

Unit A: Basic Principles of Plant Science with a Focus on Field Crops

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

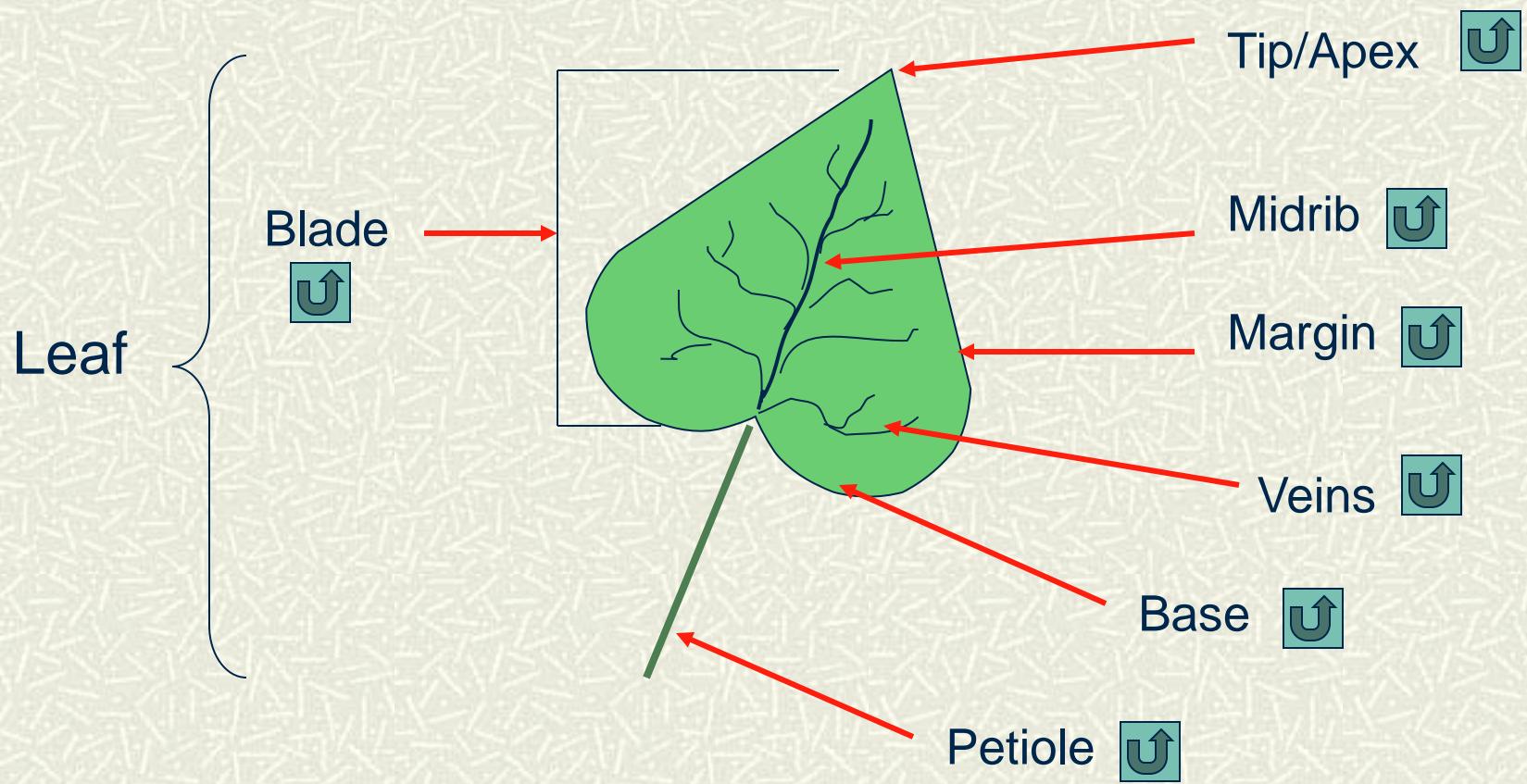
What Are the Main Parts of a Leaf?

- # 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

- 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

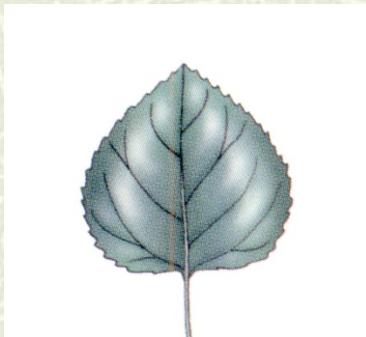


What Are Some of the Major Types of Leaves?

