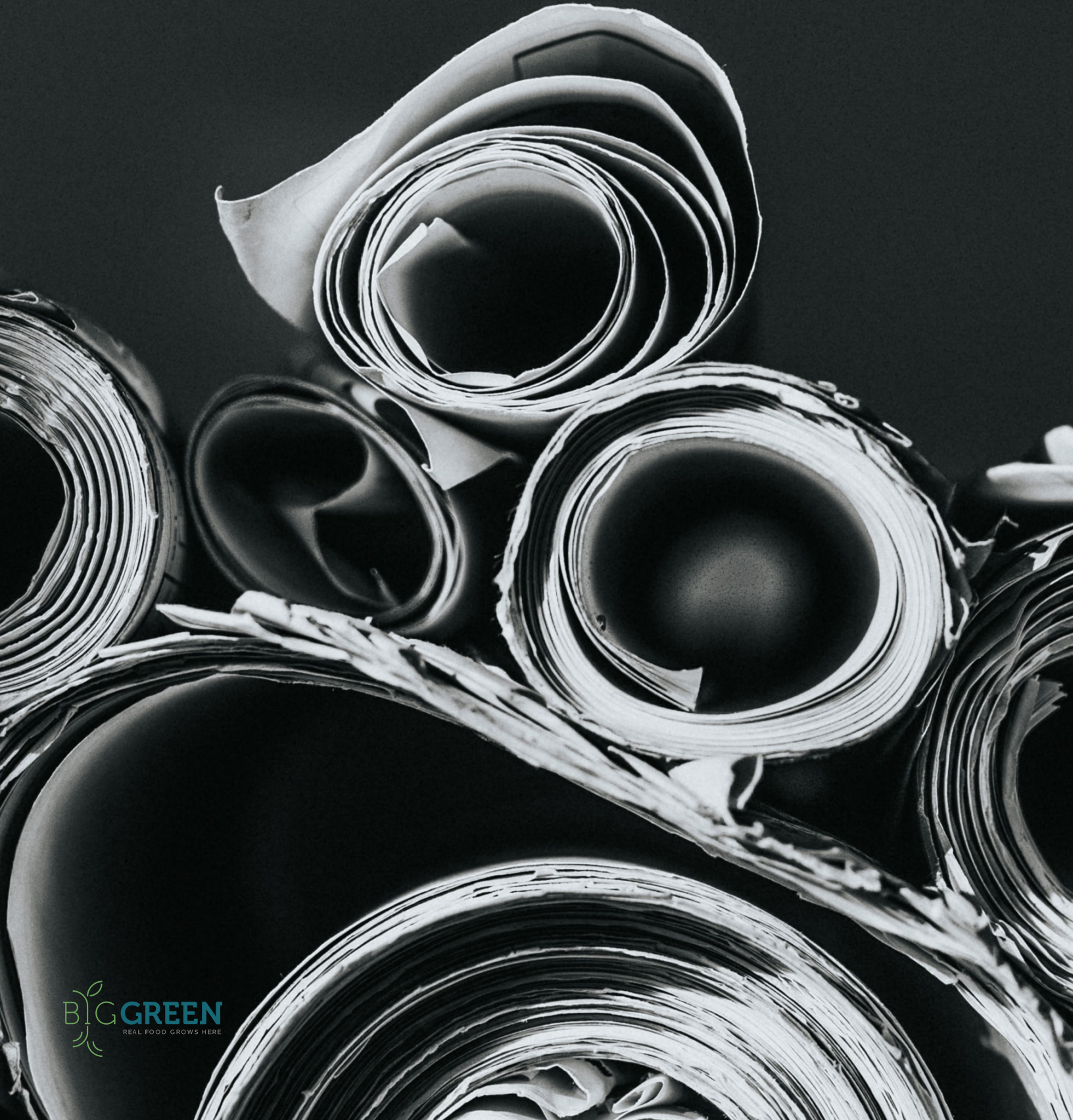
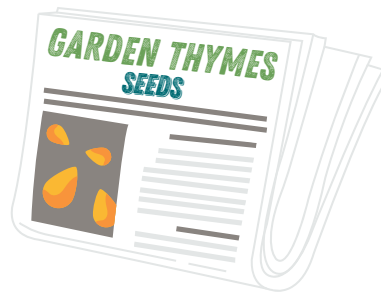


