

Are Flying Insects Differentially Attracted to Certain Colors?

Submitted by: Kenwyn R. Cradock, Biology Dept., Eastern New Mexico University, Portales, NM

Grade level(s) targeted: Grades 8 – 12.

Note: Lower grades may be able to do this but as the majority of insects collected are likely to be small and a magnifying glass or stereo microscope may be required for identifications it is expected that mostly junior high and high school classes will be best equipped to do this project.

List the National Science Standard(s) addressed by the activity.

- Understandings about scientific inquiry.
- Behavior of organisms.
- Diversity and adaptations of organisms.

Entomology Literacy Element(s) and Supporting Concept(s)

- Scientific Method: Insects are useful for demonstrating/learning the scientific method via inquiry based activities.

Possibly also (depending on how the class is taught):

- Agriculture and Food Supply: Natural enemies (insect parasitoids, predators, and herbivores) are used for biological control of pest insects and plants. Some insect are pests of crops and stored food.

Question: Are some colors more attractive to insects than others?

Hints to form the hypothesis:

When flying, how do insects interpret and perceive their world? For example, how do insects such as aphids find plants when they are flying high in the air column?

Hypothesis:

H_0 : Insects are not influenced by color so each trap has an equal chance of attracting insects.

H_A : If insects are differentially attracted to certain colors then more insects will be attracted to those preferred colors than other, non-preferred colors.

Materials needed

- 1) A warm, sunny, preferably still day in late spring through to early fall.

- 2) White + Yellow (must be included!) + Blue + Green Pan traps (plastic or disposable picnic plates/bowls work well). It may be interesting if different shades of the colors are used.

Note: it may be necessary to attach the plates/bowls to a board or to weigh them down so they do not get blown away should a breeze pick up.

- 3) Water (tap water is fine).
- 4) Dish soap (any brand will do). This is a surfactant that reduces the surface tension of the water so insects will be less likely to escape from the trap.
- 5) 70% Isopropyl alcohol (rubbing alcohol from the store works fine) for preserving the insects collected.
- 6) Magnifying glass or preferably a stereo microscope for identifying the insects collected.

Note: It may be possible to conduct the experiment without these items, but as most of the insects collected will likely be about the size of an aphid or smaller they are recommended to enhance the experience.

- 7) Pencil and paper for recording the results.

The Experiment:

- Place the traps (at least 3 for each color) in an open area in the early morning (before 9am). Ideally traps should be laid out in a randomized complete block design. Use a random number generator to suggest a layout.
- Add water until each pan trap is about half full.
- Add a dash of liquid dish soap and stir gently.
- Leave the traps out for about 6 hours.
- Bring the traps in and transfer any insects into a vial of 70% isopropyl alcohol to preserve them for future study.
- Count and identify the collected insects. As many of the insects will be small wasps (Hymenoptera), true bugs (Hemiptera), and thrips (Thysanoptera) a magnifying glass or stereo microscope will likely be required. Due to the type of insect being collected it is possible that students will only be able to identify the insects to the Sub-Order or Superfamily level in most cases. Beyond this morpho-species will likely need to be used.
- Compare the numbers and types of insects collected in each color pan trap by graphing, descriptive statistics, and possibly t-tests and ANOVAs.

- Evaluate the hypothesis.

Results:

When sunny, warm, still conditions occur some color traps should attract more insects than others. Also, it is possible that different types of insects will be attracted to different colors. It is expected that most insects collected will be small wasps (Hymenoptera), true bugs (Hemiptera), and thrips (Thysanoptera).

If it is cloudy or too breezy/windy the traps may not work out as the insects may not be flying or not be able to control their flight sufficiently well to get to the traps. In this scenario too few insects may be collected to complete the study.

Discussion:

This exercise could be concluded in a number of ways. Final counts and identifications could be written up on the board in class and discussed, either as a class or by small groups.

On an individual level the results from the class study could be used by each student to write up a report in the format of a scientific paper. This will give each student the opportunity to practice data analysis (descriptive statistics, t-test, ANOVA), data presentation (graphs, tables), as well as evaluating what those results actually might mean in terms of understanding how insects interact with colored objects.

Many of the insects collected will likely be of agricultural importance either as pests (aphids, whiteflies, thrips) or as parasitoids that attack crop pests (chalcid wasps). This opens the possibility for discussing the role of insects in agriculture, biological control, ecosystem services, etc.

References:

BugGuide.net: <http://bugguide.net/node/view/15740>

Hypothesis definition and examples;
<http://www.accessexcellence.org/LC/TL/filson/writhypo.php>

Random number generator: <http://www.random.org/integers/>

Time:

Approximately 30 minutes advance preparation for setting the pan traps. If the class period is early in the morning (8-9am) the students may be able to do this.

2-3 class periods for sorting, counting, and identification of the collected material.

A class or homework assignment to write up the project.

Cost:

Pan traps (picnic plates) – depends on the type and number of colors of plate used as many can be used more than once, hence an upfront cost acquires materials for at least a couple of years.

- Solo plates: \$2.56 for a pack of 15 x 3 different colors = \$7.68

Dishwashing soap – \$2.00 (price varies by brand and location).

Isopropyl alcohol - \$2 for 500ml at a local pharmacy or supermarket.

Total cost = ~\$12