

Unit B: Plant Anatomy

Lesson 4: Understanding Leaf Anatomy and Morphology

Vocabulary

- # Compound leaf
- # Cuticle
- # Dichotomous venation
- # Epidermis
- # Guard cells
- # Leaf blade
- # Midrib
- # Palisade mesophyll
- # Parallel veins
- # Petiole
- # Pinnately netted
- # Simple leaf
- # Spongy mesophyll
- # Stomata

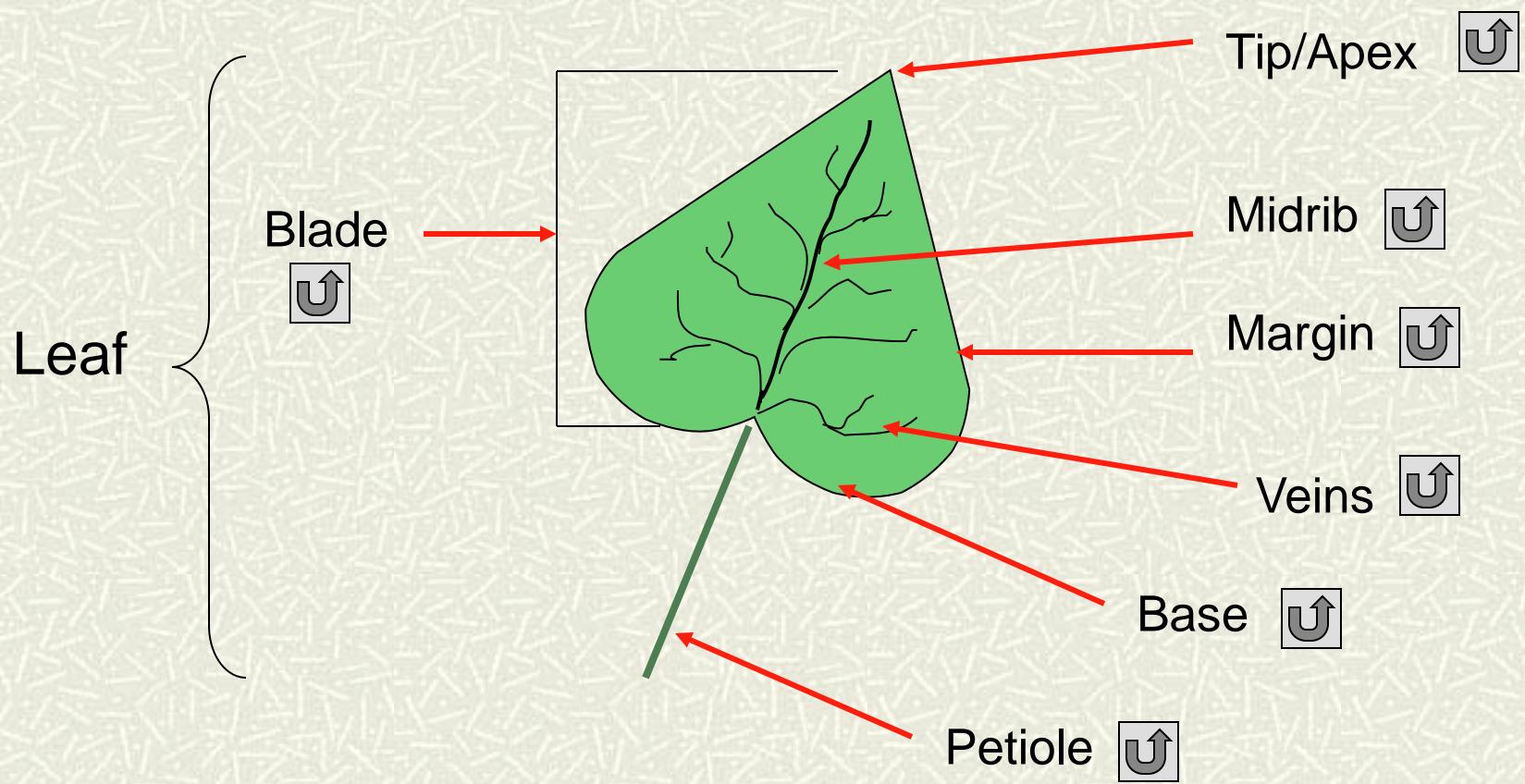
What Are the Main Parts of a Leaf?

