

Experiment Guide

Start a Milkweed Habitat

Objective

Milkweed plants are favored by Monarch butterflies. In this activity, we will create a Monarch butterfly habitat where Monarchs may visit during their annual migration. This activity is best started in the late winter or early spring. Milkweed seedlings will then have time to get started and established in the soil before summer.

Introduction to Kids' Lab

Welcome to the BASF Kids' Lab. BASF is the world's largest chemical company and run Kids' Lab programs like this all around the world. Can anyone think why? BASF wants children all over the world to understand and enjoy experimenting with chemistry!

Has anyone heard that word before: Chemistry? What do you think it means?

Chemistry is the science of matter. Have you heard the word "matter" before? What is matter? Matter is anything that takes up space and has a weight here on earth. So basically, matter is a scientific word for stuff.

Chemistry is a science that explores the composition of substances and their properties and reactions. In other words, Chemistry is a science that explores how different stuff behaves.

Matter comes in a few different forms or states: Solids, Liquids and Gases are the most common.

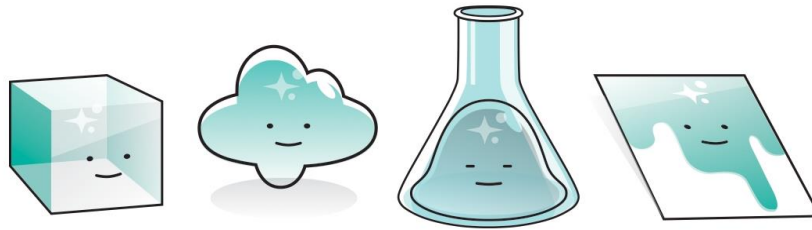
Chemistry is all around us. For example:

Who takes a vitamin? How do vitamins help you? (Grow big and strong, boost immunity) BASF makes chemicals that go into vitamins.

Raise your hand if you play a sport or ride a bike. What should you do to be safe? (Wear a helmet, pads, etc.) What materials make up the helmets that you wear? (Plastics and foam) BASF makes chemicals that go into the plastics and foams in helmets and padding.

Besides helping you grow strong and keeping you safe when you are playing your favorite sport, BASF chemistry keeps farmers crops safe, cleans water for those in need and keeps babies clean and dry.

Let me introduce you to morpH, the face of Kids' Lab. morpH can move through the three states of matter with ease. Is there a substance that you know of, like morpH that can easily shift from solid to liquid to gas (and back again)? Water! That's right! You know that water is usually liquid but what happens when you freeze water? Water becomes a solid ice cube. When you boil water, it becomes a gas. Water is one of the most important substances on earth.



Water is essential for all living things including butterflies and plants.

morpH and I would like you to explore Monarch butterflies and the milkweed plant.

Experiment Introduction

Monarch butterflies have intrinsic, aesthetic, educational, scientific, health and economic value. They are also very important to the environment and ecosystem, especially as pollinators. As Monarch butterflies migrate, they help pollinate plants along the way. This is especially important in desert areas where pollination can be scarce sometimes. Many flowering plants rely on pollination by insects such as butterflies in order to produce seeds and fruits.

Monarch butterflies are unique because of their annual migration. Monarch butterflies will travel to warmer areas in the colder seasons every year. Some will travel to Mexico or Southern California. The eastern North American Monarch population travels from all over the United States and southern Canada to Mexico. Monarch butterflies are the only insects that will migrate to a warmer climate that is 2,500 miles away each year. Some migrations are as far as 3,000 miles! They are also the only insect to make a round trip, meaning they will come back to their natural habitat once the winter hibernation is over.

Common milkweed is an important plant because many insect species like Monarch butterflies depend on it. Milkweed is extremely important to the existence of Monarch butterflies because milkweed is the only plant that Monarch caterpillars will eat. In fact, a Monarch butterfly caterpillar can consume an entire milkweed leaf in under five minutes. Female Monarch butterflies will only lay her eggs on a milkweed plant. There are many different varieties of milkweed, but all of them will provide the nourishment needed for a Monarch caterpillar to turn into an adult butterfly.

Loss of natural habitat and land development have caused milkweed to become less prevalent. This means that female Monarch butterflies cannot find a place to lay their eggs, and the Monarch butterfly population is declining as a result. Luckily, it is easy to plant your own milkweed, as you can see in this demonstration.