GARDEN
THYMES

ARTICLES FOR THE YOUNG GARDENER

6-8





Lesson Vocabulary

- Seed
- Embryo
- Cotyledon
- Seed coat
- Endosperm
- Dicot (Dicotyledon)
- Monocot (Monocotyledon)
- Germinate
- Dormant



Academic Vocabulary

- Structure
- Function
- Classify (Classification)



WHAT IS A SEED?

Seeds are plants in the form of an **embryo**. The seed is the beginning of the plant's **lifecycle**. A seed, or **embryonic** plant, contains all that is necessary to become an adult plant! When the conditions are right, a seed will sprout and produce a baby plant. Seeds are amazing plant structures that will either grow or become dormant depending on the conditions they are in. When a seed is **dormant**, it slows or stops growth, but it is still alive. This occurs so the seed preserves energy until the conditions in the environment are more favorable. When conditions are right, the seed will **germinate**, or

begin growing into a plant. Environmental conditions that affect germination and ultimately survival include water, temperature, light, and soil.

WHAT STRUCTURES DO SEEDS HAVE?

All seeds have certain similar structures. Flowering plants can be classified into two categories depending on how the seed structures are arranged. The two types of seeds are **monocotyledons (monocots)** and **dicotyledons (dicots)**. Most simply, monocots have one **cotyledon**, or seed leaf, while dicots have two. Other seed structures exist to ensure a new plant is formed. Some of these structures include:

1. **Seed coat:** The outer part of the seed that protects it from insects, disease, and moisture
2. **Embryo:** The structure that contains all that is needed to become an adult plant
3. **Endosperm:** Food storage mechanism inside the seed

The arrangement of these structures is different depending on whether the seed is a monocot or dicot. Other factors unique to each plant will also affect the size, shape, color, and other features, which is why no two seeds look alike. Figure A, below, shows an example of this. The bean seed is a dicot; the corn seed is a monocot. Figure B shows how the seed structure will affect other plant parts that emerge later in the plant's lifecycle. It is possible to use these other parts to determine the type of seed a plant came from, without ever seeing the seed.

Figure A

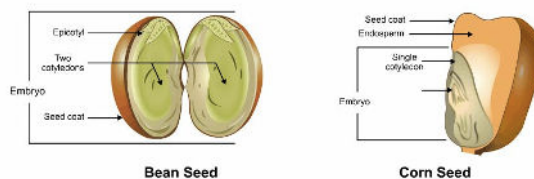









Figure B

	Seed	Root	Vascular	Leaf	Flower
Monocot					
	One cotyledon	Fibrous roots	Scattered	Parallel veins	Multiples of 3
Dicot					
	Two cotyledon	Tap roots	Ringed	Net-like veins	4 or 5



ARE THERE SEEDS PEOPLE CAN EAT?

Yes! There are many types of seeds that people can eat and that are very healthy for us. Some examples include:

- Beans
- Peas
- Quinoa
- Corn
- Rice/wild rice
- Wheat
- Sunflower seeds
- Pumpkin seeds
- Nuts



WHY SHOULD I EAT SEEDS?

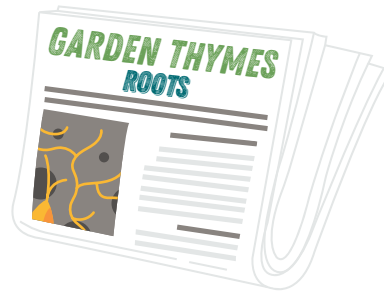
Seeds are part of the protein food group. Some seeds, like beans and peas, are also part of the vegetable food group.

