

Life on the Seedy Side

by Jim Cornish

Seeds! They fly, float, flutter. They ride, glide, slide. Some hitchhike to where they are going. Others simply explode all over the place. Some varieties are

eaten whole or are key ingredients in many foodstuffs. A few are even poisonous. One of nature's most remarkable feats of engineering, seeds are a great topic to investigate.

What Are Seeds?

Seeds are the ripened ovules of the reproductive structures of flowering plants. A typical seed has three main parts; the embryo which consists of the cells embedded with the genetic code to develop the structures of an adult plant; an endosperm which contains nutrients (proteins, carbohydrates, vitamins, minerals, and oils) stored for growth until the seedling can make its own food; and the seed coat which protects all of these structures from injury, moisture loss and predation. The embryo itself has two parts — one or two cotyledons (seed leaves), which like the endosperm, provide food to the embryo.

Types of Seed Bearing Plants

Seed-bearing plants are divided into two groups; angiosperms (flowering plants) and gymnosperms (flowerless seed plants). In angiosperms, seeds are hidden inside a ripened fruit — berries, apples and oranges being common examples. In gymnosperms, the seeds lie on the inside surface of a cone scale and lack a fruit structure. Most plants, some 250,000 species worldwide, are angiosperms and account for the majority of the world's food crops. About 800 in number, gymnosperms are largely conifer trees, most of which are used to manufacture a wide variety of wood products.

Angiosperms are further divided into two types based on the a specific characteristics of their seeds. The most common type, called dicotyledons (dicots), has two separate structures called cotyledons or seed leaves. Dicots easily split in two when soaked or roasted (beans, or peanuts for example). Less common are the monocotyledons (monocots). They have one cotyledon (i.e. corn). When germinating in soil, monocot seeds stay below the surface. Only the stalk is visible. In most dicots, the cotyledons are pushed above the soil to form seed leaves which shrivel and fall off as the plant's true leaves take over providing food through photosynthesis.

Dandelion seeds

– a favourite of children.

Spruce cones wait to age before spreading their seeds.



Photos: Jim Cornish

Seed Dispersal

For plants to survive, they must disperse their seeds to areas where competition for light, water, and nutrients is less. Since plants can't move, they depend on special seed designs and these six dispersal methods.

Seed Germination

Germination is the sprouting of a seed, usually after a period of dormancy. Germination begins when the seed is penetrated by water. The embryo inside swells, bursting the seed coat and allowing the shoots and roots to grow. During the earliest phase, the embryo has no leaves and is unable to make its own food. It relies on the endosperm as a food source, the same function as the yolk in a bird's egg.

In Canada's temperate climate, seeds typically lie dormant over the winter, germinating in spring when there is plenty of water and longer periods of warm temperatures. In fact, in northern climes some seed varieties will not germinate unless they have been frozen to soften and weather their hard shells.

Five Activities to Explore Seeds

Activity One:

Examining a Typical Dicot Seed

The inside of a seed should be studied before germination and planting experiments. This makes a comparison between the seed structure and the growing seedling relatively easy. The best seed for this is the lima bean. Readily available at any grocery store, lima beans swell when soaked, making them easy to handle and their internal structures clearly visible, especially when magnified.

Materials: lima beans, magnifying glasses or hand lenses, paper towels, bowls, water at room temperature.

Directions:

1. Soak beans for 24 hours to soften the shell and the internal structures.
2. Using a fingernail, carefully remove the shell and separate the bean into its two parts.
3. With a magnifier, examine the internal structure.
4. Compare the seed structure with the diagram of a typical dicot seed.

Tips on Germinating Seeds in Soil

Seeds need water and oxygen to germinate. If placed in soil, the following conditions are suggested. If the seeds are collected from wild plants, freezing them for a few days is usually required before planting.

Directions:

1. Start with a light, loose soil that will not compact, get soggy, or crust over.
2. Free flow of water and air is necessary.
3. Cover seeds with 2 - 4 times their thickness of soil, unless they require light to germinate. (See #4.) Large seeds can be soaked overnight and planted singly.
4. Barely cover small seeds, and sprinkle fine seeds on the soil surface and water by misting.
5. Plant flat seeds edgewise and winged seeds with wing uppermost or broken off.