Make sure you are familiar with the following terms:

Milkweed: an American plant that attracts butterflies, helps create various products and is sometimes grown as an ornamental.

Vernalization: Some plant species require a period of cold dormancy in order to stimulate flowering or sprouting. Normally, this may occur naturally through the changing of seasons. In this activity, the vernalization period required by milkweed is simulated by placing the seeds in the refrigerator.

Monarch butterfly: a migratory butterfly that is orange and black. It is mainly seen in North America. The caterpillar only feeds on milkweed because it uses the toxins in the plant as a defense against predators.

Complete metamorphosis: Certain insects undergo complete metamorphosis during their life span. There are four life stages-egg, larvae, pupa and adult and the insect looks very different at each stage.

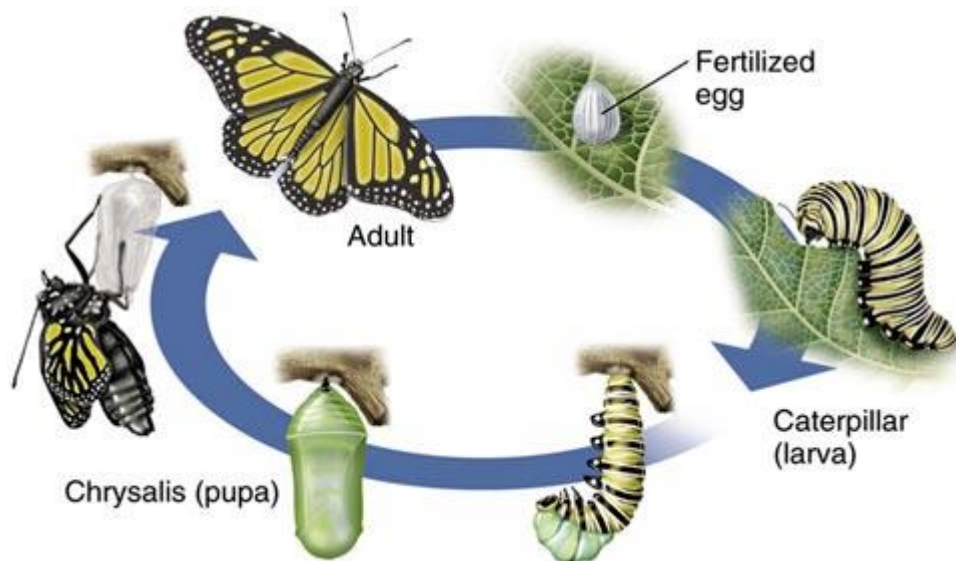
Migration: a seasonal movement of animals from one specific region to another.

Habitat: the natural home or environment of an organism, including plants and animals.

Additional Background Information

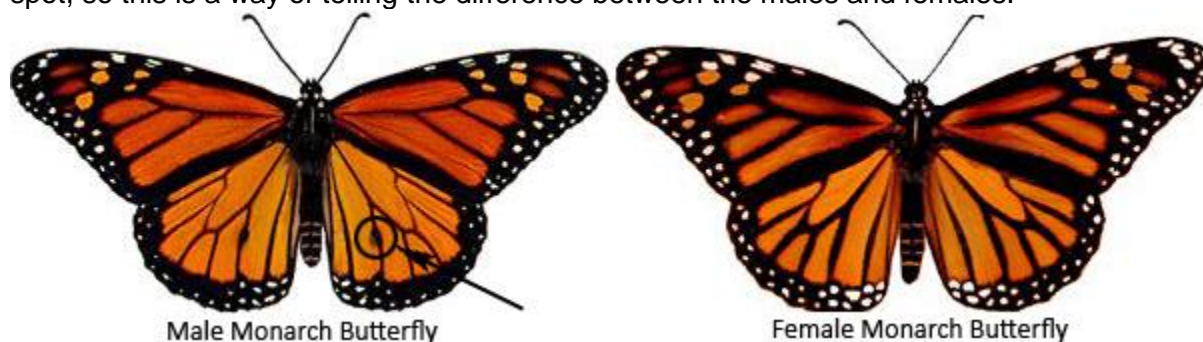
Butterflies have been around for at least 50 million years. They have been studied for centuries and are considered beautiful creatures. Butterflies are often seen in pop culture references and in some cultures, butterflies are a symbol for change. Although Monarch butterflies are mostly found in North America, you can find them in South American and the Caribbean too. You can even find them in Australia and New Zealand.

