Reproduction in soybean aphids

Teacher lesson plan – part 1

Reproduction in soybean aphids

Lesson description: In this lesson, students will collect data with live specimens (or alternate data images) of soybean aphids on two different leaf samples to practice science skills. They will use their observations to create a claim about the reproduction of aphids based on the evidence. They will use other resources to support their learning about the concepts of sexual versus asexual reproduction and how reproduction affects their survival as a species.

Time: 5-7 class periods

Grade Level: 6th-8th grade

Materials

Soybean aphids, 3 per leaf
Live specimens*

a. Soybean aphids will not jump or travel to people, belongings, or fabrics. They cannot survive away from a soybean leaf and will perish. There is no need to worry about infestations in the classroom.
b. Use caution to make sure specimens stay in the dishes on the leaves. Use a small paint brush or something similar to move or rescue a lost aphid.
c. At the end of the trials, place aphids, leaves, and petri dishes in a sealable bag in the freezer for a couple of days and then discard.
d. Encourage using cameras to zoom in and take photos/videos of the aphids. Specimens can also be placed onto a microscope or field microscope or jeweler's loupe.

*If you are unable to get live specimens, use the digital and printable photo data cards.

Digital and printable photo data cards**

**If you are using the cards, feel free to collect data each day, as with the live data, but you can also consolidate data collection by collecting multiple days at once.

Paper towels (or circular filter paper)

a. Folded and moistened to provide moisture to the leaves

Petri dishes, 2 per table
Rag1 soybean leaves, 1 per table
Non-resistant soybean leaf, 1 per table
Wax tape (i.e. ParaFilm)

a. Enough to close around a dish to secure it and enough to replace these daily

Printable **Student data** sheet
Optional

Microscope or field microscope
Jeweler's loupe
Cell phone (light and camera)

Objectives/Targets

- Students will demonstrate knowledge of the differences between sexual and asexual reproduction.
- Students will understand the life cycle of soybean aphids.
- Students will understand how soybean aphids cause problems to soybean plants.
- Students will be able to apply this knowledge by using the data obtained to determine how soybean aphids reproduce.

Vocabulary: asexual reproduction, sexual reproduction, offspring, traits, parent

Prior Knowledge

Students should know that reproduction leads to the passing on of genetic material from parent to offspring and is the mechanism for species to continue and adapt.

5E Plan

ENGAGE (15 minutes)

Materials

*5 beads/beans per partner of students
Additional supply of beans, ~100 for each partner
*Alternatively, students could draw models on paper.

1. Ask students to pair two beads/beans and suggest how they might "reproduce" more beans. Give students time to model reproduction of the beans, by adding more beads/beans from the supply. Allow students to be creative, telling them that you are checking their knowledge about reproduction.
2. Have students share their models and describe how reproduction took place in their model.
3. Give very little feedback except to ask for clarification of their knowledge. (i.e. which traits are passed to offspring, how might the process work, etc…)
4. Ask students to keep their drawings or written descriptions of 'reproduction".
5. Explain to students that we will be using a model of reproduction in the form of living things: aphids.

Aphids are insects that have distinct life stages. Knowing when and how they reproduce helps us to understand how they might affect crops. Do they reproduce slowly or quickly? Do they need a mate to reproduce sexually or can they reproduce asexually? Do they have a few or many offspring at one time? How quickly after producing offspring can they reproduce again?

In this lab you are going to explore data to determine how aphids reproduce.

EXPLORE / EXPLAIN (5 DAYS)

Day 1

1. Observe aphids in closed petri dishes or via photos: one of 3 adult aphids on a typical soybean leaf and one of 3 adult aphids on a soybean leaf that has a gene for resistance, labeled A and B. (Do not tell students which is resistant and which is not.)
    a. Students may carefully wipe off moisture from petri dishes with live aphids and use caution to keep specimens in the dishes on the leaves.
    b. Provide a soft small paint brush to rescue lost aphids.
    c. Students may use cameras to zoom in to take photos or videos of the aphids with teacher permission.
    d. Specimens can also be placed under dissecting scopes or magnifying lenses.
2. Students describe, discuss, and draw their observations.
3. Allow students to compare their observations with photos of stages of growth of aphids.

NOTE: Add a few drops of water to the paper towels in the dishes at the end of the day to maintain moisture and securely close lids.

Day 2

1. Continue observations for the day.
2. Compare counts from the day before. (There should be offspring on most, if not all, of the leaves in at least one petri dish.)
3. Discuss trends as a class.
4. Ask students to complete the e-learning course: **Insect life cycles**, Lessons 1 and 2.
    a. This can be done as individuals or groups or as a class.

    Reflection on the e-learning course:

    b. Which types of aphids have they observed in their dishes?
        i. **Wingless morph**
        ii. **Winged morph**
        iii. **Immature nymph**
        iv. **Molting**

Day 3

5. Repeat observations and counting, looking for additional morphs or molting.

Day 4

1. Repeat observations and counting, looking for additional morphs or molting.
2. Ask students to complete the e-learning course: **Insect life cycles**, Lesson 3 and 4.

    Reflection on the e-learning course:

    a. Groups will discuss what they have learned and how their observations match this.
        i. **Sexual and asexual reproduction**
        ii. **Stem mothers**
        iii. **Clones**
        iv. **Number of generations (up to 15 a season!)**
        v. **Winged morphs**

Day 5

1. Repeat the observation and counting for a final day.
2. Analyze data.

3. Interpret data.
4. **Discuss and make claims about how aphids reproduce.**

Day 6 – Clean up

1. Properly dispose of aphids, leaves, and petri dishes in a sealable bag and place in the freezer for two days.
2. Place in trash after two days.
3. *If you would like to observe for a few more days, feel free to extend but note that leaves will begin to decompose.

ELABORATE (Days 5 & 6)

1. Talk about why the type of reproduction makes an impact on the survival of aphids. How does it make their survival successful? How does it make survival more difficult?
2. How does their method of reproduction make it harder for farmers to treat the pests? How does it make it easier to treat them?