

# Master Gardener Program



Utah State University  
Cooperative Extension

# Plant Parts and Functions

- Plant Classification
- Stems
- Buds
- Leaves
- Flowers
- Fruits
- Roots

# Plant Classifications

- Woody vs. Herbaceous
- Deciduous vs. Evergreen
- Annual vs. Perennial vs. Biennial
- Gymnosperms vs. Angiosperms
- Monocots vs. Dicots
- Botanical, Scientific (Latin) Name

# Herbaceous vs. Woody

- Woody – plants that develop woody stems
- Herbaceous – soft green plants that have little or no woody tissue

# Deciduous vs. Evergreen

- Deciduous
  - Loose their leaves annually
- Evergreen
  - Retain leaves during the winter

# Annual, Perennial, Biennial

- Annual – completes life cycle in one year (seed to seed)
- Perennial – plant lives through the winter to grow from same roots the following year
- Biennial – takes two years to complete the life cycle. Stores energy in roots then flowers after cold of winter

# Gymnosperms, Angiosperms

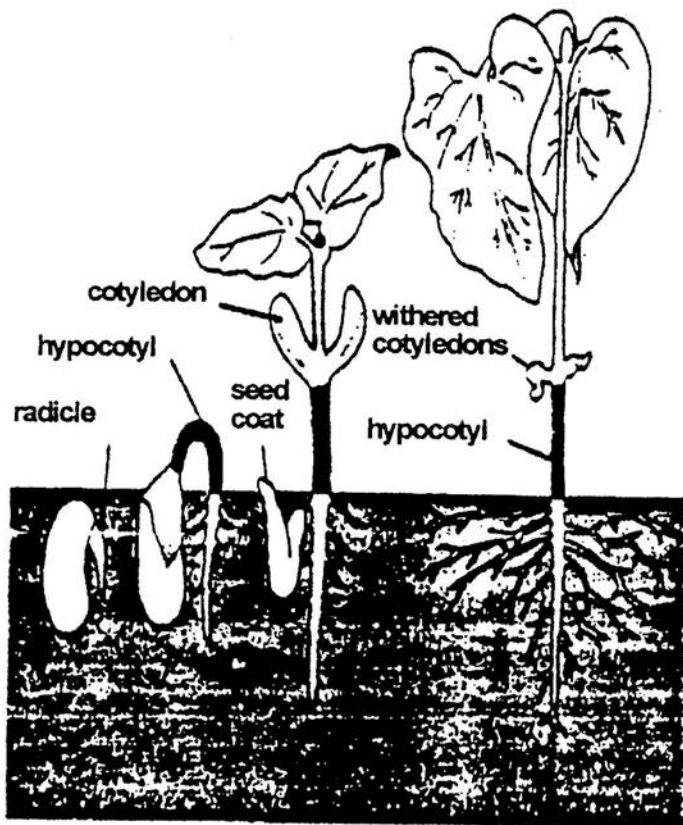
- Gymnosperms – cone bearers
- Angiosperms – seeds inside fruit
  - Dicots and Monocots



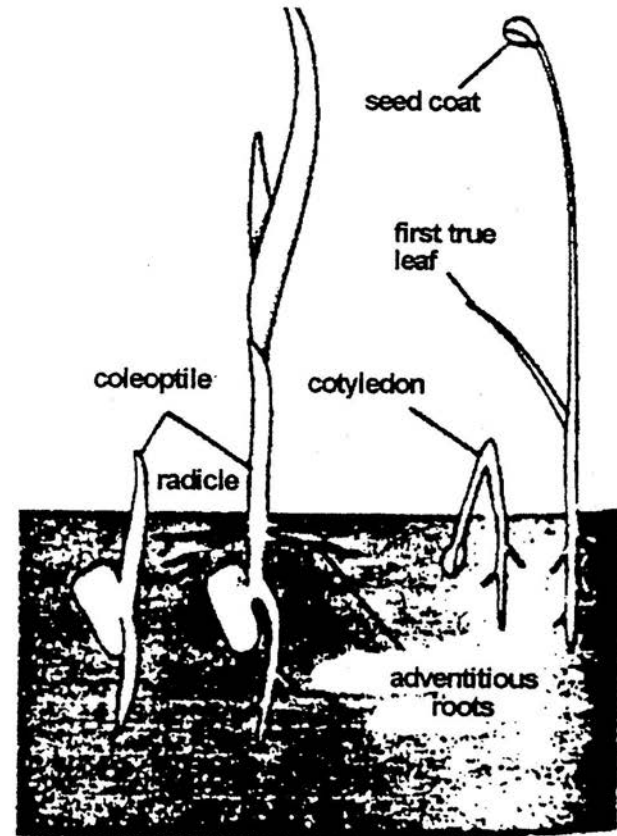
# Monocots, Dicots, Polycots

- Monocots – grasses
- Dicots – broadleafs

# Germination



**GERMINATION OF A DICOT**  
Stages in germination of garden bean



**GERMINATION OF A MONOCOT (Grasses)**  
Seed germination. (Left): corn. (Right): onion

# Scientific Names

- Binomial nomenclature system devised by Carl Linnaeus (1707-1778)
- Species are uniquely identified by name
  - Many species have more than one common name
  - Multiple species may share a common name
- Species names consist of:  
Genus + specific epithet

Genus + specific epithet

- “Genus” groups plants that are genetically related, have similar characteristics.
  - Acer = MAPLE, BOX ELDER
- “specific epithet” identifies unique plants within a genus, usually an adjective.
  - Acer palmatum = JAPANESE MAPLE, palmatum implies radiation from a single point – leaflets or veins

# Cultivar, Variety, Cross

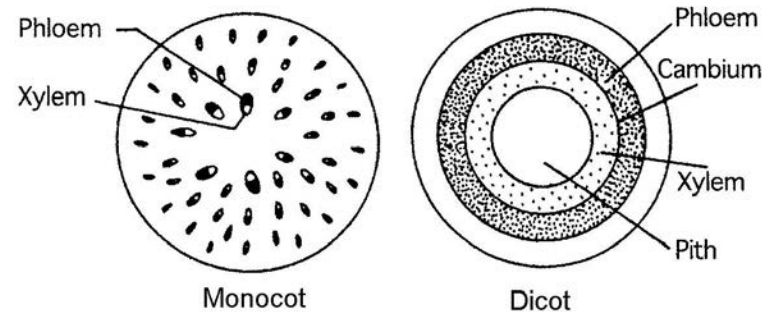
- Cultivar – a variant of a species whose characteristics reproduced vegetatively
  - *Acer palmatum* ‘Garnet’
- Variety – a naturally occurring variant of a wild species. Propagated by seed.
  - *Gleditsia triacanthos* var. *inermis* –thornless honeylocust.
  - Cross – characteristics created by crossing species *Caryopteris* X *Clandonensis*