Butterflies and moths (order Lepidoptera) undergo **complete metamorphosis** and have four stages of their life cycle- egg, larvae, pupa, and adult. Monarchs start off as eggs that hatch into caterpillars or larvae. Caterpillars eat constantly and as the caterpillars grow, they must **molt** or shed their exoskeleton several times. Eventually, they reach the pupa stage where they transform into a chrysalis. Finally, an adult butterfly will emerge from the chrysalis, mate and lay eggs.



<http://www.doctortee.com/dsu/tiftickjian/cse-img/biology/animals/invertebrates/complete-meta.jpg>

Monarch butterflies are known for being bright orange and black. Male Monarch butterflies have a black spot on the inside surface of its hind wing. The females do not have the black spot, so this is a way of telling the difference between the males and females.



<http://www.obsessionwithbutterflies.com/img/butterfly/male-female-monarch-butterflies.jpg>

Safety Guidelines

Lab safety is a must! In order to safely explore Chemistry, we need to follow proper lab safety. How do you think we are going to do this? Biologists follow very strict procedures to protect themselves and they include:

- Gloves
- Safety glasses
- Lab aprons or lab coats

Before we get started:

- Be sure everyone including instructors and helpers are wearing safety glasses and gloves. An apron or lab coat are also recommended for this activity.
- Point out any safety features in the classroom (ie. Eyewash or emergency shower; emergency exits).
- Mention housekeeping rules – NO EATING OR DRINKING.
- Mention location of bathrooms.

The Experiment: Starting Milkweed Plants

This activity has two parts. The first part, the seeds are simply chilled in the refrigerator can be completed ahead of time. The second part includes preparing pots with soil and sowing the seeds or root sections while explaining the importance of monarchs and milkweed. You must procure seeds or roots, planting containers and soil in advance.

Materials

- A milkweed plant root or seeds
- Refrigerator for chilling seeds
- Soil
- Water
- Planting container

Starting Milkweed from Root Cuttings

If you have access to an established milkweed plant, start with a root section. These are easier to get established and do not require a chilling period. For root sections, harvest lateral root sections with adventitious buds in the spring. These should be about six inches long and can be started in pots or directly in your milkweed habitat in the springtime. Place 2 to 4 inches deep in the soil and keep well-watered until they are established.

Starting from Seed

Step 1: Prepare the seeds:

Milkweed seeds require a vernalization or chilling period to stimulate sprouting. This can be done by simply placing the seeds in a cool place for a month or two. Slightly bury a few seeds in a planting pot filled with moist soil and place it in the refrigerator for 30 to 60 days.

