Seed Predation by Ants

Grade Level: Elementary, Middle School, High School
Ecological Concepts: Predation, Herbivory
Arizona Science Standards: Science as Inquiry; Life Science

Materials:
1) Grass or other seeds of different sizes
2) Clear plastic drink cups*
3) Writing/drawing materials
4) Magnifying lenses*
5) Insect field guide*
*May be borrowed from SCENE.

BACKGROUND
There are many species of ants in the Sonoran Desert. Some are carnivorous, some grow and eat fungi, and other species eat mostly plant seeds found in their habitat. Different types and sizes of seeds are available at different times of the year, depending on the plants in the area. Most ant species build their living spaces, called colonies, underground. This is where the eggs are laid, hatch, and the larvae are cared for. Seed eating ants bring seeds back to the colony. When ants find a source of food, many of them will keep going to the food until it is gone. This is an ant trail. A good way to find a colony is to follow an ant trail back to the colony opening. Unusable food parts and other garbage from the colony are placed in piles outside the opening to the colony.

GUIDED INQUIRY
Observation/Exploration Period: Survey your habitat (and adjacent grounds, if necessary), and map where ant colonies are found. What size are the ants? What items do they seem to be carrying? Also make note of the potential food sources near the colonies. Time of year could influence what food items are available.

Group Discussion and Question Period: What do ants eat? Do they prefer certain foods? Do seed eating ants prefer some seeds instead of others?

Important aspects of guided inquiry are encouraging students to generate multiple hypotheses, and letting students make decisions about what data are important and create their own data sheets. Keeping these ideas in mind, the sample in the box below illustrates how ONE OF MANY possible investigations around this topic might develop.

Sample Hypothesis : Let's use the question, "Do ants in our habitat prefer a certain size of seed?" Our hypothesis could then be, "Ants that normally prefer to eat seeds will prefer large seeds to small ones, because large seeds provide more food per seed." Or, "As seed size increases, more of those seeds are chosen by the ants."

Sample Experiment Design: We need to set up a fair test of what characteristic, if any, of seeds is attractive to ants. To do that, we want to test one characteristic, or factor, at a time. A single factor would be one like size or shape. To test our hypothesis about the independent variable, seed size, we need seeds of different sizes. If possible, collect seeds (grass seeds are best) from the habitat area to use. If not, purchase seeds of two noticeably different sizes but similar shape and color to control for these other factors. You also need to control for ant species by using the same ant species for each seed pile. Count out ten seeds of each size and mix twenty seeds together. Make five sets of mixed seeds. In the habitat find five areas that have ant trails or visible ant colonies opening above ground. If you have lots of colonies to choose from, randomly choose the ones to use. Each ant colony is an experimental unitand by using more than one colony we are replicating the units being treated.

For observation purposes, the best kind of seed eating ant in the Sonoran Desert is the large red ant, genus *Pogonomyrmex* (Pogo, for short). Place a mixed seed pile along the ant trail or within 1 meter of the colony opening. Move away a meter or so and observe the ant behavior for a set period of time. Be careful not to disturb the ants.

Let the piles sit for about five to ten minutes before recording data so the ants in the area can settle down and find the piles. Groups of two-four students can watch individual piles and record data. If nothing happens for a while you can put clear plastic cups over the seed piles with an opening cut in the side to allow ants in but keep birds and other seedeaters out, and then check the piles the next day.

Sample Prediction: Ants will take more large seeds than small seeds.

Record Results: Count the number of each seed size that is taken by ants of each colony separately.

Sample Analysis of Data and Presentation: Calculate the total number of seeds of each size taken by ants. The raw data, total number of seeds taken of each size, can be presented as a **bar graph** or **pie chart**. The seed sizes can be listed on the horizontal axis and number of seeds on the vertical axis. For students who can divide, calculate the **average** number of seeds of each size taken by all ant colonies. Graph the average number on the vertical axis.

Discussion: Was your hypothesis supported? If yes, go on to test other hypotheses. If not, why not? What did happen? Why? This is a great opportunity to revise your hypothesis and do another test.

MORE:
(1) Elementary:
(a) Many ants collect nectar. Do a similar experiment using shallow bowls with different concentrations of sugar. (See **Attract a Hummingbird** activity.)
(b) Try other kinds of possible foods ants may collect. Your initial observations will give you ideas.
(c) Test seed shape by using seeds of the same size and color but different shape (round versus oval).

(2) Middle School:
(a) Find the **mean**, **median**, **mode**, and **range** of the data.
(b) Test different seed sizes. How large (maximum) a seed will ants take? How small (minimum) a seed?

(3) High School:
(a) Calculate the **variance** and **standard deviation** of the averaged data.
(b) Weigh the seeds of each size group. Mark the seeds with dots of different colored paint. Go through the refuse piles near the colonies to see if you can find any of the marked seed coats (usually only the inner seed itself is eaten; the exterior coat is discarded). This is a good way of making sure ants took the seeds, and not some other animal.