- # Leaves are the primary food producing organs of a plant
- # They are designed to efficiently collect light and use that light energy to produce food
 - Remember that this process is called photosynthesis
- # There are several parts of a leaf:

- 1. Tip or apex – this is the top of the leaf; It can be pointed, round, smooth, etc 
- 2. Margin – is the edge of the blade; This is quite specific to each species of plant
 - Some are smooth, toothed, lobed or incised 
- 3. ***Midrib*** – the central vein running down the center of the blade 
- 4. Veins – contain the xylem & phloem of the plant 
 - They can be parallel or netted in arrangement

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- 5. Base – is found at the bottom of the blade; Like the apex, it can be round, heart shaped, flat, etc 
 - 6. **Petiole** – is known as the leaf stem; It is not exactly like a stem, but it does hold xylem & phloem; Holds the blade away from the stem 
 - 7. **Blade** – the main collecting structure of the leaf; Has a large, broad surface 
 - Has many layers which help the plant move and store photosynthetic materials and by-products

Main Parts of a Leaf

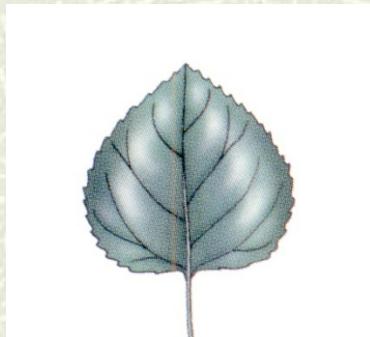


What Are Some of the Major Types of Leaves?

- # There are many different types of leaves
 - Some are adapted to hot, dry climates
 - They store water in their leaves or are smaller in size
 - Some have very large blades to collect maximum light in shady locations
 - Some plants have their blades broken into many sections

A leaf which has only one blade on its petiole is called a ***simple leaf***

- Most plants have simple leaves



When the blade is divided into three or more sections, it is said to be a ***compound leaf***

- There are many different kinds



Types of Compound Leaves



Odd
Pinnately
Compound

Even
Pinnately
Compound

Palmately
Compound

What Are Some Vein Patterns Found in Leaves?

- # Veins of flowering plants are found in several patterns
 - Most patterns can be categorized into two main groups
 - A. ***Parallel veins*** – found in monocots
 - None of the veins on the whole leaf will cross each other
 - It may look like they fuse together at the top or bottom of the blade

■ B. ***Netted veins*** – found in dicots

- They connect & branch from each other
- Some have several smaller veins branching out of a dominant midrib
 - Known as ***pinnately netted***
- Other leaves have several dominant veins (midribs) branching from the petiole
 - Known as ***palmately netted***
- A few have a spreading vein pattern called ***dichotomous venation***
 - Seen in the *Ginkgo* tree

Types of Leaf Venation



Parallel
Netted Veins



Pinnately Netted
Veins



Palmately Netted
Veins



Dichotomous
Netted Veins

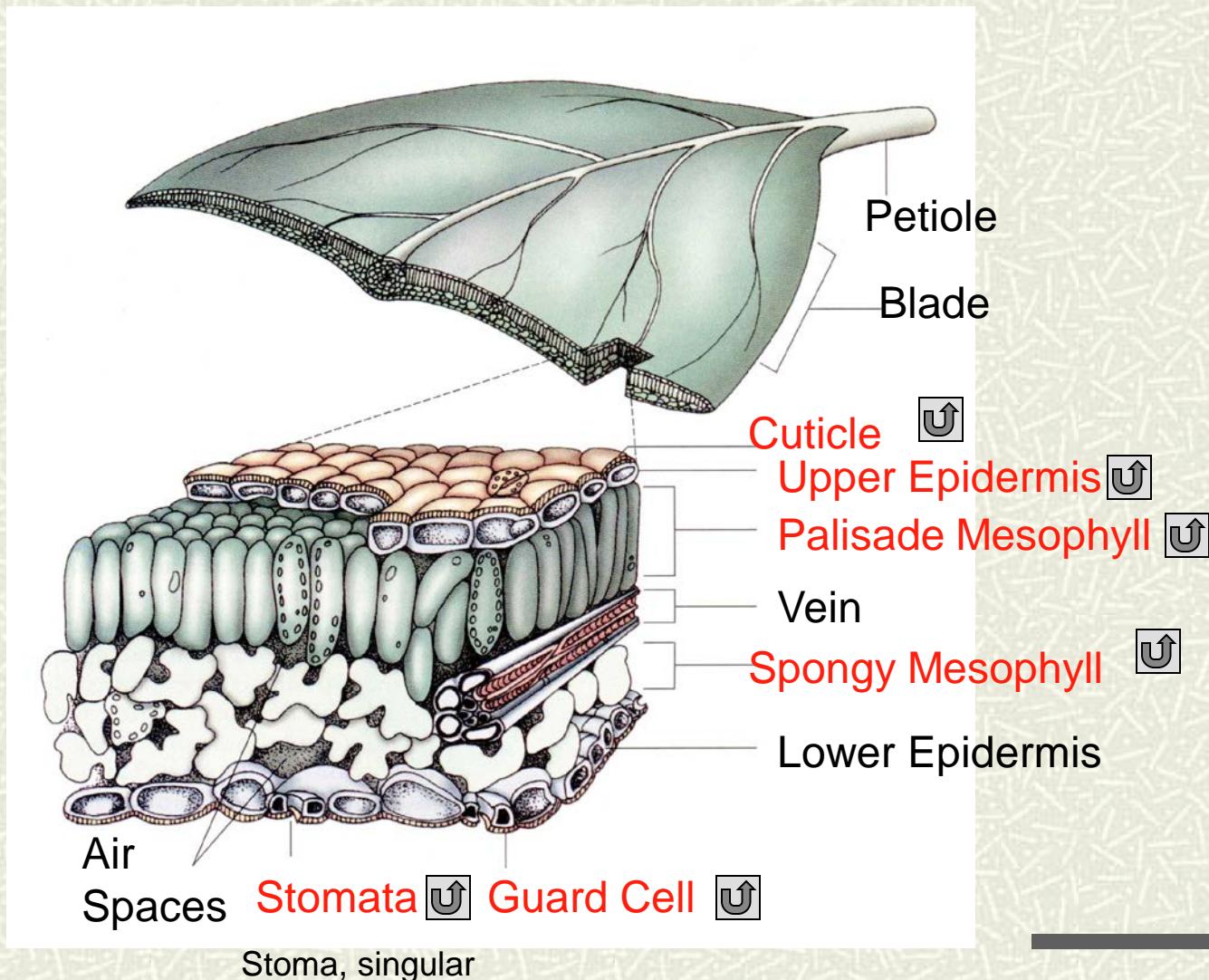
How Is A Leaf Organized?