# Propagation

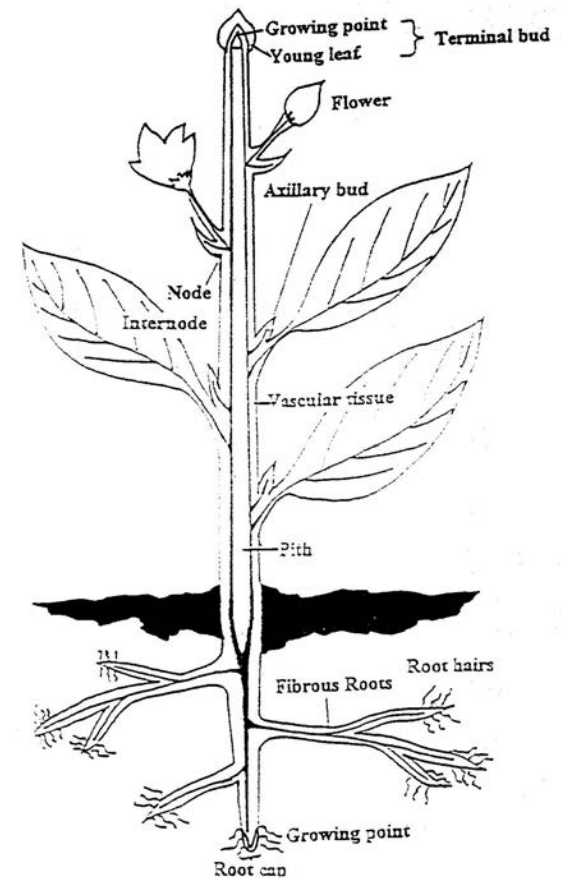
- Sexual – seed
- Vegetative – plant parts
  - Division
  - Plantlets
  - Root and stem cuttings
  - Grafting and Budding
  - Air layering
  - Tissue culture (micropropagation)

# Vascular System

- Phloem – outside cambium
  - transport sugars to roots
- Xylem – inside cambium
  - water and nutrients from roots
- Pith
  - heartwood, dead tissue
- Cambium – single cell layer
  - Separates xylem and phloem
- Wounds
  - Shallow destroy phloem



- Node
  - Area on stem where a leaf may emerge
- Internode
  - Relatively inactive area between nodes
  - Length varies depending on plant vigor, conditions, species
- Compressed stems – short internodes
- Elongated stems – longer internodes

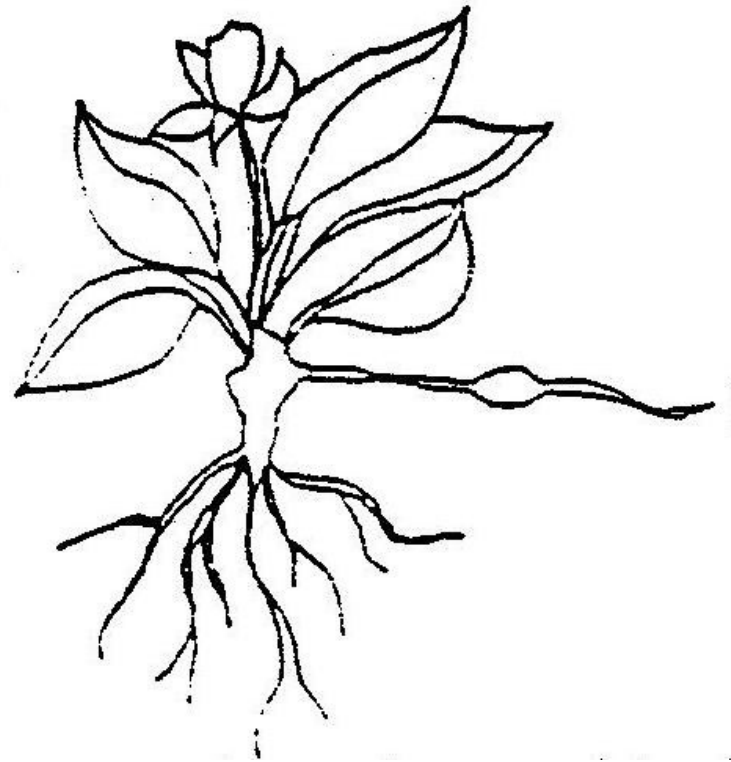




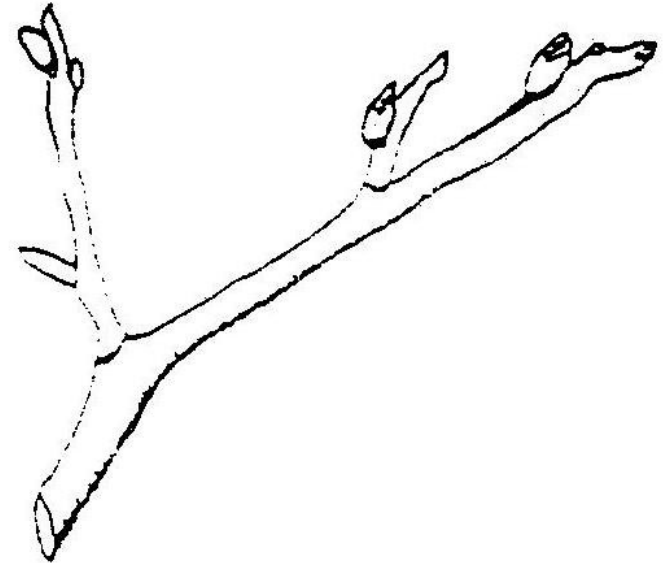
# Types of Stems

- Above ground stems
  - Crowns
  - Spurs
  - Stolons
- Below ground stems
  - Tubers
  - Rhizomes
  - Bulbs
  - Corms