- # 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

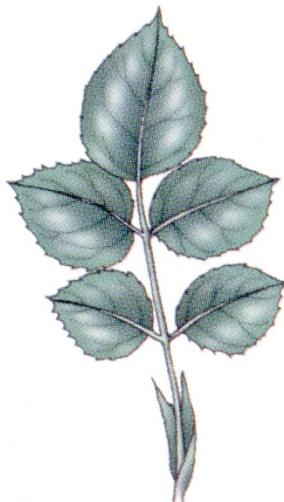


- # When the blade is divided into three or more sections, it is said to be a ***compound leaf***

- There are many different kinds



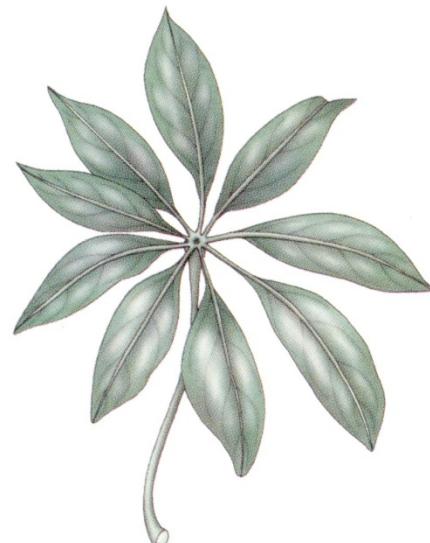
Types of Compound Leaves



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

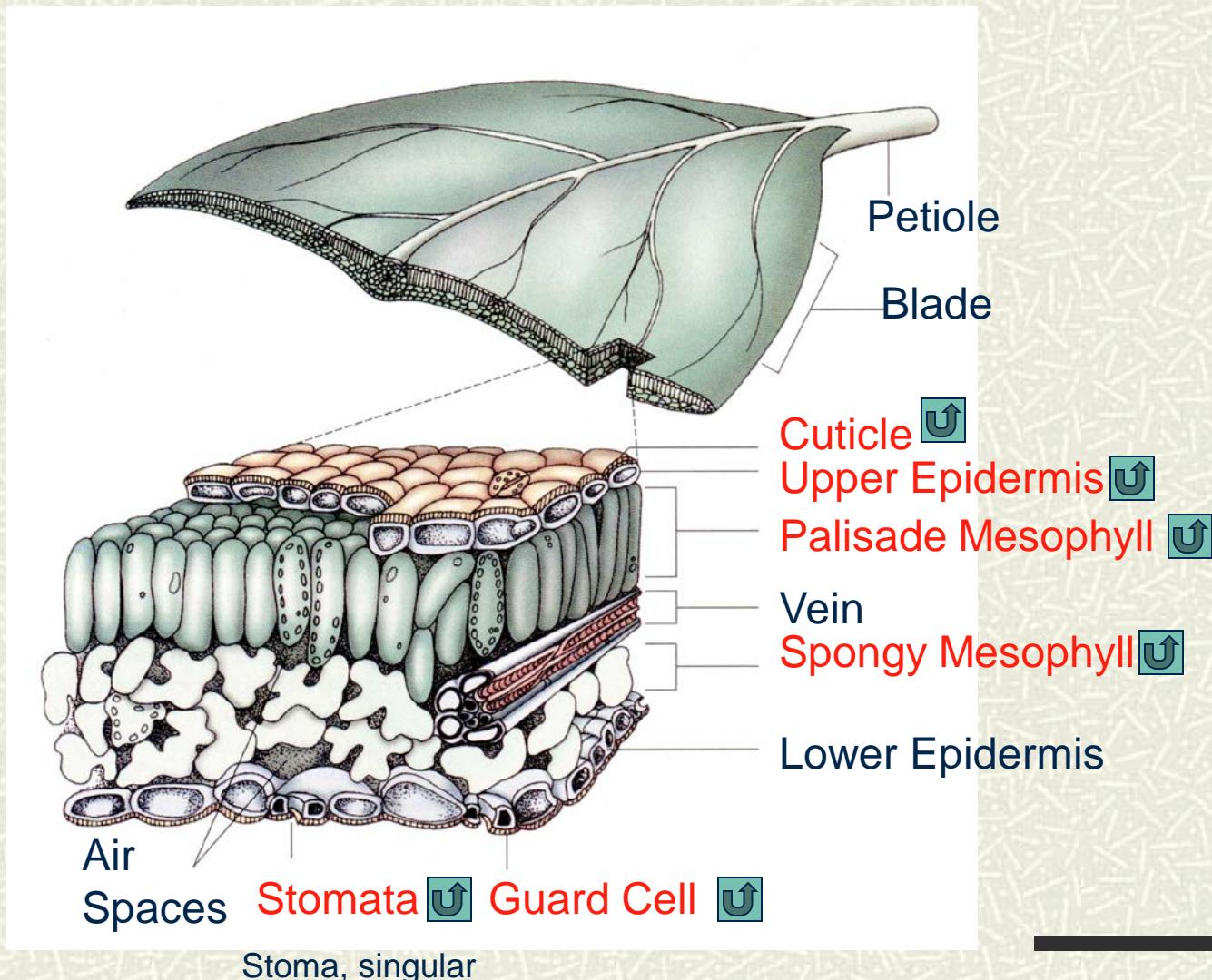
How Is A Leaf Organized?

- # 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 

- 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



Courtesy of
Wm. C. Brown
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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?

18Summary 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?