Proteins are good for your body because they:

- Help your muscles grow and repair themselves.
- Keep you full longer because it is harder for your body to digest protein.
- Help deliver and store oxygen in your muscles, which helps give you energy.

Vegetables are good for your body because they:

- Have fiber which is great for your digestive system.
- Contain many nutrients that are good for your heart and can help prevent some serious diseases.
- Deliver all that goodness and are also low in calories.



Lesson Vocabulary

- Roots
- Soil
- Absorb (absorption)
- Anchor
- Taproot
- Fibrous root



Academic Vocabulary

- Structure
- Function
- Classify



WHAT IS A ROOT?

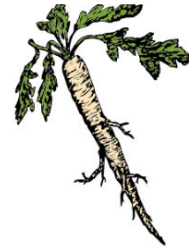
A **root** is the first part of a plant that grows out of the seed. Its **function is to absorb**, or take in, water and nutrients from the soil. This allows the plant to continue to grow. Another function of the root is to act as an **anchor** in the soil. It holds the plant in place and provides a **structure** to support the entire plant.



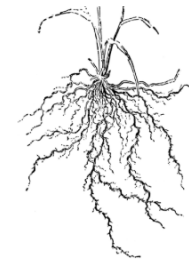
WHAT STRUCTURES DO ROOTS HAVE?

Since each plant needs different things, roots can look different. Scientists **classify** roots into two main categories: taproots and fibrous roots.

Taproots grow down and are the main root for the plant. They have much smaller roots, or root hairs, growing off of them. A taproot is usually thick because it also stores food for the plant. Many of the roots we eat are taproots. Some examples are beets, carrots, and dandelions.



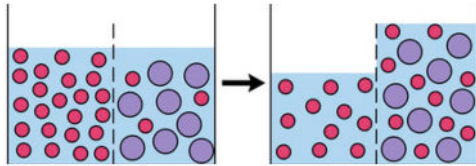
Fibrous roots are made of many small roots that branch out underground. The roots are usually the same size. Some plants that have these roots are grasses, corn, wheat, and onion.



These two root structures both serve a function for the plant. Taproots absorb water and nutrients by growing deep into the ground. They have smaller root hairs that increase the surface area available for this process to happen. Fibrous roots spread out laterally, or to the side of the plant. Since they stay close to the surface, they rely on water closer to the surface. However, they provide significant stability for the plant, allowing it to grow tall, and help keep soil in place which slows erosion. Because of these various functions, some plants adapt and have both systems over their lifetime.

The process that roots use to absorb water and nutrients is called osmosis. This process of **osmosis** occurs when molecules of a solvent (like water) pass through a semipermeable membrane from a less concentrated solution into a more concentrated one, thus equalizing the concentrations on each side of the membrane. In other words, water, which contains nutrients the plant needs, passes through the walls of the roots which are semipermeable (not everything can pass through the cell walls). The roots allow water and other nutrients in. Osmosis happens because the concentration of water inside the root is different from

the concentration outside the root. Osmosis occurs as a way to balance out the concentrations of the solute, which results in more water entering the root than is outside the root.



ARE THERE ROOTS PEOPLE CAN EAT?

Yes! There are many types of roots that people can eat and that are very healthy for us. Some examples include:

- Carrots
- Radishes
- Beets
- Turnips
- Parsnips
- Rutabaga



WHY SHOULD I EAT ROOTS

Roots are part of the vegetable group. Vegetables are an important part of a healthy diet. There are many different types of vegetables that help the body be healthy.

Roots are good for your body because:

- Roots can be a healthy source of carbohydrates.
- They are low in calories.
- They are full of vitamins and minerals your body needs to be healthy and fight disease.



