

The Plant Kingdom

Each day of the creation account begins, mysteriously, at night; “and there was evening and morning.” This seems contrary to our method of starting the day in the morning and ending in the evening, but this is the pattern God established for the creation week and is also reflected in the culture He established for the Jews.

Gardening by Foot

Plant comes from an Indo-European root word meaning *sole of the foot* as in planting seeds and smoothing over the dirt with your foot.¹ This method of sowing seed is suggested in Deut. 11:10

“...for the land which you go to possess is not like the land of Egypt from which you have come, where you sowed your seed and watered it, by foot, as a vegetable garden...”

1. The Bible states that the entire plant kingdom was created in a single twenty-four hour period on day three.
2. Although all plants were created on the third day, it appears that the vegetation in the Garden of Eden was awaiting cultivation by farmer Adam.²
3. Tall forest trees are the first living things you can see from space.³
4. One out of five living organisms are plants.⁴
5. Unlike animals, plants make their own food using sunlight and they can't voluntarily move. These are two factors that define a plant.
6. *Botany* is the section of biology that deals with plants. It means *plant* in Greek.
7. People who specialize in the study of plants are called *plant scientists*, though they used to be called *botanists*.



¹ Webster's New World Dictionary, Second Collegiate Edition p. 1089

² See Genesis 2:5

³ Jonathan Bocknek, *The Science of Plants*. P5

⁴ Boyce Rensberger, *Instant Biology*, p. 3

Classifying Plants

Just as animals and people are categorized as either vertebrates or invertebrates, so plants are easily categorized as being either vascular or nonvascular plants.

Unpronounceables

Tracheophyta is the division name for all vascular plants and it is easy to remember because everyone can relate to a trachea. What about the division name for the nonvascular plants?

The fact is that scientists continue to change these names with amazing regularity. Even *Tracheophyta* is used less in many circles.

As of this writing, scientists are classifying nonvascular plants as *Marchantiophyta*, *Thocerotophyta*, *Bryophyta* and other unpronounceable words. Vascular plants have other equally confusing names. We're sticking with vascular and nonvascular.

1. The plant kingdom has two main groups: vascular and nonvascular.
2. Vascular plants are in a division called *Tracheophyta*.
3. **Tracheophyta** comes from the same word we get *trachea* because they both refer to hollow tubes to move air and/or water around.
4. *Vascular* means "a slender tube or vessel." It's related to the word *vase*.
5. *Nonvascular plants* absorb water through their surfaces.

3rd Day - Plants

Vascular Plants

Tracheophyta
"plants with a trachea"



Nonvascular Plants

without a trachea



Vascular Plants



These are the majority of all plants; plants with a trachea or tubes for transporting water and nutrients to all the cells of a plant.

1. Plants that have seeds hidden inside them are called *angiosperms*, which literally means “hidden seeds.” 9 out of 10 plants are angiosperms.⁵
2. Genesis chapter one specifically talks about vascular plants like trees, herbs and grasses; but all vegetation, or at least the seeds for it, was created on the third day.

3rd Day - Plants

Vascular Plants

Tracheophyta
“plants with a trachea”

1. Plant Parts

- *Flowers (with fruit & seeds)*
- *Leaves*
- *Stems*
- *Roots*

2. Grasses

3. Annuals & Perennials

4. Trees

⁵ . Louise and Richard Spilsbury, *Plant Classification*. P.11

1. Plant Parts

Achoo!

Allergies are caused from an immunity system on overload. Your body produces antibodies to fight infections. Allergens are usually neutral substances, like pollen or dust.

An allergic overreaction in the nose is what we call *hay fever*; in the lungs it's called *asthma*. If your skin reacts it's called hives and in your stomach we call it *food allergy*. If your whole body reacts, it's called *anaphylactic shock* and can be life threatening.

Juicy Fruit

Succulent or juicy fruits are brightly colored and moist, with a fleshy tissue surrounding their seeds. Oranges are a great example.

Dry "fruits" have a hard, dry wall around their seeds, like nuts, grains and legumes.