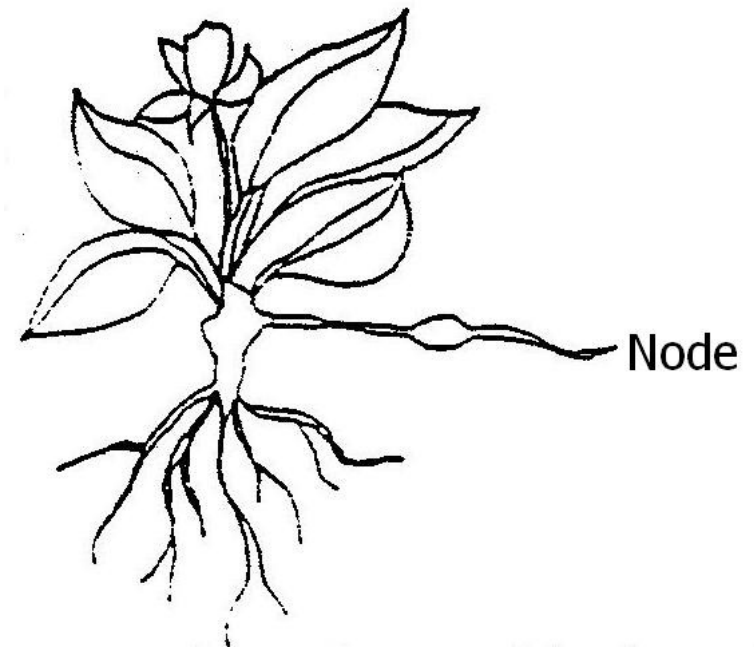
- A crown is a compressed stem



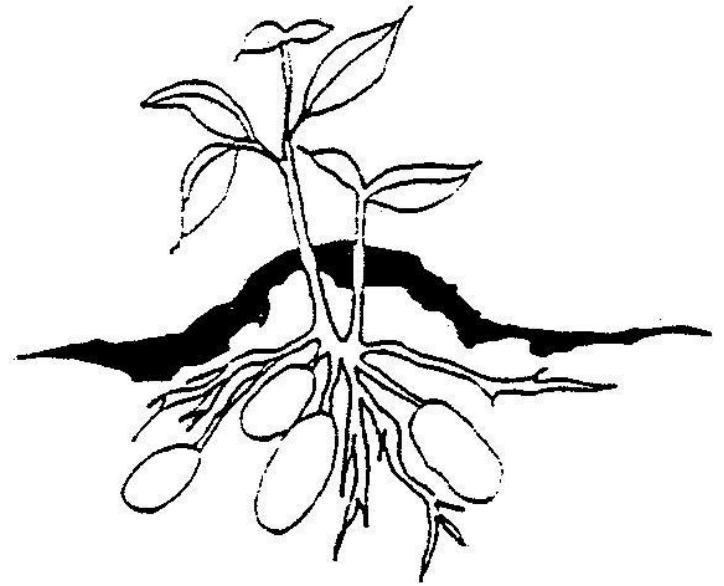
- A spur is a compressed stem of a woody plant that is adapted to fruit production.



- A stolon or runner is an elongated stem that lies along the ground. It may root at any node along the stem.

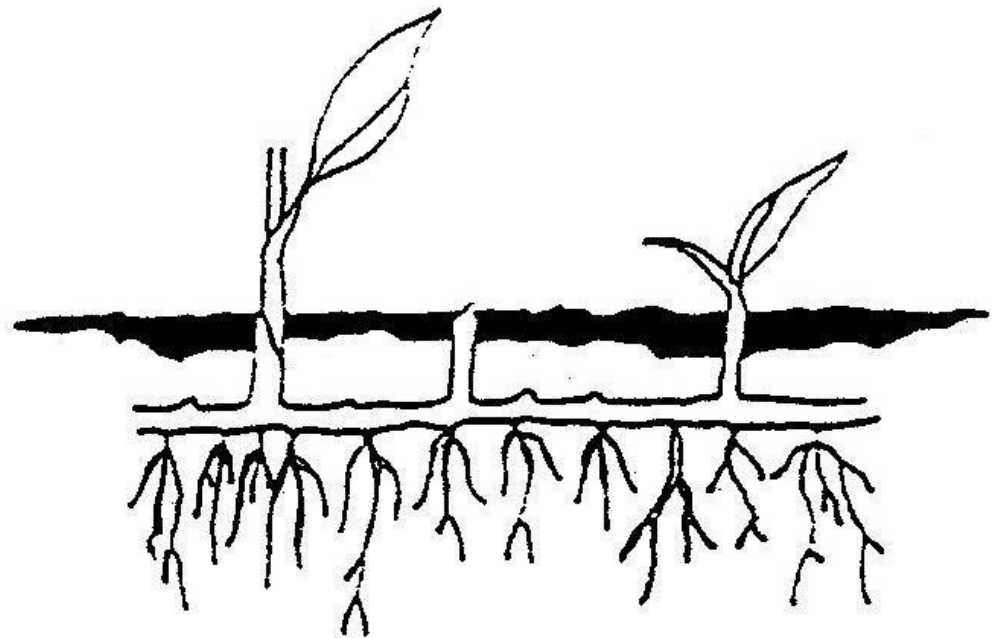


- A tuber is a thick fleshy root which acts as a storage organ.
- The eyes of potatoes are the nodes on the potato tuber.