Lesson Vocabulary

- Stem
- Xylem
- Phloem
- Transport (transportation)
- Nutrients



Academic Vocabulary

- Structure
- Function
- Classify
- Edible



WHAT IS A STEM?

Stems are an important part of plants and usually start growing after the roots form. The main function of a **stem** is to support the growth of the plant. There are two ways this happens. One way is that the stem itself holds up the plant. The most important **function** of the stem is to **transport** (or move) water, food, and **nutrients** to all parts of the plant. **Nutrients** are absorbed by the roots and transported to the rest of the plant by the stem. Water, nutrients, and food are what allow plants to grow.



WHAT STRUCTURES DO STEMS HAVE?

There are two important structures that support **transportation** in plants. These two structures are called the **xylem**

and the **phloem**. Together, with some other plant structures, the **xylem** and **phloem** are part of the plant's vascular bundle.

The organization of the vascular tissues in a plant can be scattered or formed in a ring. Scattered bundles are found in monocot plants.

Other components in the stem are the

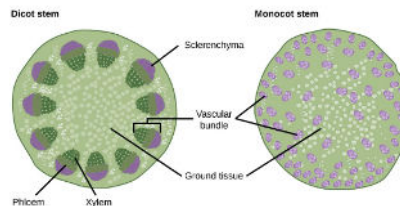
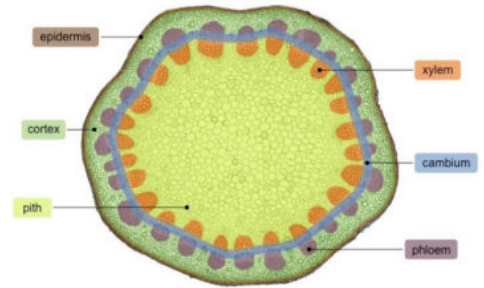
cambium (which is between the xylem and phloem in some plants) and the **epidermis**. The epidermis is the outer tissue of the stem which defends the plant from environmental threats.

The xylem and phloem are like a team that works together

to transport things the plant needs. The **xylem** transports water and nutrients from the roots to the leaves. Plants make their own food in the leaves! We will learn more about that soon. Once the leaves

make food, the **phloem** transports the food to the rest of the plant. The xylem and phloem are a great example of how plant parts work together to make sure the plant survives and can produce new plants. Plants have also found ways to modify their structures over time. There are three main types of stem modifications which allows plants to make the best use of its environment to grow and reproduce.

- **Aerial:** Stems that grow above ground like celery
- **Subaerial:** Stems (or runners) that grow across the ground like strawberries
- **Underground:** Stems that grow under the soil. Examples of these stems include:
 - » **Tubers:** Potatoes and yams
 - » **Rhizomes:** Ginger and turmeric
 - » **Bulbs:** Onions and garlic





ARE THERE STEMS PEOPLE CAN EAT?

Yes! There are many types of stems that people can eat.

EDIBLE AERIAL STEMS:

- Celery
- Asparagus
- Rhubarb
- Broccoli stems

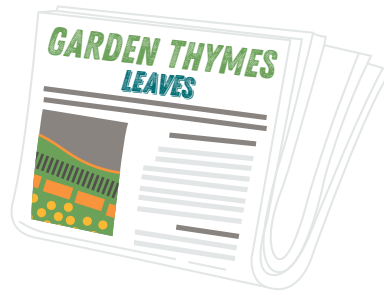
EDIBLE UNDERGROUND STEMS:

- Potatoes
- Onions
- Yams
- Garlic
- Cassava
- Ginger



WHY SHOULD I EAT STEMS?

As you can see from the list of edible stems, there are a wide variety of stems that can become part of a healthy diet and many that grow in the Learning Garden. Usually stems are easy to prepare. For example, celery and rhubarb can be washed and eaten raw. Other stems like asparagus or leeks are tasty when sauteed in a pan. Potatoes and yams can be excellent sources of healthy carbohydrates. Stems like onions and garlic are often used to add flavor to other foods. Both are in recipes from around the world. In addition to these benefits, stems provide many valuable vitamins and minerals that our bodies need. Since they are packed with nutrients and generally low in calories, stems can be enjoyed often as part of a delicious and healthy diet!