World Records

The top five most produced fruits in the world are:

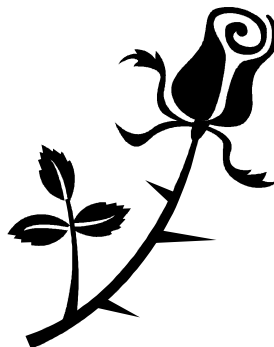
#1 Tomatoes	60 MTY*
#2 Bananas	44 MTY
#3 Apples	36 MTY
#4 Oranges	34 MTY
#5 Watermelons	22 MTY

*MTY=million tons per year⁷

The world record for a tomato is nearly 8 lbs, the weight of a youth's bowling ball.

Flowers

- A.** Flowers are very diverse in how they work. The ones we described in the film are a common and simple type of flower design.
- B.** Flowers are just one part of the plant. Their function, besides looking nice to people, is to *reproduce the plant*. They make and scatter seeds. Flowers attract pollinators. Birds see reds and yellows while many insects see the ultraviolet parts of the flower.
- C.** Two main parts of a plant are the *male Stamen* (which has the pollen on it) and the *female Stigma* (which is the top of the stalk where the eggs are).
- D.** Fertilized or pollinated eggs turn into new seeds and the protecting area becomes fruit.
- E.** *Fruit* is generally thought of as oranges and bananas. But *fruit* really means the ripening base that protects the seed.⁶
- F.** A *vegetable* means the edible part of any plant such as leaves, stems and roots.
- G.** *Vegetative reproduction* means starting a plant using a piece of the plant like a stem or root or rhizome like Iris flowers. Grafting is another method which attaches one plant part into another plant
- H.** **Spores** are a very different kind of seed that can reproduce a plant all on their own. Fern leaves have spores on them. Although *spore* actually means *seed*, plant scientists make a clear distinction between regular seeds (flowering and cone-bearing plants) and spores (ferns). Thus, spore plants *do not have hidden seeds* and thus are *not angiosperms*.



⁶ Fruit is technically the ripe ovary of the plant. *Ovary* is Latin for *egg*.

⁷ Source: Furmanos Tomato Corporation www.furmanos.com



Little Foot

The petiole, the *little foot*, will twist and turn so that each leaf faces the sun for greatest absorption.

Leaf Blade

The blade of a leaf is technically called the *lamina* meaning “thin or spread out.”

This is also where we get the word *laminated* meaning a thin sheet or layer of wood or plastic.

Energy Machines

Plants only use about 1% of the entire light spectrum to produce their food, yet plants produce billions and billions of tons of food per year.⁸

Fossils exist of giant 99 foot tall horsetail plants and enormous fern forests. Fossilized vegetation has even been found in the polar regions.

It is evident that the climatic growing conditions of the past were far superior to what we experience today.

Score

Xylem is the technical word for what we call wood or lumber. *Xylem* is pronounced ZIE-lum, and it’s an important word because it starts with the letter ‘X’ and is worth 28 points on a double-word score in a game of Scrabble.[®]

Leaves

- A.** Plants use sugar in the form of glucose, not too much different than the sugar people like to eat. This is the primary function of leaves; to manufacture sugar from their environment so the plant can eat.
- B.** The main parts of a leaf are the blade and the petiole which means *little foot*.
- C.** Some leaves “eat” insects, like sundews and the Venus fly trap. Actually, the leaves *digest* the insect and absorb the liquefied material.
- D.** Photosynthesis is the process whereby leaves make sugar for food. Here’s the formula:

Carbon dioxide (in the air) + water + sunshine = sugar and oxygen (back in the air.)
- E.** Any extra sugar produced by plants is stored as starch. Potatoes are a starch storage. Carrots, beets and radishes are a kind of root storage.
- F.** The chemical inside each leaf that makes photosynthesis possible is called chlorophyll. *Chlorophyll* means *green leaf* and is responsible for the green color in most plants.
- G.** Colder weather stops photosynthesis, causing the brilliant colors associated with fall to emerge. The petiole is cut off from the plant forming a leaf scar and the leaf falls off.
- H.** Evergreen needles remain green year around and very slowly photosynthesize throughout the winter.