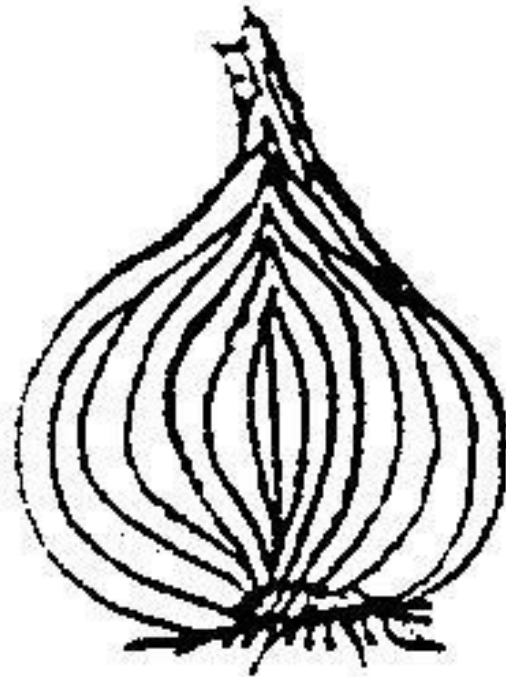


# Rhizomes

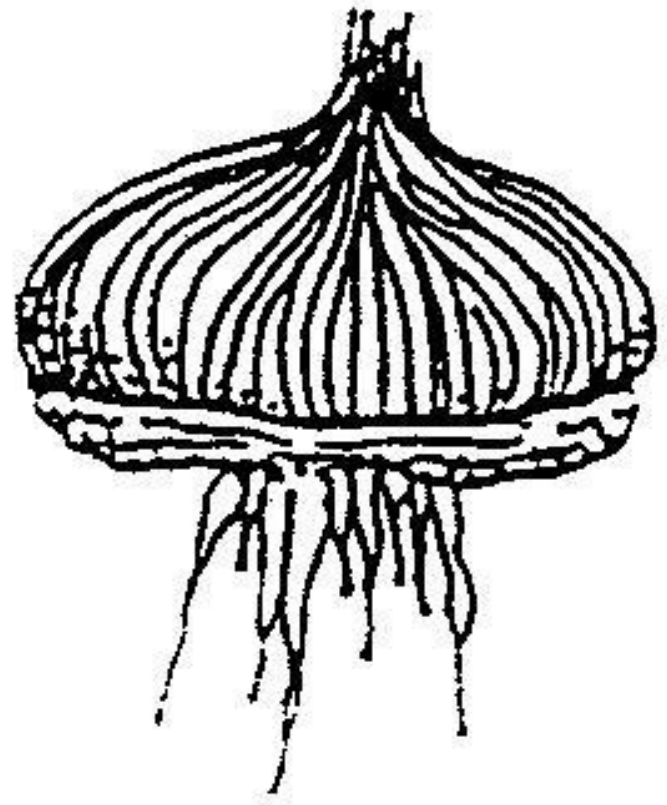
- A rhizome is an underground horizontal stem from which roots and shoot develop.



- A bulb is an underground storage organ containing an embryonic plant. It is made up of a short stem and fleshy leaves



- A corm is an underground storage organ made up of a compressed and thickened stem covered with a thin papery skin.



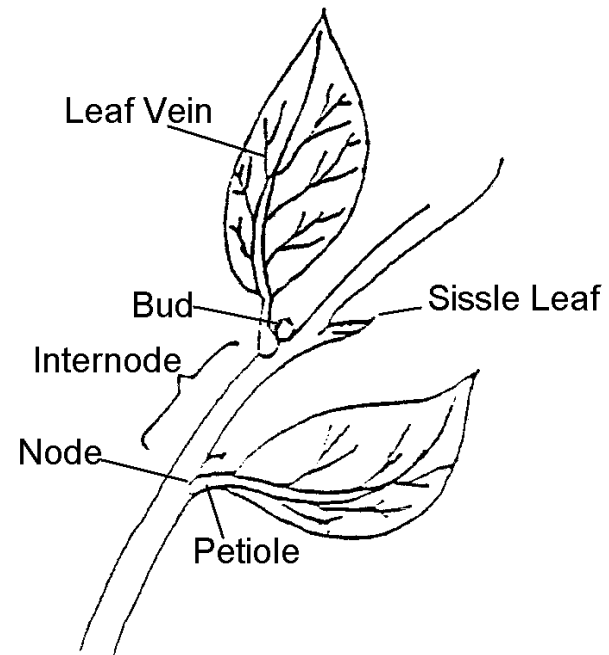


- New stems, flowers, or leaves arising at a node.
- Flower/fruit buds often have a critical winter time and temperature rest requirement before they will bloom.
  - Forsythia (minimal requirement)
  - Peaches 700-1000 hrs below 45° F
  - Cherries 900-1100 hrs below 45° F
- Buds are hardy until the rest period is broken after which they are susceptible to frost.
- Food source - broccoli artichoke

# Types of Buds

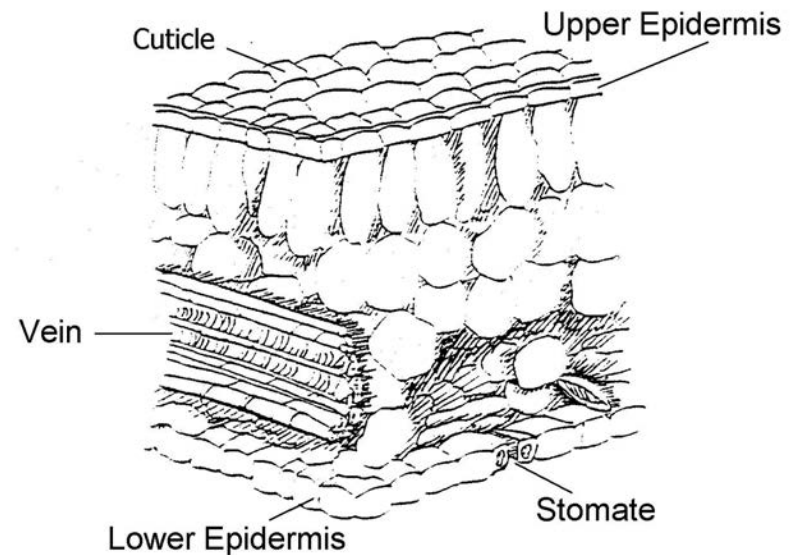
- Latent – buds that are present but inactive. Often suppressed by hormones from the terminal bud.
- Lateral – branching point for side stems and base of the petiole.
- Terminal – growth point, bud at end of stem.
- Adventitious – buds at points other than nodes. Water sprouts and suckers.

- Petiole -stem like appendage
- Petiolate - leaf without petiole
- Principal function -photosynthesis



# Leaf Anatomy

- Epidermis – outer covering
- Cuticle – protects leaf from dehydration
- Stomates – open and close for gas transport
- Guard Cells – control the opening and closing of the stomates.



# Leaves for Identification

- Leaf shapes contribute to plant ID
  - Leaf type
  - Leaf shape
  - Arrangement
  - Margins
  - Veination
  - Gymnosperm leaf types

