Forage Nutrition for Horses
Cassie Wycoff
Livestock and Forage Agent
P 864-984-2514 ext 117
E cwycoff@clemson.edu

CLEMSON
COOPERATIVE EXTENSION
Putting knowledge to work for SC
Introduction

• Horses evolved as grazing animals, well adapted to eating quality grasses and hay (forages).
• Forages should be the major component in a cost-effective feeding program no matter the stage of growth.
Whether the forage source is from pasture or hay, the horse’s digestive system is best designed to consume *predominately forage* diets in *small frequent meals*. 
Plant Parts

• Fibrous carbohydrates- cellulose, hemicellulose, pectin (lignin)
  – Broken down to volatile fatty acids in hindgut
  – A horse consuming a mostly forage diet will meet more than 80% of their energy needs from VFAs.

• Simple carbohydrates- simple sugars, starch, oligosaccharides.

• Fat (low in plants)
  – Contains 2.25 x energy of protein or carbs

• Protein (depends on fertilization)
Digestion

- Stomach
- Small Intestine
- Large Intestine

Indigestible Fiber
Fermentable Fiber
Fat
Protein
Starch/sugar

Glucose
Amino Acids
Fatty Acids
Lactic acid
Volatile Fatty Acids
Energy

- *Digestible Energy (DE)* affected by gross energy of the feed and digestibility of energy-containing components.

↑ Fiber  ↓ DE
Forages

• Horses can consume up to 3% BW per day.
• At least 1% should come from forage.
  – Microbes in hindgut rely on constant substrate for fermentation to maintain overall gut health.
Forages

• Good quality hay:
  – Free from debris, dust, mold & weeds
  – Not weathered
  – Leafy, green
  – Young
Hay Selection

• The best hay is one that will *meet the nutritional needs* of the horse at the *most economical cost*.

• Early cut hays are more likely to meet the nutrient requirements of horses in high production situations than mature hays.
Forages

Grass hay

• Common grass hays
  – Timothy
  – Coastal
  – Fescue

• Cool season > Warm season

• Lower energy vs. legumes

• Cut and cured at right stage for optimal nutritional value!
Forages

Legumes (fix N from atmosphere)

• Common Legume Hay
  – Alfalfa
  – Clover

• vs. grass hay- higher in energy, Ca, protein & vitamin A

• Problems: increased urination, energy, ammonia
What Factors Affect Forage Quality?

1. Maturity stage
   ➢ *Maturity stage at harvest is the most important factor determining forage quality of any species.*

2. Leaf-to-stem ratio
   ➢ Leaves are higher in quality than stems.
   ➢ Proportion of leaves declines as the plant matures.

3. Temperature
   ➢ Plants grown at high temperatures produce lower quality forage due to lignification.

4. **Harvesting and storage techniques**
   - Field losses include rain damage, leaf loss, and plant respiration.
   - Storage losses to uncovered bales can be 40%
What Factors Affect Forage Quality?

5. Daily fluctuations
   - Higher carbohydrate content in afternoon-harvested hay
Forage Toxicity

• Fields containing toxic plants not uncommon.
  – Toxicity varies widely among growing season, weather conditions and animal susceptibility.

• Common Situations Associated with Poisonings:
  – Overgrazing/Lack of supplemental forage
  – Unfamiliar pasture
  – Dietary imbalances
  – Incidental/curiosity
  – Weather- drought/freeze
  – Herbicide usage
Forage Toxicity

• Nitrate Poisoning
  – Anything that slows plant growth can lead to high nitrate levels in well-fertilized plants.
  1. Heavy fertilization
  2. Stress of drought or freeze
  3. Application of herbicide
  4. Cloudy weather, low temperatures

Safe levels of total diet N < 1%.

Accumulators

- Sorghum-sudan grass
- Pearl millet
- Johnsongrass
- Lambs quarters
- Pigweed
Forage Toxicity

• Sorghum and sorghum-sudangrass hybrids
  – Drought and frost-stressed plants also produce sub-lethal doses of hydrocyanic acid.

• Causes condition *cystitis*.
  – Frequent urination
  – Lack of coordination
Forage Toxicity

Some forages have toxic effects due to endogenous substances.