Stems

- A.** Stems hold the plant up...but you probably already knew that.
- B.** Stems are the plant’s link between the water and minerals below the ground with the light and air above the ground. Water and minerals are transported through their vascular tissue.
- C.** *Woody stems* include trees, shrubs and vines. In areas where summer and winter are present, (as opposed to the tropics for example) trees will form annual rings indicating their age.⁹
- D.** There are also *herbaceous stems* like grape vines, flowers, beans and cucumbers. We often think of herbs as a plant used for medicine. But technically, any non-woody plant is an herb.

⁸ A Beka Books. *Biology: God’s Living Creation*. P. 42 and Richard Spilsbury, *Plant Classification*. P. 36

⁹ Yes, that means that in some tropical regions with year round growth, annual tree rings don’t form.



Grass Qualifications

A plant qualifies as a grass if it is self-pollinating, with long narrow leaves, jointed stems, flowers forming in small spikes and generally growing densely in meadows. Grasses cover nearly 1/3 of the earth's land area.

Fast Grass

Bamboo is the tallest grass growing over 100 feet tall with a 3 foot diameter base. Bamboo is one of the fastest growing plants known, with some varieties growing 3 feet per day.¹¹



Film Trivia

The man on the riding lawn mower in this segment is John Olson, Wes' Father.

Roots

- A. *Roots anchor* a plant to the soil and absorb water & minerals for plant growth.
- B. There are two basic kinds of roots: *tap roots* like carrots and *fibrous roots* like grass.

2. Grasses

- A. Grasses are some of the most important plants in the world. All *grains* are grass plants and are usually classified as *cereal grasses*. They include wheat, rice, corn, oats, barley, rye and millet. Columbus called corn, *Indian grain*. 350 million tons are produced annually in the world.¹⁰
- B. Fermented grasses make *alcoholic* beverages, including beer and hard liquor. Wine is made by fermenting grapes.
- C. *Sugar cane*, where we get most of our crystalline sugar, is a grass. *Corn* is a grass and so is *bamboo*.
- D. Animals eat *forage grass* like Timothy grass, fescue, brome, millet, corn, oat, rye, hay and sorghum grass.
- E. Humanity depends on an uninterrupted harvest of grass. In developing countries, nine out of ten people live almost entirely from grass grains.
- F. *Rice* feeds over 1/2 of the world's population.¹²

3. Annuals & Perennials

- A. *Annuals* last only one year. They flower, produce seed and die in one season. Plants like peas, beans, marigolds, sweet peas and zinnias are annuals.
- B. *Perennials* come back year after year. They are "permanently perennial." Trees, asparagus, asters, black-eyed susans and lavender are examples of perennials.
- C. *Biennials* are a third group of flowering plants which take two years to complete their life cycle. In year one, they only form a ring of leaves. In year two, they produce their flowers and seeds. Cabbage, carrots and beets are biennials.

¹⁰ Augusta Goldin. *Grass, the Everything, Everywhere Plant*. P 46

¹¹ The New Book of Knowledge. Vol. 7 P. 318

¹² Augusta Goldin. *Grass, the Everything, Everywhere Plant*. P 63

4. Trees

Thirsty Trees

On a sunny day, a single medium-sized oak tree will give off nearly 150 gallons of water as the water evaporates through its leaves.¹³

How to Water a Tree

Watering a tree by hosing down the leaves is like quenching your thirst by taking a shower. Trees, like most plants, take up their water through their extensive root systems. Water in the ground is water in the tree.