Six Seed Dispersal Methods

| Dispersal Type | Description | Examples |
|----------------|---|--|
| Gravity | Gravity brings heavy seeds straight to the ground and spreads them down slopes where they might be further dispersed with the help of fire, water, wind or animals. | cone-bearing plants like pine, spruce and fir |
| Wind | Some seeds have parachutes or wings and are carried on the wind. | parachutes: dandelions, yellow goatsbeard, cottongrass, cattails; wings: American elm, maple |
| Animals | Some seeds are covered with hooks or burrs. The seeds attach themselves to the fur of a passing animal or the feathers of a bird. This free ride ends when the seeds are later brushed or groomed off some distance away. | burdock, and varieties of grasses |
| | Seeds are often contained inside a fruit animals like to eat; berries, for example. The seeds often pass undigested through their digestive tracts and germinate. | many varieties of berries |
| | Birds, animals and insects also bury gymnosperm seeds. When the cache is forgotten, the seeds sometimes grow into plants. | seeds of cone-bearing trees |
| Exploding | Some seed-pod burst, flinging their seeds over a large area. | milkweed, touch-me-nots |
| Floating | Air trapped in some seeds makes them buoyant so they easily float away from the parent plant. Seeds of aquatic plants and plants living near streams, rivers or the ocean are dispersed this way. | coconuts, lotus |
| Fire | Some seeds are not released from their cones until after a fire. Fitted with small wings, the seeds can easily disperse on the wind and replant a destroyed forest. | lodgepole or jack pines |

Activity Two:

Collecting and Studying Typical Gymnosperm Seed

The best sources of gymnosperm seeds are the common cone-bearing members of the genus *Pinus* — the pines, firs, cedars, junipers and spruce trees common in Canada's forests.

Directions:

1. Collect cones from or in and around the base of a cone-bearing tree.
2. Shake the cones to release any seeds still in the cone. If the cone is closed, heat on tin foil in an oven at 200 degrees for twenty minutes or until the cone opens.
3. Using a hand lens, examine the seed. Look for the seed-wing.

Activity Three:

Collecting and Sorting Seeds

Seeds of all kinds are lying about, waiting for the right conditions to germinate. Finding them after being dispersed is another matter. Below is a simple and fun way to collect seeds and to study the plants they produce.

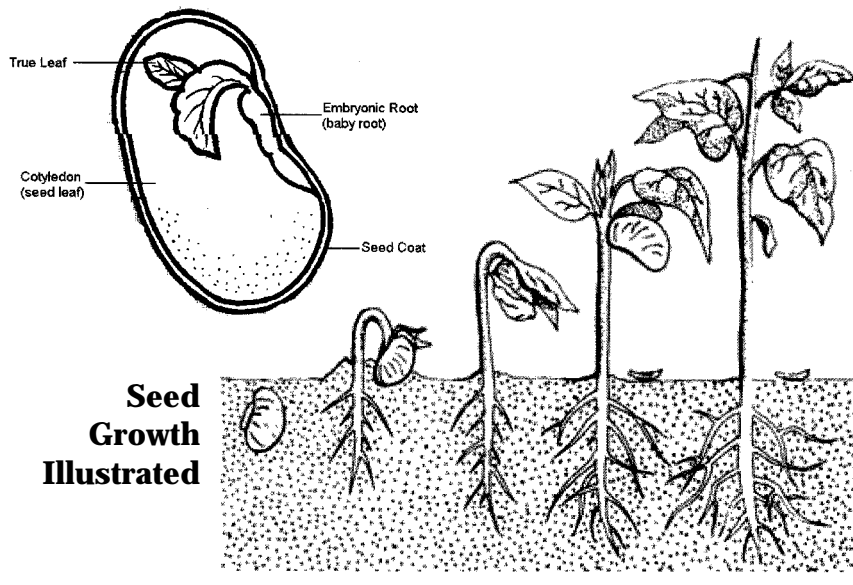
Sock Walk

Materials: socks, potting soil, trays, water.

Directions:

1. Wear a pair of old socks over your footwear.
2. Walk around a backyard, grassy or wooded area until a lot of plant material has collected on the socks. Then remove the socks.

Parts of a Seed



3. Fill a pot almost to the top with potting mix. Place the sock with seeds on top of the soil and then cover the sock with an additional 2 cm of soil.
4. Water well and place in a warm sunny spot.
5. Keep moist and see what sprouts over the coming days or weeks!

Activity Four: Seed Germination activities

Material: glass jars, assorted seeds (lima beans, kidney beans, pinto beans, peas, radish, corn or squash seeds) paper towels, water, newspaper, glass-marker.

Directions:

1. Roll a paper towel into a cylinder and place inside a glass jar.
2. Wet the towel so it sticks to the glass.
3. Place a variety of seeds between the towel and the jar.
4. Fill the centre of the jar with a crumpled sheet of newspaper to hold the wet towels in place.
5. Put two centimetres of water in the bottom of the jar to keep the towel moist.
6. Seal the jar to prevent moisture loss and place in a well-lighted, warm room, but out of direct sunlight.
7. Use a glass-marking pen to number your seeds.

SEEDY WEB SITES

There is an abundance of web sites on seeds available. Please visit Scouts Canada's web site (www.scouts.ca), click on Media, click on the Leader Magazine, and click on the August/September 2007 issue. A list of web sites have been added to this article (on the web site only) for you to explore further.