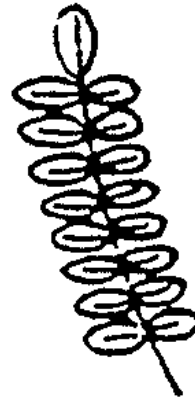
# Leaf Types



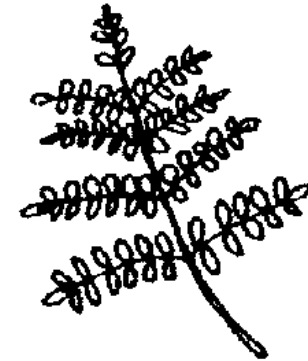
Simple



Palmate  
Compound



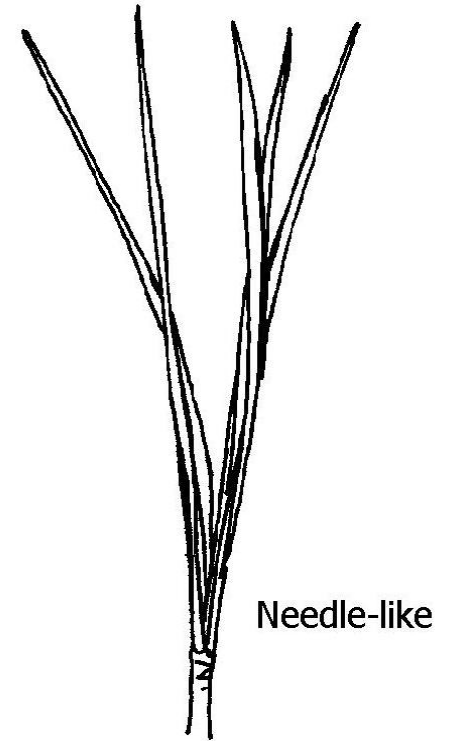
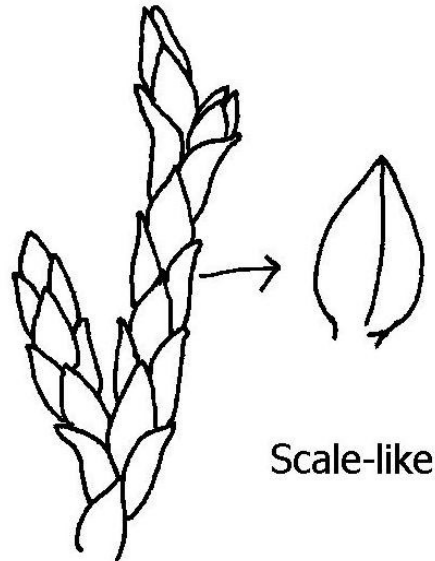
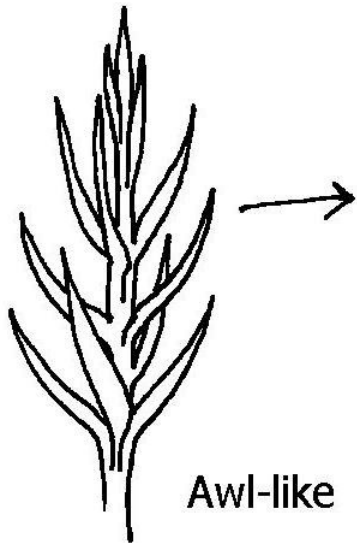
Pinnate  
Compound



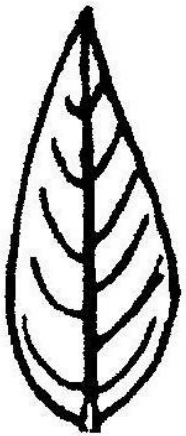
Double  
Pinnate  
Compound

Compound pinnate may be odd or even.