Step 2: Sow the seeds

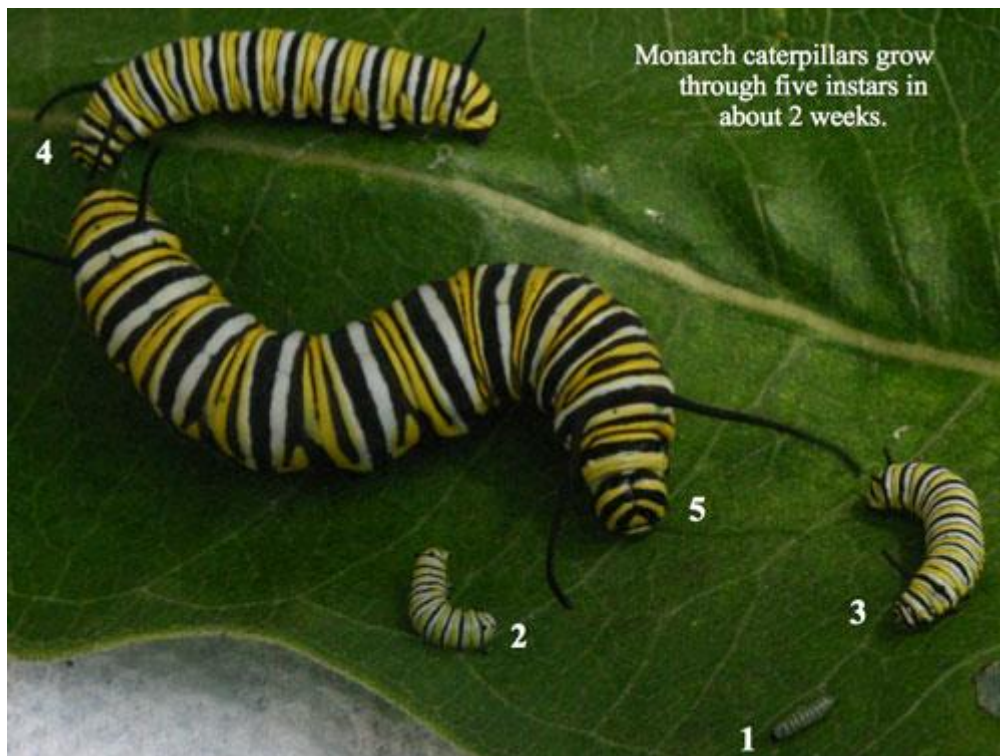
After this chilling period in step 1, place the pot with the seeds outside (if it is warm) or in a greenhouse. Once your seeds have sprouted, transplant young individual plants into larger pots or outdoors and completely cover the roots with soil.

Step 4: Water and Protect

Keep the young plants well-watered until they are established. If planting more than one milkweed plant at a time, give them ample room to encourage the plants to spread. Avoid using any herbicides or pesticides around your milkweed plants.

Step 5: Look for Monarch Butterflies and Caterpillars

Your milkweed plants will attract many pollinating insects like bees and other butterflies. But be on the lookout for Monarchs as they move through North America during their annual migration. Also look for Monarch caterpillars because they only eat milkweed leaves.



<https://monarchchaser.files.wordpress.com/2008/10/5instars.jpg>

Additional Information: Living Acres

The Living Acres campaign was launched by BASF to raise awareness about the declining Monarch butterfly populations and the importance of biodiversity alongside modern agriculture. Through Living Acres, BASF helps people, primarily farmers in Monarch migration areas to establish milkweed plants in non-crop areas so that Monarch butterflies will continue to thrive in North America.

These are the Seven Steps to Starting a Milkweed Stand. If there are Living Acres flyers or brochures to share with students and teachers, please hand them out accordingly.

1. **SEED/ROOT.** When starting from seed, acquire mature seeds that have been stored over winter in cool, moist conditions. Or plant milkweed using root sections from established plants by harvesting lateral, 6-inch long roots with visible buds in early spring. Roots should be transplanted 2 to 4 inches deep in an area where surrounding vegetation has been removed.
2. **POT.** Four to six weeks before the last expected frost, plant two or three milkweed seeds in peat pots and place in a warm environment, such as a greenhouse, with full daylight.
3. **PLANT.** Dig a small hole and plant seedling peat pots in outdoor locations that receive at least six hours of sunlight daily. Cover each peat pot completely with soil.
4. **SPREAD.** Place seedlings in groups spaced 3 to 4 feet apart in an area free of competing vegetation. Alternatively, individual seedlings can be planted 15 to 20 feet apart. Remove competing vegetation in a 2-foot diameter circle.
5. **WATER.** If rainfall isn't sufficient, water the milkweed seedlings. Use a small amount of fertilizer to speed the establishment of the plants.
6. **GROW.** To allow the plants to establish, don't directly apply herbicide to milkweed for the first year. Herbicides (with a few exceptions) may be used after the first year, but only when monarchs are not present.
7. **MOW.** To help milkweed thrive, mow around the established area to control unwanted plants, like invasive tall-growing weeds and woody species. However, neighboring nectar-producing plants are beneficial as a food source for monarchs.

Summary:

As the abundance of milkweed has declined, the population of Monarch butterflies has also declined because Monarchs depend on this plant species to lay eggs and feed the caterpillars along their annual migration. By planting milkweed along the migration route of these Monarch butterflies, you are helping sustain their population by giving them a place to lay their eggs and support the young caterpillars. Monarch butterflies are important pollinators and will visit all kinds of flowering plants as they travel across North America.