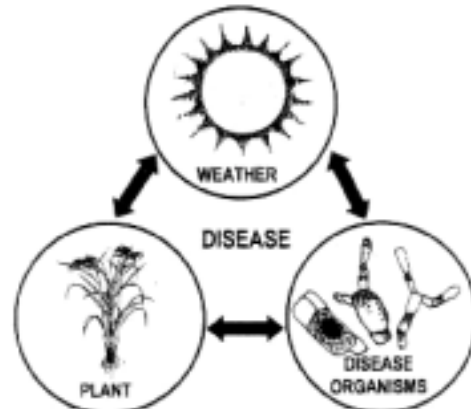


WEATHER, AGRONOMIC PRACTICE AND EFFECT ON DISEASE

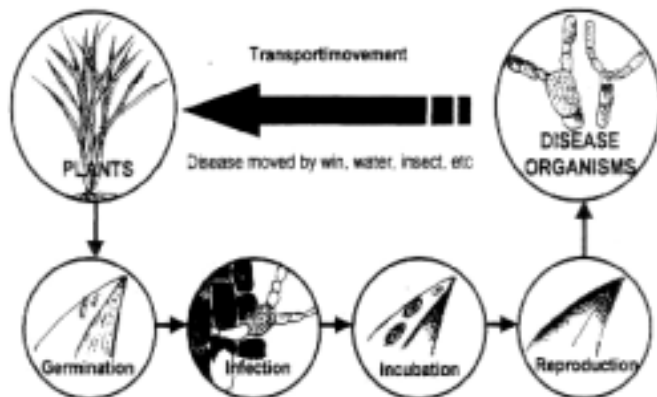
Background

Disease organisms for plants include bacteria, fungi, virus and nematodes. Actually the meaning of disease is the interaction among plants, pathogens (disease organisms), and the environment. Weather and agronomic can effect the processes of the disease cycle in the following ways:

- Transport/movement: Disease organisms move to plant (host).
- Germination: Is mostly determined by the availability of an appropriate host.
- Infection: Success and failure of infection may depend on the growth rate of the disease organisms in relation to the defense rate of the host plant.
- Incubation: The time required for an infection to cause a symptom.
- Inoculum development/reproduction: Production of fruiting bodies on fungi can be a function of temperature, sunlight and relative humidity.



PROCESSES OF THE DISEASE CYCLE



Objective

We should be able to explain the effects of weather and agronomic practice on disease.

Times: 120 minutes.

Materials: Paper, marker and book that contain rice disease.

Procedures

□ Preparation

Open discussion by asking:

- What is the meaning of disease?
- How can disease organisms attack the plant?
- How is the plant damaged by disease?

□ Action

- Choose a major disease (each small group choose a different disease)
- On large piece of paper, make three columns. On first column write disease process, the second column write effect of weather and the third column write effect of agronomic practice?
- Discuss in the small group to answer and complete the second and third columns. Find the answer in the book.
- Present our finding to the group.

□ Discussion

- How can the plants be damaged by disease?
- What kind of ecosystem components have an impact on disease process

□ Follow up

- Collecting disease symptom.



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