# Gymnosperm Leaf Types



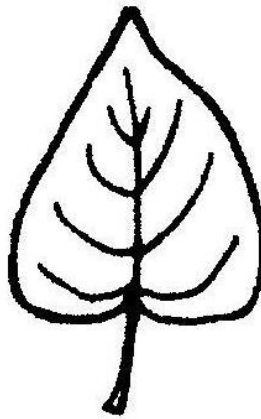
# Leaf Shapes



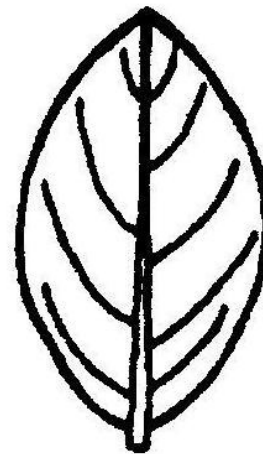
Lanceolate



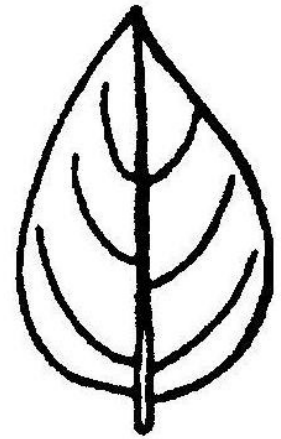
Linear



Cordate



Elliptical

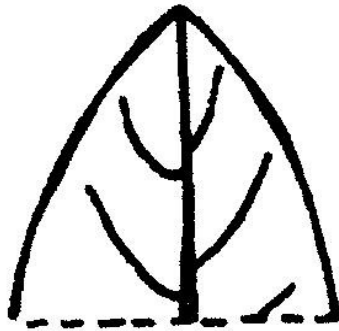


Ovate



# More on Leaf Shapes

## Apex shapes



Acute

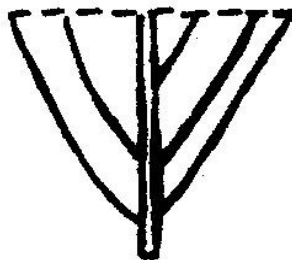


Acuminate

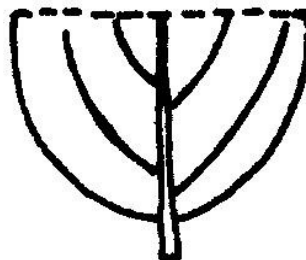


Obtuse

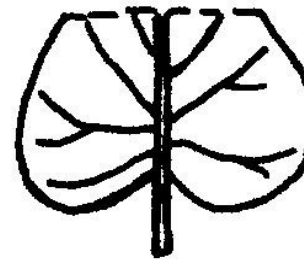
## Base shapes



Cuneate

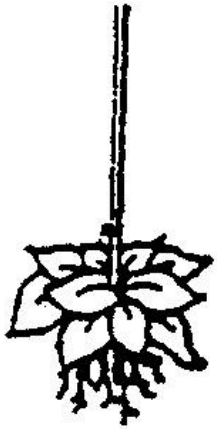


Obtuse

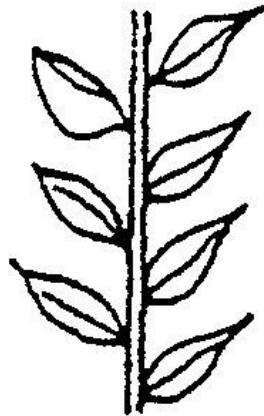


Cordate

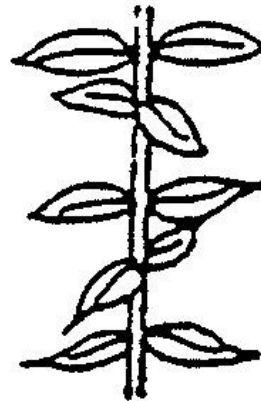
# Arrangement



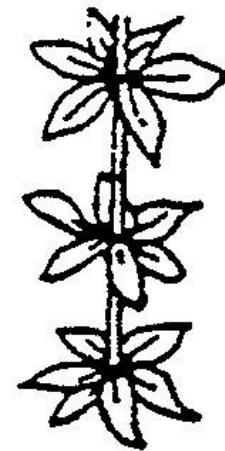
Rosette



Alternate

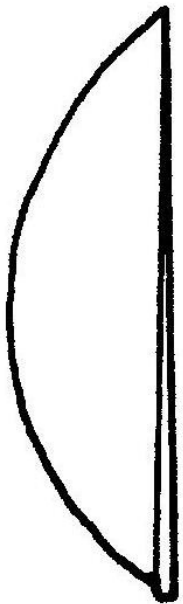


Opposite