Lesson Vocabulary

- Leaf
- Photosynthesis
- Chloroplasts
- Chlorophyll



Academic Vocabulary

- Structure
- Function
- Classification
- Prediction



WHAT IS A LEAF?

A **leaf** is the part of the plant that makes the plant's food. Yes, plants can make their own food through a process called **photosynthesis**. This happens when leaves absorb sunlight and carbon dioxide, a gas found in the air. Carbon dioxide is naturally present in the air and is actually something humans add to the air when we breathe out. A chemical reaction takes place inside the leaves during which the sunlight and carbon dioxide are changed into sugar, or food for the plant. This is an amazing process that we see happen all over the plant world.

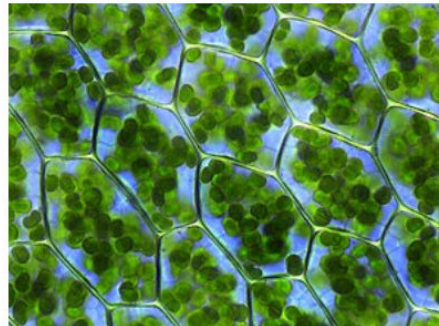


WHAT STRUCTURES DO LEAVES HAVE?

The function of photosynthesis is supported by several specialized leaf structures. Even though leaves can

look very different from each other, they all have the same

photosynthetic structures. **Chloroplasts** are organelles, specialized cell structures, in which photosynthesis takes place. Photosynthesis converts light energy into chemical energy and produces oxygen and other organic compounds.



Chloroplasts are filled with **chlorophyll** molecules which are able to absorb light. During this process, the green light in the light spectrum is reflected off the leaf which is why all leaves look green. Photosynthesis is one example in nature that demonstrates how energy can be transferred from one form to another through a reaction.



ARE THERE LEAVES PEOPLE CAN EAT?

Yes! There are many types of leaves that people can eat. Some edible leaves grow in the garden. Some examples are:

- Kale
- Spinach
- Collard greens
- Swiss chard
- Cilantro
- Basil
- Cabbage
- Brussels sprouts

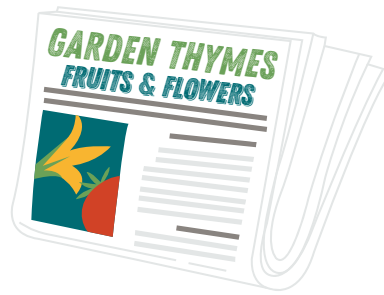


WHY SHOULD I EAT LEAVES?

As you can see from the list of edible leaves, there are a wide variety that can be part of a healthy diet and many that grow in the Learning Garden.

Leaves, like stems, are easy to eat. Sometimes, they are referred to as “greens”. Leaves are green because of chemicals produced during photosynthesis. Most of the time they can be washed and eaten raw, but they are also delicious cooked. Some people use leaves as a way to eat other foods like in a lettuce wrap or veggie bowl. Many people also eat a variety of greens, such as spinach, kale, and Swiss chard, in salads and smoothies. Leaves are often added to soups or cooked with other vegetables such as onions or beans. Certain leaves that are especially flavorful are used as herbs. Basil and cilantro are examples of those that can be found in most gardens.

The nutritional benefits of eating leaves are many. Leaves are very low in calories and deliver excellent nutrients your body needs. Most leaves also contain a lot of fiber which helps you feel full longer. Some people even call certain leaves, like spinach and kale, “superfoods” because they are so good for you. Vitamins K, A, and C are found in most edible leaves, as is folate which is important to the cells in your body.



