Introduction to Grass Plant Identification

GENEVIEVE CHRIST
My Background

- Small Family Farm
- 10 years in 4-H
- Grassland Evaluation Contest
My Background - College

- The Pennsylvania State University
  - Major: Agricultural Science
  - Minors: Agronomy and Animal Science
- Work Experience
  - University Dairy Farm
  - Weed Science Division
My Background – Work Experience

- Lancaster Co. Conservation District
- Penn State Cooperative Extension
  - Agronomist
  - Required Masters Degree
- Member Service Representative
  - Not in agriculture
  - Want to get back into the field
Grassland Evaluation Contest

- State and National Contest
- Four test sections
  - Grassland Evaluation
  - Wildlife Evaluation
  - Soils Evaluation
  - Plant Identification
- Competed and Coached
Development of Module

- Why a plant identification module?
  - Hard to teach
  - CAI Mission
- Necessary understanding
  - Lifecycles
  - Growth habits
  - Plant morphology
- Focusing on 25 grass species
  - 16 Cool Season
  - 9 Warm Season
Module Chapters

- Introduction
- Grass Plant Morphology
- Parts of a Grass Plant
- Cool-Season Grasses
- Warm-Season Grasses
- Summary
- Exams
Introduction

Objectives:

1. Review grass plant morphology focusing on what is a grass species, plant life cycles, and plant growth cycles

2. Understand grass plant morphology and the key plant parts necessary for proper plant identification

3. Evaluate the 25 grass plant species while focusing extra attention on the keys to identification
Grass Plant Morphology

Plant Life Cycles

Annual
• Complete whole life cycle from seed to senescence in 1 year
• New plants grow from seed the next year

Biennial
• Complete whole life cycle from seed to senescence in 2 years
  • Year 1 - germinates from seed and vegetative growth occurs
  • Year 2 - typically requires vernalization, then flowers, sets seeds, and plant dies

Perennial
• Live for more than 2 years, typically flowers and set seed every year
• Regrow from root energy reserves
Grass Plant Morphology

Annual plants life cycles in detail

There are two typical life cycles for annual plants:

1. **Summer Annual**
   - Plants germinate in the spring, grow, flower, set seed, and then die in late summer or fall. These plants only live for a few months, example giant foxtail.

2. **Winter Annual**
   - Plants germinate in late fall or early spring, grow, flower, set seed, and then die in late spring or early summer. Cold tolerant plants that do not survive in hot dry conditions, example downy brome.
Grass Plant Morpohology

Grass Plant Growth Cycles

Based on temperature and geographic location

**Cool-Season Grasses**
- Plants survive best between 65°F and 80°F.
- Plants typically grow in the spring and early summer, go dormant during the hot summer, and resume growth in the fall

**Warm-Season Grasses**
- Plants tolerate hotter temperatures and grow best between 75°F and 95°F.
- Plants germinate in early summer, grow hard all summer long, and die at the beginning of fall

**Note:** Many pasture systems will utilize cool-season and warm-season grasses to provide forage almost all year round
Parts of a Grass Plant

- **Node** – a place on a stem where a leaf is or has been attached
- **Internode** – part of the stem between two successful nodes
- **Sheath** the lower part of the leaf that encloses the stem and younger leaves
- **Midrib** – the central vein of a leaf

Midvein of a corn leaf.

Node and internode of a grass stem.
Parts of a Grass Plant

- **Stolon** – a horizontal stem at or just above the surface of the ground that gives rise to a new plant at its tip from axillary branches

- **Rhizome** – a creeping underground stem

- **Tiller** – a shoot growing from the base of the grass plant

- **Leafbud or budshoot** – an emerging blade of grass. Described as *rolled* or *folded*
Parts of a Grass Plant

Study Questions

Question 1. What is the name of the plant organ the arrow is pointing at?
A. Ligule  
B. Auricle*  
C. Blade  
D. Stolon

Question 2. What type of ligule is shown?
A. Absent  
B. Hairy  
C. Membranous*  
D. Scallop Toothed

Question 3. Which plant life cycle continues for more than 2 years and regrows from root reserves?
A. Annual  
B. Biennial  
C. Lateral  
D. Perennial*