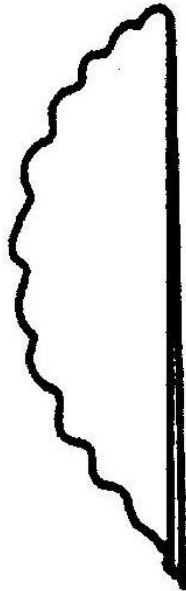


Whorled

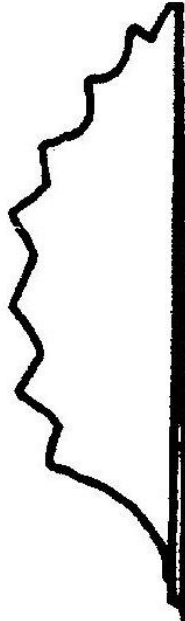
# Leaf Margins



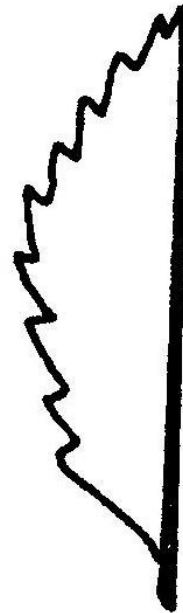
Entire



Crenate



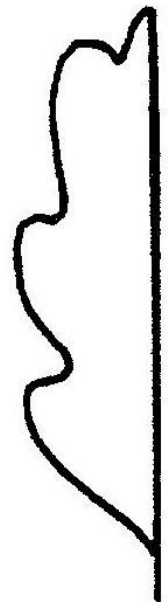
Dentate



Serrate

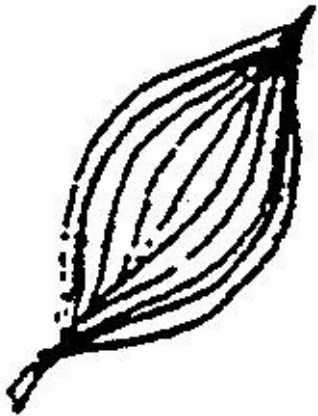


Incised

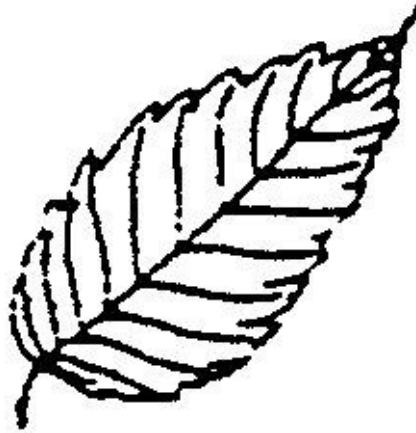


Lobed

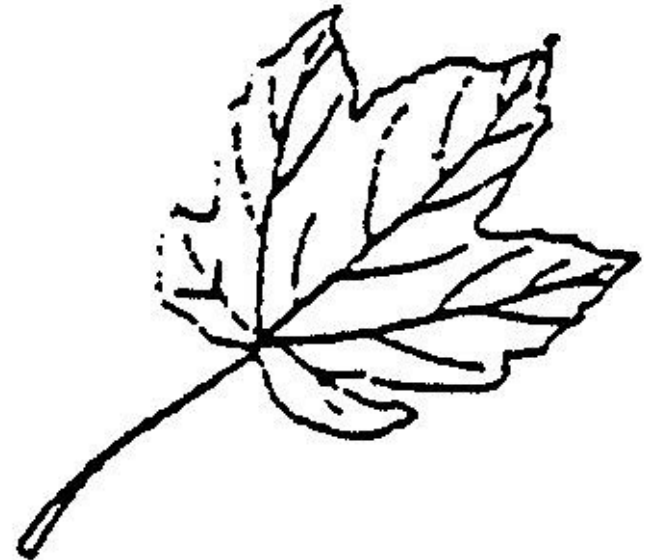
# Veination



Parallel

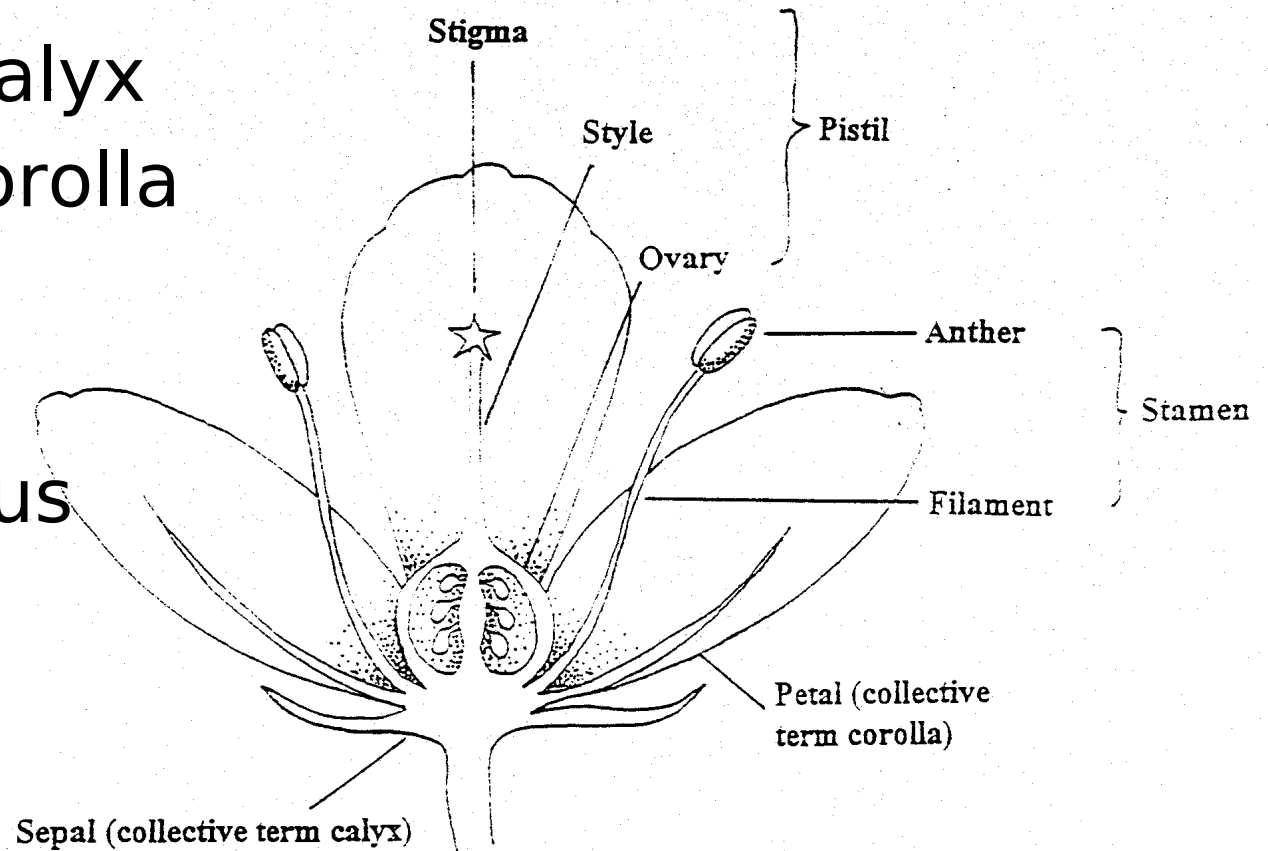


Pinnate



Palmate

- Sepals - calyx
- Petals - corolla
- Pistil
- Stamen
- Monoecious
- Dioecious



# Flower Processes

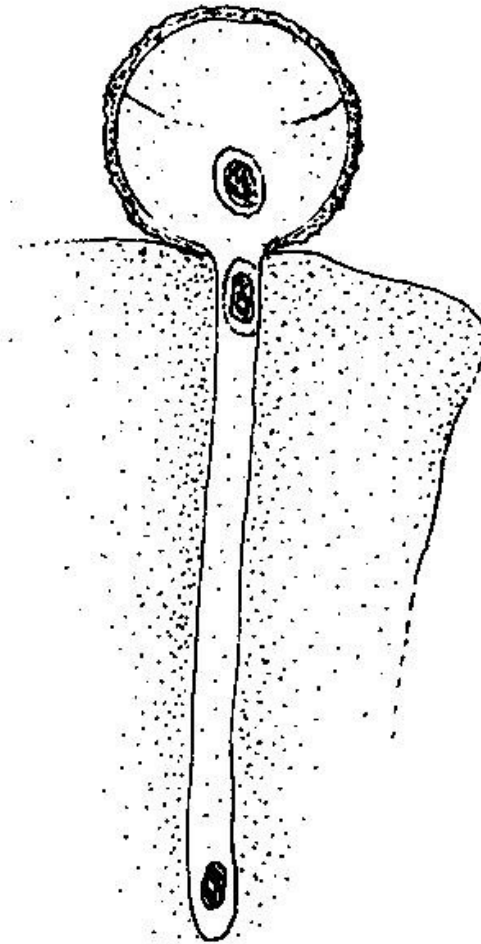
- Pollination
- Germination
- Fertilization
- Fruit Development

# Pollination

Pollination is the transfer of pollen from the anther to the stigma.