Lesson Vocabulary

- Flower
- Fruit
- Stamen
- Pistil
- Sepal
- Petal
- Seed
- Pollination



Academic Vocabulary

- Structure
- Function
- Classify
- Edible
- Reproduction



WHAT IS A FLOWER? WHAT IS A FRUIT?

Plants make flowers and fruits in order to reproduce. **Reproduction** is the name of the process that plants use to make new plants.

Flowers are the part of the plant that contains the reproductive parts that need to be pollinated to make new plants. Flowers come in many shapes, sizes, and colors, but even though they look different, their function is the same.



All fruits start as flowers. Flowers need to be pollinated to produce fruit. After pollination, the plant will begin to produce fruit and seeds will grow. **Fruit** is the environment in which the seeds will be able to grow and ultimately be dispersed, or spread, creating a new plant. **Fruit's** function is to protect the seed.

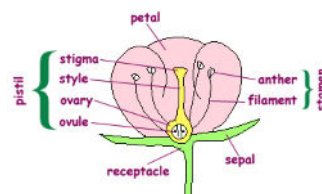


WHAT STRUCTURES DO FLOWERS AND FRUITS HAVE?

There are structures that allow plants to create new plants. Pollination is the process of taking pollen grains from the male part of a flower, the stamen, to the female part of the flower, the stigma which is part of the pistil. This process ultimately allows seeds to start growing. Pollination usually happens with the help of animals, like bees or butterflies, or wind.



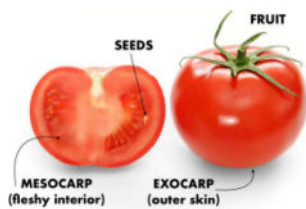
Flowers have specific structures that allow for reproduction to occur. Their colors and smells are pleasing to us and to the animals that the flower needs for pollination. Flowers contain two main parts, a male structure called the stamen and a female structure called the pistil. The stamen contains the pollen and the pistil contains the seed and ovary which will become the fruit. These structures have smaller structures that are important to the process of reproduction.



Flowers contain two main parts, a male structure called the stamen and a female structure called the pistil. The stamen contains the pollen and the pistil contains the seed and ovary which will become the fruit. These structures have smaller structures that are important to the process of reproduction.

Fruit is the ripened female pistil that has been fertilized with pollen. Typically the seeds are inside the fruit which protects the seed from the surrounding environment. Some seeds are found on the outside of the fruit, such as with corn and strawberries. Just like other parts of the plant, fruits can serve as an important food crop. There are two layers to all fruits.

There are two layers to all fruits. The **exocarp** is the layer of skin, sometimes thick and tough, that is on the outside of the fruit. The exocarp can occasionally be eaten, like in the case of apples and tomatoes. The **mesocarp** is the fleshy inside of the fruit that surrounds the seed. The mesocarp is the part of the fruit that is most commonly eaten.



WHY SHOULD I EAT FLOWERS AND FRUITS?

Like most other plant parts, fruits and flowers offer many benefits for people as part of a healthy diet. Sometimes, people talk about fruits and flowers as if they are vegetables. Examples of these are broccoli, cauliflower, beans, and peppers. These are actually flowers and fruits, but their taste isn't as sweet as others so they end up being called vegetables. The sweeter fruits, such as melons and berries, are what we often think of as fruits. Whatever they are called, flowers and fruits are both delicious and full of nutrients. According to the chef's plate, fruits and vegetables should make up half of each meal.



WHAT IS A FLOWER? WHAT IS A FRUIT?

Yes! There are many types of flowers and fruits that people can eat. Edible fruits and flowers grow in the garden.

EDIBLE FLOWERS

- Broccoli
- Squash blooms
- Nasturtium
- Calendula
- Cauliflower
- Bachelor buttons
- Hibiscus

EDIBLE FRUIT

- Peppers
- Squash
- Watermelon
- Green beans
- Tomato
- Cucumber
- Pumpkin
- Zucchini
- Berries