# The Farmer in the Lab

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| Time | Grade Level | Content Area (s) |
|---|---|---|
| Four weeks | Grade 5 | Life Science |

## Objective

Students will explore the development of pest-resistant varieties of wheat.

## Activity Outline

1. Make cages to contain aphids by following the steps below:
   a. Remove the label from the pop bottle
   b. Use scissors to cut off the top and bottom area of the bottle to form an open-ended cylinder
   c. Cut two 4-5 cm diameter holes on opposite sides of the plastic bottle to allow for ventilation
   d. Cover the side and top holes with voile and attach the voile using a hot glue gun

### Materials

- Seed of a resistant variety of wheat (Largo was used in this example)
- Seed of a susceptible variety of wheat (Amigo was used in this example)
- Locally important crop pest (Greenbug Biotype E aphids were used in this example)
- Pots
- Potting soil
- Grow lights
- Watercolor paint brushes
- Crushed ultra voile
- Hot glue gun/hot glue
- Scissors
- Utility knife
- Recycled pop bottles

**Note:** Seeds can be sourced online or locally from a science supply, nursery, or seed supply company.

2. Divide students into pairs. Each pair will plant five Amigo and five Largo seeds in equal-size pots. They should be planted 2.5 cm below the top of the soil and 6 cm apart under grow lights and identical conditions. Two pots of each variety will act as controls and will not receive the aphid treatment. Pots should be labeled with the type of seed variety planted. Different seed varieties should be kept separate in different pots.

3. Students will water the plants every three days with equal amounts of water. They should record the height of the wheat plants and qualitative observations in their science notebooks. When the plants reach 12 cm in height, place two aphids on each wheat plant using a watercolor paintbrush. Use the "cages" from the recycled pop bottles to cover the plants and keep the insects contained. Ensure that the bottom opening of the cage is firmly placed in the soil to prevent aphids from escaping. Students should continue to make qualitative observations concerning the health of the plant for three weeks. Continue to water at intervals but refrain from picking up the cages to do so.

4. Count the total aphid population following three weeks of infestation by collecting the aphids with a small paintbrush and brushing them into a petri dish. An average of the aphid counts on both varieties of wheat will pinpoint which wheat variety supports larger aphid populations. Students can infer from the number of aphids on the two wheat varieties that one seems to have fewer aphids and look healthier.

5. Students note the striking differences (both measured and observed) between the two wheat varieties. Help students understand that the natural resistance of the plant can be determined by counting the number of aphids on the wheat plant; the resistant plants will have smaller aphid populations. Discuss which variety may be a better choice for a farmer to plant and why the choice helps with crop protection and production.

6. Students graph the aphid populations found on the two wheat varieties based on the pooled class data and make conclusions and inferences based on their graph.

## Goals

Students will better understand problems faced by farmers and understand how local problems may affect global food supplies.

## Formative Assessment

Students recorded the growth and health of the wheat plants in a journal. This helped students realize the importance of detailed data collection. Classroom discussion revealed what students understood and what needed further explanations.

## Post Assessment

In an essay question, ask students to explain why wheat varieties could be used in a pest management system. Students should also define the control variable, independent variable, and dependent variable in this investigation.

## Background Info for Teachers

GBE (Greenbug Biotype E) is a serious perennial pest on much of the wheat grown in the United States. It damages the wheat with its piercing, sucking mouthparts and toxic saliva. Largo wheat is resistant to GBE, which means it shows little to no damage after infestation. Amigo wheat, however, will be severely damaged and may even die within two weeks of infestation.

## Internet Resources

Sources for wheat seeds:

*www.ufseeds.com/product/winter-wheat-seeds/*

*www.johnnyseeds.com/farm-seed/grains/wheat/*

*https://hancockseed.com/products/wheat-seed-50-lb-bag*

*www.territorialseed.com/category/s?keyword=wheat*

## Safety

As a safety precaution, the teacher should make the cages because sharp scissors or utility knives and hot glue guns are required.

Check for allergies before bringing any food into the classroom. Students must wash hands thoroughly after working with potting soil.