

Using Zeolites as a Fertilizer



Parents' note: This activity should be completed after (or in conjunction with) the *Absorbing Ammonia* activity. The zeolite clinoptilolite (found at pet stores in the fish filter section) is used for both activities, and it can be re-used after the *Absorbing Ammonia* activity.

Introduction

Ammonia is very harmful to fish and other animals that live in or around water. It is also not healthy for humans—yuck! But ammonia, in small doses, is good for plants. Ammonia is used as a **fertilizer**, which means that ammonia helps provide nutrients to plants to help them grow.

Ammonia is good as a fertilizer only in small doses. Dumping a bottle of ammonia onto a plant would not be healthy for the plant! One way scientists have discovered to administer small amounts of ammonia over long periods of time is through the use of zeolites. Clinoptilolite is zeolite that absorbs ammonia (as you have seen in the *Absorbing Ammonia* activity). Because the zeolite is **porous**, meaning filled with holes, the ammonia can leak out of the zeolite but at a much slower rate than it was absorbed. This makes ammonia filled clinoptilolite very good as a fertilizer—it releases ammonia into the soil at a slow rate. Also, because a lot of ammonia can be stored in clinoptilolite, the soil does not need to be re-fertilized as often.

Clinoptilolite can be bought as a fertilizer (it already has soaked in ammonia), but in this activity, you will make your own fertilizer out of clinoptilolite and ammonia. Then you can test your fertilizer on plants to see how the plants react with the fertilizer.

In this activity we will:

- Make fertilizer using clinoptilolite and ammonia. You will learn about the effect that adding ammonia-soaked zeolites has on plant growth. You can then see how differing amounts of the clinoptilolite affects plant growth.

Safety

Parents, please be cautious around the ammonia. It can be extremely dangerous. Make sure that your children do not ingest it or get it into their eyes. If this occurs, immediately call poison control. If ammonia gets onto your skin, wash it off with soap and lots of water.

Materials

- Clinoptilolite (this can be purchased from a pet store in the fish filters section or reused from the “Absorbing Ammonia” activity)
- Household ammonia
- Jar with a cap to hold ammonia and zeolites
- At least three 15 quick growing seeds of the same species. Beans work well. Additionally, young plants can be used as well.
- Potting soil
- Trowel or large spoon which can get dirty
- Enough containers to hold the plants (labeled with a permanent marker)
- Water
- A sunny windowsill

Preparation and Pre-activity

Remind children how the zeolite clinoptilolite absorbs ammonia. Fill the jar with the zeolites. Then pour ammonia over the zeolites. Ask the children what they think will happen to the ammonia if the jar is capped and allowed to rest? Cap the jar filled with zeolite and ammonia and put the jar in a safe place (where no younger children or pets could upset it) overnight or longer.

Ammonia is good for plants in small amounts. What do you think will happen if you give the plant small doses of ammonia through zeolites? What do you think will happen if you add too many zeolites to the plant? Write these predictions down—you can then compare them to your results after you complete the experiment!

Activity

This activity requires planting of seeds, so it can get messy. You might want to think about doing this activity outside or covering your table with newspaper or a garbage bag.

First, start by removing the excess ammonia from the zeolites. Carefully pour off the ammonia from the jar containing the zeolites, and rinse the ammonia down the drain with lots of water. Wash your hands after this step.

Next, take the zeolite to where you will be planting your seeds. First, plant five of your seeds in potting soil without any zeolites—this is called your **control**, or the part of the experiment that remains constant. You can compare your control to the other plants that you will be fertilizing with zeolites. Mix some zeolites into enough potting soil to fill a planting container. Should you put a lot of zeolites in, or just a little? You can experiment with different amounts of zeolite in each potting container. Mark your potting containers (with a permanent marker) so that you can remember which pot is which. Make sure to keep a control plant with no zeolites in it! Extra zeolites can be used as fertilizer for a garden or thrown away.

Place your pots in a sunny windowsill. You will want to water the seeds about every other day, making sure that each pot gets the same amount of water. Soon your

seeds will begin to grow! You can chart their growth by measuring each plant's height with a ruler and charting how high each plant was on each day. There are also other things to measure such as the width of each plant, how "healthy" each one looks, how sturdy it is, how many blossoms does it have (if you have flowers or a fruit-producing plant), and what is its total growth (the height the plant is now minus the height the plant started at). You will probably want to let the study continue for at least two weeks, but how long you continue your study and what you measure is up to you, the experimenter!

After you are finished your measurements, consider planting your plants outside. You can also keep them inside as a window decoration. Remember to water them!

Conclusions

Did your seeds grow? Which one grew the best—was it one of the plants that had zeolites in the soil, or was your control plants? Did any of your plants have too much zeolite in them (the plant died or did not grow)? How did you measure your plants' growth? What type of measurements did you use? Looking back on your experiment, are there any types of improvements that you could make?

This experiment is a type of engagement called **inquiry**. There are no set outcomes for the experiment, and the experimenter (in this case, you!) does not know what will happen in the experiment. Typically, plants will grow better with zeolite mixed in with their soil, but too many zeolites can "burn" the plant. What happened with your plants? Consider making a graph or chart to see the growth of the plants over the course of your experiment!

Extensions

Try this experiment using the same amount of zeolites and different types of plants. You could also try to see how much zeolite it will take before there is too much ammonia in the soil (by "burning" the plants). See if adding liquid ammonia to one plant (instead of ammonia in the zeolites) is beneficial. Figure out the ratios of soil to zeolites (volume of soil/volume of zeolites) to find the best ratio for growing zeolites in a different shaped container. The possibilities are endless—good luck thinking up more on your own!