- Cross pollination
  - Wind
  - Water
  - Birds
  - Insects
- Self pollination

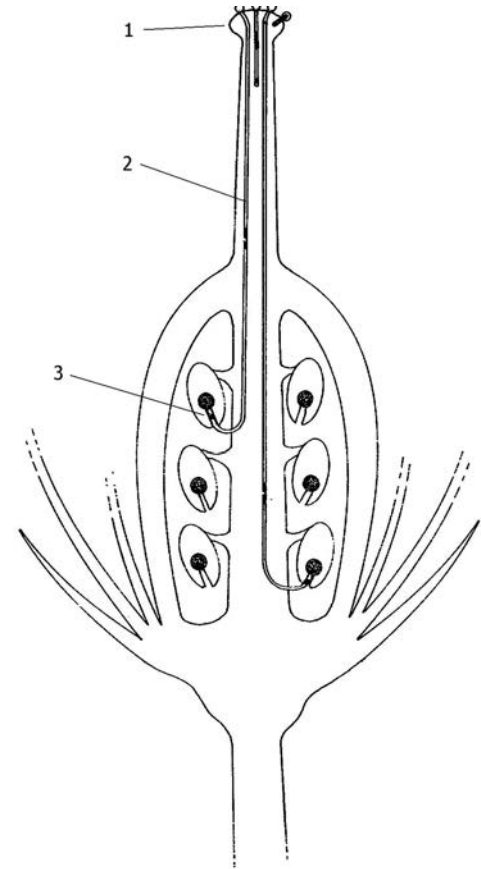
# Germination





# Fertilization

1. Pollen lands on stigma and germinates
2. Pollen tube grows through the style
3. Tube delivers sperm to the egg



# Fruit Development

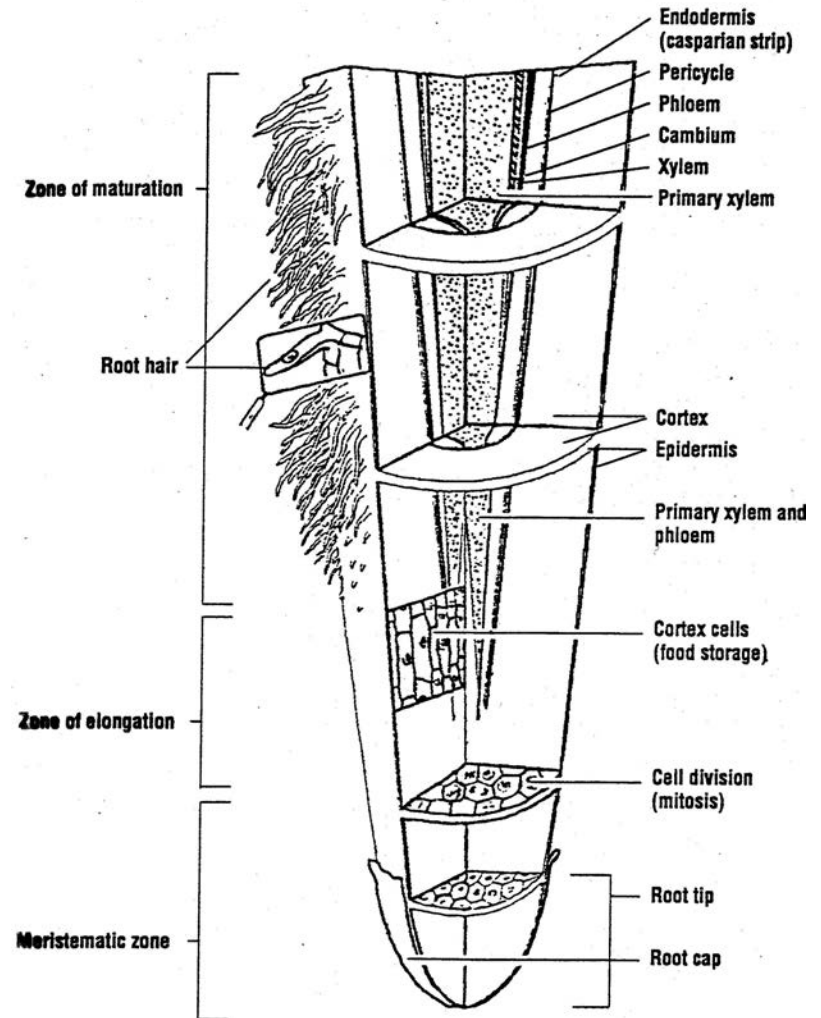
- Flower parts shrivel and drop except for ovary
- Ovary develops to swollen fruit with seeds
- Fleshy fruits – apples, cucumbers
- Dry fruits – pinecones, pea pods

- Simple – single ovary
  - apples, tomatoes
- Aggregate – single flower, many ovaries
  - strawberries
- Multiple – tight clusters of separate flowers
  - pineapples, figs

- Have built in food supply
- Germinate when dormancy is broken
  - Water
  - Temperature, hot or cold, moist
  - Scratched, nicked seed coat
  - Light or dark

# Root Anatomy

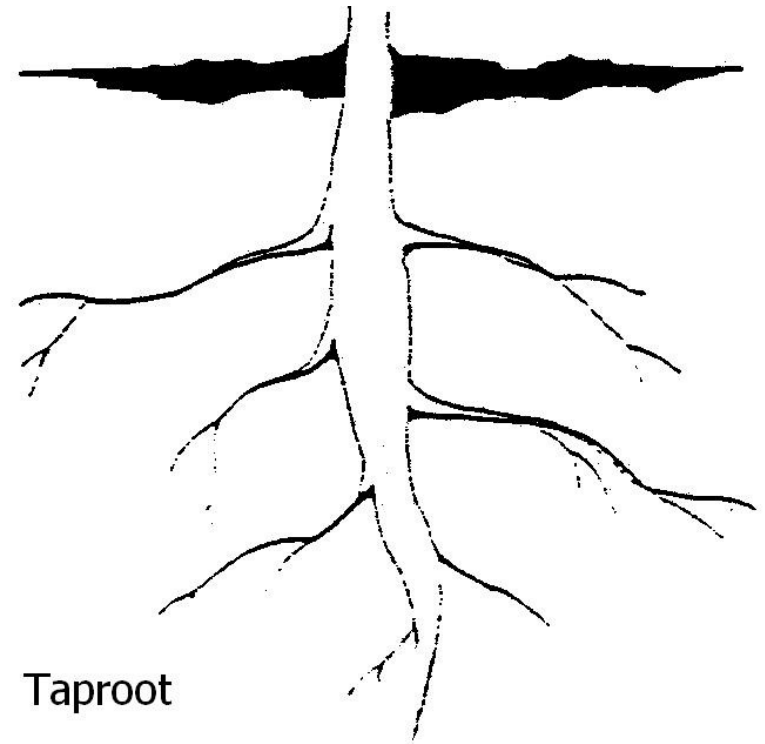
- Root hairs
- Root cap
- Zones
  - Maturation
  - Elongation
  - Meristematic



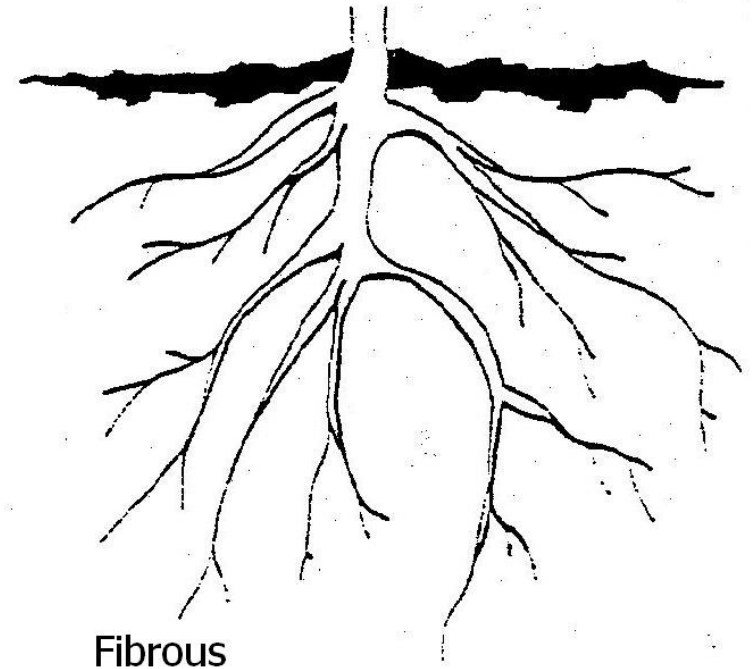
# Types of Roots

- Taproot
- Fibrous
- Root hairs
- Mycorrhizae

- Prominent root with few branches
- Sometimes swollen to store food



- Composed of
  - Many branching rootlets
  - Many lateral rootlets
- Usually lacks a taproot





# Root Hairs

- Hair like projections of a root's epidermal cell
- Extends the surface area of a root

- The symbiotic relationship between certain soil fungi and roots
- Fungi
  - Enter the root tissue
  - Extend absorption area into soil
  - Provide added nutrients (P and N)
  - Receive carbohydrates from the plant

# Summary

- Plant Classification
- Stems
- Buds
- Leaves
- Flowers
- Fruits
- Roots