

PESTICIDES GAMES: POLLINATOR GAME

OBJECTIVE

This game illustrates that invertebrates like bees cannot detect which flowers have been contaminated with toxins, and that pesticides can affect the health of bees and their colony.

OVERVIEW

Pesticides are used across Britain in green spaces and farms to kill weeds, tackle insect pests and control crop diseases. Many pesticides don't just kill the target pest. They can affect other wildlife and the environment by either direct poisoning, contaminating water courses or disrupting ecosystems.

In 2016, more than 16,600 tonnes of pesticides were used on British farms. Around 500 different types have been licensed in the European Union (EU) alone.

TIME NEEDED

One lesson to make and install monitors

One lesson to analyse results

PARTICIPANTS

Whole class

RESOURCES NEEDED

- Small markers to represent flowers, some with marks to represent pesticides

LEARNING OUTCOMES

- understand that pesticides can affect more than just the target species
- understand that toxic materials can pass through the food chain

INSTRUCTIONS

1. Scatter the 'flowers' across an area of grass.
2. Divide the class into two groups, each has a queen bee and the workers compete to find flowers.
3. The team that gathers the most flowers in two minutes wins.
4. When tallying, note how many flowers have marks on them. These flowers are tainted with pesticides. High levels of pesticides can be fatal, while low levels can cause behavioural change.
5. Each student with a contaminated flower can either spin around three times so that their coordination and foraging behaviour is impaired, or they can forage in slow motion.
6. Now spend another two minutes gathering flowers.
7. When tallying, note if any students have gathered contaminated flowers in both rounds. These bees are not healthy as toxins have accumulated in their system.
8. Count the total flowers for each hive.
 - Which hive has gathered the most? They can make the most honey.
 - Which colony has visited the fewest pesticide infected flowers? This is the healthiest colony.

Pesticides can be harmful to individual bees as they can disrupt their foraging behaviour, homing ability and communication. This can impact the health and function of the colony and make the colony less resistant to pests and disease.

This could lead to colony collapse.

WHAT ARE NEONICOTINOIDS?

Neonicotinoids are one of the world's most popular pesticides and are now almost completely banned in the EU because of the threat they pose to pollinators.

They are a group of systemic insecticides similar in chemical structure to nicotine. Systemic means that the chemicals are taken up by plants and transported to all the tissues and in turn transferred to the pollen and nectar, where they can be eaten by pollinators.

EFFECTS ON POLLINATORS

In recent years, studies have shown that neonicotinoids can have lethal effects on pollinator species by direct contact or ingestion.

In addition, research has revealed that they could lead to other harmful effects, such as disrupting foraging behaviour, homing ability, communication and the development of larvae. There is evidence to suggest that exposure to low doses can also damage the immune system of bees.

For more details

[nature.com/articles/ncomms12459](https://www.nature.com/articles/ncomms12459)

Discover more about the decline of bees and the science behind protecting pollinators:

nhm.ac.uk/discover/news/2018/november/bee-declines-is-banning-pesticides-the-solution.html

CLASS DISCUSSIONS

- Should pesticides be banned?
- Are there other factors impacting bee populations?
- What solutions could be implemented? (For example, reducing overall chemical use, restoring wildflower meadows, and growing more native plants and fewer monocultures.)