Question 4. Which of the following is not a reason to understand grass plant identification?
A. Determine forage value  
B. Is it poisonous*  
C. Is it a weed  
D. Suitability
Parts of a Grass Plant

Study Questions

Redraw the plant and then have click and drag names to the correct location.
- Leaf blade
- Leaf sheath
- Node
- Internode
- Tiller
- Rhizome
- Stolon
- Inflorescence
- Collar
Two Main Sections - Cool and Warm Season Grasses

- Approach to each species
  - Life cycle
    - Annual or perennial
  - Identifying characteristics
    - Auricles
    - Ligules
    - Blades
    - Seedhead
  - Root structures
- Keys to identification
With an understanding of grass plant biology and physiology the remainder of this module will examine cool-season and warm-season grasses and teach specific plant characteristics to assist in identifying common grass plants.

**Cool-season grasses:**
- Little barley *Hordeum pusillum*
- Barnyardgrass *Echinochloa crus-galli*
- Kentucky bluegrass *Poa pratensis*
- Smooth bromegrass *Bromus inermis* Leyss
- Large crabgrass *Digitaria sanguinalis*
- Downy chess *Bromus tectorm*
- Tall fescue *Festuca arundinacea*
- Johnsongrass *Sorghum halepense*
- Orchardgrass *Dactylis glomerata*
- Reed canarygrass *Phalaris arundinacea*
- Giant foxtail *Setaria faberi*
- Green foxtail *Setaria viridis*
- Yellow foxtail *Setaria glauca*
- Perennial Ryegrass *Lolium perenne*
- Quackgrass *Elytrigia repens*
- Timothy *Phleum pratense*

**Warm-season grasses:**
- Bermudagrass *Cynodon dactylon*
- Big bluestem *Andropogon geradii*
- Old world bluestem *Bothriochloa bladhii*
- Little bluestem *Schizachyrium scoparium*
- Broomsedge bluestem *Andropogon virginicus*
- Eastern gamagrass *Tripsacum dactyloides*
- Indian grass *Sorghastrum nutans*
- Purple top *Tridens flavus*
- Switchgrass *Panicum virgatum*
Module Materials

- Weeds of the Northeast
- .edu websites
- Plants.usda.gov
- Identifying Pasture Grasses
- Virginia Tech Weed Identification Guide
Cool-Season Grasses

**Barnyardgrass** – *Echinochloa crus-galli* (L) P. Beauv

**Life Cycle:** annual

**Identifying Characteristics:**
- Auricles: absent
- Ligules: absent
- Blades: wide, glabrous, with a rough surface
- Seedhead: nodding panicle

**Key to identification:** auricle and ligule absent, whole plant glabrous, distinctive seed head
Cool-Season Grasses

Johnsongrass – *Sorghum halepense* (L) Pers

**Life Cycle:** perennial

**Identifying Characteristics:**
- Roots: fibrous with very thick scaly rhizomes
- Auricles: absent
- Ligules: membranous, long and prominent with fringe of hairs
- Blades: long, wide, and glabrous
- Seedhead: open panicle with numerous whorled branches and purplish tint

**Key to identification:** tall, typically grows in wet regions, wide, long glabrous blades, thick rhizomes
Cool-Season Grasses

Quackgrass – *Elytrigia repens* (L.) Gould

**Life Cycle:** perennial

**Identifying Characteristics:**

- Roots: fibrous with long sharp-tipped rhizomes
- Auricles: narrow and slender, clasp the stem
- Ligules: membranous and very short
- Blades: rolled in the bud, flat blades with pubescent to glabrous upper surface and glabrous under surface
- Seedhead: long spike with 2 rows of spikelets along the axis

**Key to identification:** auricles, rhizomes, and distinct seed head
Warm-Season Grasses

Broomsedge bluestem – *Andropogon virginicus* L.

**Life Cycle:** perennial

**Identifying Characteristics:**

- Roots: densely fibrous with short rhizomes
- Auricles: absent
- Ligules: membranous with fringe of hairs on upper margin
- Blades: folded in the bud, long, narrow, and sharply pointed at the apex, hairy on the upper surface and margin around the collar region
- Seedhead: silky haired spikelets produced along the upper half of the stem in sheathed axils of the upper leaves

**Key to identification:** distinct seed head, recognized in the dormant stage as dried clumps of stems and leaves

Broomsedge bluestem is mostly glabrous on the leaf blade except towards their base where long hairs usually occur along their upper sides or margins.
Warm-Season Grasses

Eastern Gamagrass – *Tripsacum dactyloides* L.