- # A leaf is organized to collect sunlight and turn it, through photosynthesis, into food
- # The leaf has many layers of tissue to allow this to happen:
 - 1. **Cuticle** – on top of the leaf is a waxy non-cellular layer 
 - Prevents water from escaping the leaf
 - It is usually very thick on plants in arid regions

- 2. ***Epidermis*** – the next layer of the leaf
 - Used for protection
 - Skin-like layer found on the top & bottom of the leaf surface
 - May be one or more cell layers thick 
- 3. ***Palisade mesophyll*** – directly beneath the epidermis
 - Standing on end & packed very tightly
 - Responsible for most photosynthesis 

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- 4. ***Spongy mesophyll*** – under the palisade layer
 - Loosely packed cells
 - Have numerous air spaces which hold the raw materials used and products of photosynthesis 
 - 5. ***Stomata*** – usually on the lower epidermis
 - Tiny holes for gas exchange; They can open & close 
 - 6. ***Guard cells*** – control the opening & closing of the stomata
 - Found on either side of the stomata 

Internal Parts of A Leaf



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Wm. C. Brown
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Economical Importance of Leaves

- # There are many species whose leaves have economic uses.
- # The main use of plant leaves by humans is for eating. Freshly picked raw leaves in particular are an excellent source of vitamin and minerals. Leaves that have been picked and stored for awhile, or leaves which have been cooked or dried will have smaller amounts of vitamins and minerals, but will still be very beneficial.

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- # Of all the many foods, green leaves are actually the richest in vitamins and minerals. The reason for this is that these nutrients are also required in photosynthesis
 - # We eat leaves of various plants, including artichokes, celery, lettuce, onions, spinach cabbage, Brussels sprouts, oregano, and basil.

People around the world use herbs not only to flavor their food but for medical purposes.

- Thyme has been shown to slow down the ageing process by maintaining the vigour of our body cells; sage is an excellent antiseptic for treating mouth ulcers and sore throats; camomile is a safe treatment for childrens' stomach upsets

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- # Leaves of palms and other trees have been used for thatching roofs. Cloth and woven fabrics made from bark, leaves, and other tree parts have also been used for clothing
 - # Raked leaves can be used as mulch beneath trees and shrubs.



Leaves can also be used to keep certain pests away. For example, in Asia *Elaeagnus umbellata* is planted as an ornamental. However, the leaves can be used to control the cotton aphid, an insect pest. Along with fruits and leaves, roots also have medical uses



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Elaeagnus umbellata

Summary

- # How is a blade different from a leaf?
- # Compare a midrib to a vein.
- # What is the edge of a leaf called?
- # How is a simple leaf different from a compound leaf?
- # Can you give an example of a simple or compound leaf?
- # What are the four types of venation within the leaf?

Summary Continued

- # What protects the leaf on the outside? (It is a waxy coating).
- # What is the function of the epidermis?
- # Compare the palisade layer with the spongy layer.
- # What is the purpose of a guard cell?
- # Where does gas exchange occur on the leaf?