- A. Trees are the *oldest living things* on the planet. Biblical chronology places the world-wide flood about 4,500 years ago. The oldest trees in the world, bristlecone pines, are 4,500 years old.
- B. Some trees, like pine trees, have pine cones where the seeds are exposed and not enclosed in a fruit. These are “gymnosperms” meaning naked or exposed seeds.
- C. Trees are the largest living things on the planet. Some redwoods are over 350 feet tall.
- D. Woody plants that shed leaves and remain leafless in winter are called *deciduous* which means “to fall off.” Apple trees are an example.
- E. Woody plants that retain leaf coverage throughout the year, like pine trees, are called *evergreens*. Sometimes they are called *conifers* which means “cone bearing” since most conifers are also evergreen trees. Ivy plants are also evergreens.



Trees are prominent throughout the Bible. Two trees were central to the rise and fall of Adam and Eve. The Jews were forbidden to cut down fruit trees in war.¹⁴ Deborah judged Israel under a tree and Rebekah’s nurse was buried under a tree named “The Oak of Weeping.” Noah’s ark and the Ark of the Covenant were made from trees. Jesus Christ died on a tree and his betrayer, Judas Iscariot, hung himself on a tree. At the end of time, mankind will at last have access to the Tree of Life. Trees will be with us in heaven and for all eternity.¹⁵

¹³ New Book of Knowledge. Volume 18, P 307

¹⁴ Deuteronomy 20:19

¹⁵ Revelation 22:2



Nonvascular Plants

1. Nonvascular plants include things like algae, moss, fungi, liverworts and mold.
2. There's a variety of reasons that some biologists won't classify many of these organisms as plants: because they have no leaves, flowers, stems or roots or because some (like fungi) don't use photosynthesis, or because their cells have a different material than most plants, etc.
3. Algae are in three entirely different kingdoms as of this writing. Fungi currently have a kingdom all to themselves. But they were probably made on day three right along with other plants—"replicating systems" that lack the traits associated with animals like voluntary movement and *nepbesh* life (see page 4 footnote for a description of *nepbesh*).

3rd Day - Plants

Nonvascular Plants

plants without a trachea

1. Moss & Liverworts
2. Algae
3. Fungi
4. Lichen

All about Peat

Peat Moss is the accumulation of a type of moss called *sphagnum*. As the plants die, new ones grow on top of them and the dead layers are packed down into a spongy mass called *peat*. *Sphagnum* is Greek meaning *a kind of moss*. This odd word is pronounced s-FAG-num. Moss farmers drain the swamps and use special machines to dig it out. Peat is commonly used as fertilizer and can be cut into chunks to burn when other fuel sources are scarce. Germany and Canada are the world's biggest suppliers of peat moss.

Warts and Worts

A wart is a small growth on your skin probably caused by a virus. The *wort* of Liverwort and St. John's Wort is an obsolete Old English word that means plant, vegetable or herb.

Using Diatoms

Diatomaceous earth is used in filtration systems because it is filled with millions of microscopic pores. It's also used as an abrasive filler in toothpaste, as an absorbent in kitty litter and to help soak up toxic spills. As a pest killer, diatomaceous earth causes small cuts in the waxy outer layer of insects, causing them to dehydrate and die. There is even a food grade version that kills worms in people and pets.

1. Moss & Liverworts

- A. Everyone agrees these belong in the plant kingdom even though they have no true leaves, stems, roots or vascular tissues. They use *photosynthesis* which gives just about anything a free ride to the plant kingdom.
- B. *Moss* is the soft green plant that carpets damp rocks, walls and roofs. It can act like grass in keeping soil erosion down.
- C. *Liverworts* look like clumps of little, dark green leaves. They are a small, low-growing plant filled with moisture and green chlorophyll.

2. Algae

- A. *Algae* actually means *molby and putrid* which is why algae are often called *scum*, because scum is any thin layer of impurities that forms on the top of liquids.
- B. In the food chain, algae are on the bottom. The smallest fish eat algae and then the bigger fish eat smaller fish.
- C. Algae are thickeners in many foods including mayonnaise, ice cream and salad dressings. Scientists call them "produce proteins."
- D. Algae blooms are caused by the rapid reproduction of various algae in both fresh and salt water. They can clog filters and poison the water.
- E. Classification of algae is often difficult depending on your classification system. Today, you can find various algae scattered throughout kingdoms Monera, Protista and Plantae.
- F. *Diatoms* are a microscopic algae eaten by many larger life forms. Their skeletons pile up by the billions and can be harvested as diatomaceous earth.
- G. *Algae* is the plural word as in "lots of algae." It is pronounced al-jee. The singular is *alga* and it is pronounced al-guh.