**Life Cycle:** perennial

**Identifying Characteristics:**

- Roots: fibrous with short knotty rhizomes and deep hollow roots
- Auricles: absent
- Ligules: fringe of hairs
- Blades: rolled in the bud, glabrous with a rough margin and a prominent mid-rib
- Seedhead: single raceme or subdigitate panicle, typically with a reddish-purple tinge from the long feathery stigma and stamens

**Key to identification:** looks a lot like corn. Older plants will grow into a donut shape
With an understanding of grass plant biology and physiology the remainder of this module will examine cool-season and warm-season grasses and teach specific plant characteristics to assist in identifying common grass plants.

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- Switchgrass *Panicum virgatum*
Module – Study Guide

- Review Questions after each chapter
- Mimic exam questions
- Want Module Takers to pass exam
Parts of a Grass Plant

Study Questions

Question 1. What is the name of the plant organ that is found at the junction of the leaf blade and leaf sheath?
A. Ligule
B. Auricle*
C. Blade
D. Stolon

Question 2. Which of the following is not a type of ligule?
A. Absent
B. Hairy
C. Clasping*
D. Scallop toothed

Question 3. Which plant life cycle continues for more than 2 years and regrows from root reserves?
A. Annual
B. Biennial
C. Lateral
D. Perennial*

Question 4. Which of the following is not a reason to understand grass plant identification?
A. Determine forage value
B. Is it poisonous*
C. Is it a weed
D. Suitability
Cool-Season Grasses

Study Questions

Question 1. Which species has a canoe or boat shaped leaf tip?
A. Perennial ryegrass
B. Downy brome
C. Tall fescue
D. Kentucky bluegrass*

Question 2. Timothy has a unique plant part that isn’t found in other grass species, what is it?
A. Rhizome
B. Corm*
C. Lemma
D. Auricle

Question 3. Cool Season Grasses grow best in what temperature range?
A. 45° F and 85° F
B. 65° F and 80° F*
C. 75° F and 90° F
D. 45° F and 65° F

Question 4. Which grass species is characterized by the blade with a “M” constriction?
A. Tall fescue
B. Orchardgrass
C. Smooth brome*
D. Barnyardgrass
Warm-Season Grasses

Study Questions

Question 1. Which warm-season grass has silky haired spikelets on its seedhead that is produced along the upper half of the stem?
A. Little bluestem
B. Big bluestem
C. Broomsedge bluestem*
D. Eastern gamagrass

Question 2. Which warm-season grass has a prominent mid-rib which looks a lot like corn and has a reddish-purple, long feathery stigma and stamens?
A. Purple top
B. Broomsedge bluestem
C. Bermudagrass
D. Eastern gamagrass*

Question 3. What type of seedhead does switchgrass have?
A. Stiff spike
B. Large open panicle*
C. Drooping spike
D. Stiff branched panicle

Question 4. How do you describe the growth style of Bermudagrass?
A. Low and mat-forming*
B. Stiff and tall
C. Bunch or clump
D. Donut shaped
Module Exam

- After completing the CAI module an exam must be passed to earn CCA Credits
- 25 exam questions were developed
Sample Exam Questions

1. Which species is not a warm season grass?
   a. Bermudagrass
   b. Barnyardgrass*
   c. Big bluestem
   d. Purple top

2. Identify which of the following has a nodding spike-like panicle seedhead, wide leaf blades, and a membranous fringe ligule?
   a. Giant foxtail*
   b. Barnyardgrass
   c. Little barley
   d. Yellow foxtail
Sample Exam Questions

3. Which one of the following is not a characteristic of a grass plant?
   a. Parallel leaf veins
   b. Embryo with one cotyledon
   c. Netted leaf veins*
   d. Narrow leaves

4. What type of seed head has a main axis and subdivided branches, much like switchgrass?
   a. Open-panicle*
   b. Umbel
   c. Divided spike-type
   d. Spike
Conclusion

- Module Use
  - CAI Continuing Education Credits
  - Grassland Evaluation Contest
  - Extension Presentations
Thank You

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Questions