Some Seedy Facts

- ♦ Some coconuts have floated 2,000 km over the sea before finding dry land.
- ♦ The largest seed in the plant kingdom weighs 60 lbs. It's the seed from the Coco de mer, or double coconut palm.
- ♦ Orchids have the smallest seeds. Some pods hold over 3 million microscopic seeds.
- ♦ Some seeds found in frozen soil in Canada were grown and produced flowers — the seeds were thought to be more than 10,000 years old!
- ♦ The increasing genetic engineering of crop seeds by man is a cause for concern as bio-diversity is reduced and fewer wild seeds remain.
- ♦ Most oak trees don't grow acorns (seeds) until they are at least 50 years old.
- ♦ Archaeologists have recovered remains of sunflower seeds dating back to 800 AD.
- ♦ A kiwi contains 600-1000 tiny edible seeds inside each fruit.
- ♦ Apple seeds contain a small quantity of cyanide which renders the seeds quite bitter tasting.
- ♦ One bean from the Castor-oil plant will kill an adult.
- ♦ It has been calculated that a single squirrel can eat its way through 40,000 pine cones in a year.
- ♦ Some seeds will not germinate unless they are frozen and thawed before planting.
- ♦ Corn and soybean have been germinated in space to study the effects of microgravity on their development. It was discovered that without the influence of gravity, the seeds germinated faster. Their roots grew in random directions and not just down as on Earth.
- ♦ Seeds are 80% carbohydrates; thus a good source of energy. Both sunflower seeds and pumpkin seeds are high in protein.

- Record dates of planting and germination.
- Monitor the seeds. Record your observations.

(Zip-lock bags can be used in place of glass jars. Place a wet paper towel along the bottom of the bag and place the seeds on top. Seal bag and store as with jars.)

Variations on Germination Jar

Using one variety of seed, place germination jars in different places (warm, cold, light, dark and combinations) to study how variations in light and heat affect germination. Compare germination in open jars with germination in sealed ones.

Activity Five:

Plant a Surprise Garden

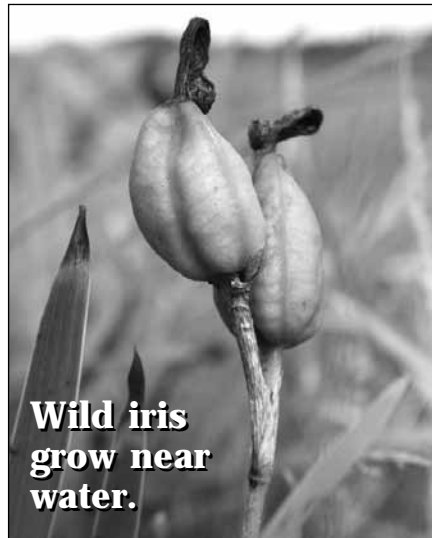
Bird seed provides an interesting way of studying a variety of plants.

Directions:

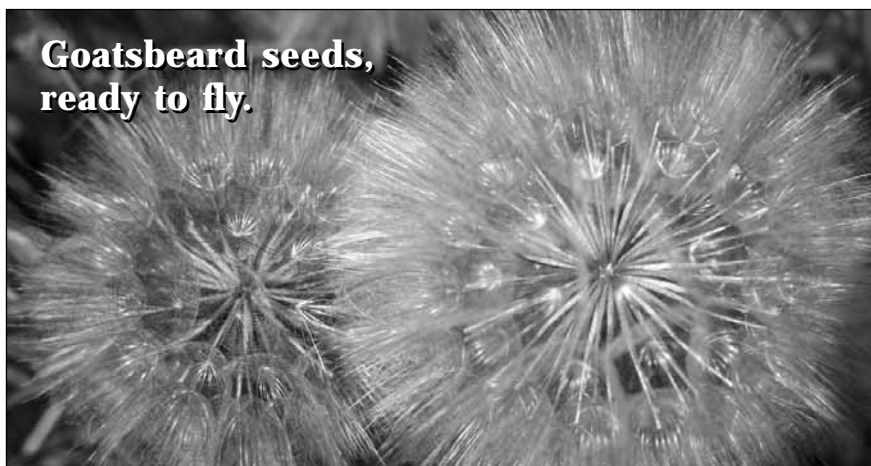
- Sort through a bag of bird seed and separate out intact seed.
- Sort them by type.
- Using a planting tray (egg carton), plant and water the seeds and see



**Tawny
cotton grass
seed looks
soft and
warm.**



**Wild iris
grow near
water.**



**Goatsbeard seeds,
ready to fly.**

what grows. (See Tips on Germinating Seeds in sidebar.)

- Identify the seed as monocots or dicots.
- Photograph the growth stages and print photos or use them in a Powerpoint™ presentation to show stages in growth of a seed.
- Plant dozens of the same seed type and each day remove the soil around the plant to observe the process of growth beneath the soil. Photograph each one to create a slideshow using presentation software that enables pictures to fade in and out, giving the illusion of growth. X

- *Jim Cornish is a frequent writer for the Leader Magazine. An amateur naturalist and photographer, Jim teaches Grade 5 children in Gander, Newfoundland and Labrador.*

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