3. Fungi

- A. Let's get it straight. *Fungus* is singular; "one fungus." *Fungi* is the plural form, "three fungi" and can be said either *FUN-je* or *FUN-guy*.
- B. Fungi were homeless parasites; they were never included in the animal kingdom and since they don't photosynthesize, some scientists removed them from the plant kingdom. Generally, these exiled parasites reside in their own fungi kingdom.
- C. Fungi include mold, mildew, puffballs, mushrooms, stinkhorns, athlete's foot, ringworm, rusts and smuts.
- D. Some fungi can grow at the astonishing rate of 1/2 mile per day.¹⁶
- E. *Mushrooms* are fungi and about 1 out of 100 mushrooms are poisonous to humans.
- F. The antibiotic *penicillin* is made from a specific mold (named, not surprisingly, as *penicillium*).

Stinks and Rusts

Stinkhorns are just what they sound like, a foul smelling fungus. *Rusts and smuts* are a plant disease attacking grain. This fungus makes a black sooty growth that destroys the crop.

Eating Fungus

Mushroom is a word some people use for an edible fungus and *toadstool* is used for the poisonous ones. Technically only fungi with the gills under their bells are called mushrooms.



The Nobel Prizes. Alfred Nobel (1833-96) was the man who invented dynamite using diatomaceous earth to stabilize the nitroglycerine. Nobel became a very wealthy man through this invention and at his death, he left nearly 95% his entire estate (he was unmarried) to the establishment of five special prizes. They were to be awarded every year to "those who, during the preceding year, shall have conferred the greatest benefit on mankind."

This was the start of the famed Nobel Prizes which have been awarded every year since 1901. The five categories for the prizes are physics, chemistry, medicine, literature and peace. The one you hear the most about is the Nobel Peace Prize. Anybody can be nominated for a Nobel Prize but nominees are never publicly announced and they are not supposed to be told that they were ever even considered for the prize. Plus, the records are sealed for 50 years to avoid turning the prize into a popularity contest.

The nominees are voted on by the Norwegian Nobel Committee. The winners (which are publicly announced) receive a gold medal, a diploma and a sum of money currently worth about \$1.3 million US dollars. Nearly 800 Nobel Prizes have been awarded since the beginning of this foundation.

¹⁶ D.A. Sousa, What is a Fungus? P. 16

4. Lichen

- A. *Lichen* is an alga and fungus sharing the same room. The alga provides the food for itself and the fungus using photosynthesis. The fungus supplies the water, minerals and shelter.
- B. Some lichen can be eaten when food supplies are scarce.
- C. *Beatrix Potter* was an accomplished scientific illustrator who studied fungus and lichen (when she wasn't writing bunny stories). She loved to draw mushrooms in particular. Her science paper on lichen verified that it was in fact two life forms working together.



Flopsy, Mopsy and Cottontail. Helen Beatrix Potter (1866-1943) was the author and illustrator of more than 20 famous children's books, the first and most famous being *The Tale of Peter Rabbit*. She and her brother Bertram were raised in England, mostly by nannies and governesses. The family summer vacations to Scotland opened her eyes to nature and the animals that would eventually be featured in her stories. As a child, she would often entertain herself with her real pet animals who included two pet rabbits named Benjamin Bouncer and Peter Buck, a tea-drinking hedgehog named Mrs. Tiggly-winkle, a spaniel dog named Spot, a Berkshire pig named Pig-Wig and a mouse named Xarifa.

Her first story about Peter Rabbit was an immediate success. She completed many scientific illustrations for a naturalist named Charles McIntosh and eventually completed her paper on lichen.

Potter married at 47 but never had any children. In her will, a significant part of her property—cottages, 15 farms, 4000 acres of land — were given to the England National Trust to ensure that its beauty could remain unspoiled. Her legacy is now part of the Lake District National Park in England.

Plants Quiz

1. The primary function of flowers is to
 - a) Hold the plant upright
 - b) Feed the plant
 - c) Reproduce the plant
 - d) Defend the plant
2. The stigma is which part of the plant?
 - a) Male
 - b) Female
 - c) Neither
3. "Botany" is a Greek word that means
 - a) Vascular
 - b) Plant
 - c) Created
 - d) Bean sprout
4. Why is the stamen considered the male part?
 - a) It carries the eggs
 - b) It carries the ovary
 - c) It gets carried away
 - d) It carries the pollen
 - e) The stamen isn't the male part.
5. Vegetation was created on which day?
 - a) 1st
 - b) 2nd
 - c) 3rd
 - d) 4th
 - e) 5th
6. The botanical function of fruit is
 - a) To protect the seeds
 - b) To water the plant
 - c) To defend the plant
 - d) To hold the plant up
 - e) None of the above
7. The stalk attaching a leaf to the limb is called a
 - a) Stick
 - b) Lichen
 - c) Lamina
 - d) Blade
 - e) Petiole
8. The division name of vascular plants is
 - a) Tracheophyta
 - b) Trachea
 - c) Thallophyta
 - d) Angiosperm
9. Circle the nonvascular plant
 - a) Cattail
 - b) Apple
 - c) Tulip
 - d) Moss
10. Chlorophyll is the chemical responsible for
 - a) Pollinating plants
 - b) Transporting water in plants
 - c) Photosynthesis in plants
 - d) Purifying water in plants
11. The formula for photosynthesis is
 - a) Carbon dioxide + water + sunshine = sugar and oxygen
 - b) Carbon dioxide + salt + sugar = water and oxygen
 - c) Carbon monoxide + water + tar = sugar and oxygen
12. The primary function of leaves is
 - a) To cool the plant down
 - b) To make food for the plant
 - c) To reproduce the plant
 - d) To defend the plant

13. Technically, fruit is
- The ripening base around the seed of any plant
 - Just stuff like apples and oranges
 - Fruit is not a technical term
14. Which of these is NOT a grass?
- Wheat
 - Rice
 - Alfalfa
 - Corn
 - Ivy
15. 9 out of 10 plants have hidden seeds and are called
- Annuals
 - Angiosperms
 - Gymnasiums
 - Algae
 - Nonvascular plants
16. A plant is considered nonvascular when
- It has small leaves
 - It lacks the trachea-like tubes to transport water
 - It absorbs water from its roots
 - It spreads to other organisms
17. Diatoms were once living creatures.
- True
 - False
18. Penicillin is an antibiotic made from
- Photosynthesis
 - Pinecones
 - Fungus mold
 - Smuts
19. Lichen is a kind of
- Nonvascular plant
 - Vascular plant
 - Creeping ivy
 - Perennial grass
 - None of the above
20. A perennial is a plant that comes back year after year.
- True
 - False
21. Which of these is NOT a part of a plant?
- Stem
 - Flower
 - Root
 - Lard
 - Leaf
22. Fungi don't use photosynthesis to make their food.
- True
 - False
23. "Conifer" means
- With seed
 - With fur
 - Hidden seeds
 - Cone bearing
 - None of the above
24. Two of the *main* features that define a plant are:
- They make their own food and they can't move voluntarily
 - They are yellow and eaten by other animals
 - They smell and look nice.
 - They absorb water and oxygen.
25. Jesus believed that God made the world in six days.
- True
 - False

Answers are on page 99



Possible Discussion Questions

- How is eating a plant the same or different than eating an animal?
- What did Jesus believe about creation and the Bible? Why is it important to believe what He believed?
- How do we know the Bible is a reliable document?
- God made all vegetation on the day before He made the sun. How could the plants have survived this?
- Discuss a few of your favorite ways plants are talked about in the Bible.

END OF PLANT SEGMENT