• **Blister Beetles (SW US)**
  – *Alfalfa Hay*
  – Difficult to detect (1 in. length)
  – Contain a toxin (cantharidin) → blisters skin surfaces
    • Ingestion of several lead to death.
Forage Toxicity

• Endophyte-infected tall fescue causes reproduction problems in mares.
  – Agalactia (decreased milk production)
  – Increased gestation time
  – Thickened placenta

 Mares should be removed from fescue pasture and hay 90 days before foaling.
Forage Toxicity

• Many poisonous plants produce toxins fatal to horses.
  – Some common plants include:
    • Water hemlock
    • Black locust
    • Bracken fern
    • Wild cherry trees
    • Oleander
    • Acorns
    • Nightshade

*Usually, these plants are not palatable and horses will not eat them unless restricted from quality sources of hay or pasture.
Forage Testing

• Assesses nutrient composition
  – Calories (energy)
  – Protein
  – Vitamins
  – Minerals
  – Water

• Why test?
  – Match quality with animal requirements.
Forage Sampling

Basis of all analyses

• Sample must be representative of what’s being predicted

• Use core sampler

• Random samples
Chemical Analysis

- Chemical analysis will provide a more complete picture of forage quality.

- Knowing this information can better help one make accurate decisions as to the quantity of hay and supplements needed in a feeding program.
Chemical Analysis

- Forage Quality
  - High < 35% ADF
  - Moderate 35-40% ADF
  - Low > 40% ADF
# Forage Protein Content

<table>
<thead>
<tr>
<th>Category</th>
<th>Forage</th>
<th>% CP</th>
<th>% DP</th>
<th>% Lysine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes</td>
<td>Red Clover</td>
<td>14.9</td>
<td>8.3</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>15.0</td>
<td>10.0</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>Lespedeza</td>
<td>13.4</td>
<td>7.5</td>
<td>0.60</td>
</tr>
<tr>
<td>Grasses</td>
<td>Timothy</td>
<td>9.0</td>
<td>6.0</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Orchardgrass</td>
<td>10.1</td>
<td>6.0</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>Bermudagrass</td>
<td>10.4</td>
<td>4.5</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>Fescue</td>
<td>8.4</td>
<td>3.7</td>
<td>0.41</td>
</tr>
</tbody>
</table>
# Forage Energy Content

<table>
<thead>
<tr>
<th></th>
<th>Hay</th>
<th>DE Mcal/kg</th>
<th>TDN %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legumes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Clover</td>
<td>2.16</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td>2.16</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Lespedeza</td>
<td>2.07</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td><strong>Grasses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timothy</td>
<td>1.98</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>2.07</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>1.86</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Fescue</td>
<td>1.81</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>
Feeding Classes of Horses

- Maintenance (Mature idle)
- Work (Light, Moderate, Heavy, Intense)
- Growth
- Broodmares & Stallions
# Nutrient Requirements

<table>
<thead>
<tr>
<th>Class</th>
<th>Wt</th>
<th>DMI, lbs</th>
<th>DMI, % BW</th>
<th>DE, MCals</th>
<th>Crude Protein, g</th>
<th>Ca, g</th>
<th>P, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>1102</td>
<td>18.1</td>
<td>1.64</td>
<td>16.7</td>
<td>630</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Light work</td>
<td>1102</td>
<td>18.5</td>
<td>1.67</td>
<td>20.0</td>
<td>699</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>Moderate work</td>
<td>1102</td>
<td>20.5</td>
<td>1.86</td>
<td>23.3</td>
<td>768</td>
<td>35</td>
<td>21.0</td>
</tr>
<tr>
<td>Intense work</td>
<td>1102</td>
<td>25.4</td>
<td>2.3</td>
<td>34.5</td>
<td>1004</td>
<td>40</td>
<td>29.0</td>
</tr>
</tbody>
</table>
Mature Idle Horse

- 2% BW Grass Hay
  Mid-mature to mature (average quality)
  - Ex: 1100 lb. horse- 22 lbs. DM or 24.4 lbs./d As-Fed (22lbs/ 0.9)

- Vitamin-Mineral supplement according to directions.
Mature Idle Horse

Start with Forage

• Grass Hay (Average)
  • 0.91 Mcals/lb. (DM basis)

• Ex: 1100 lb. (500 kg) horse
  • 16.7 Mcals req \(=\) 18.35 lbs. DM
    0.91 Mcals/lb.

• All caloric needs met with average quality hay.
Light Work

Recreational riding - 1-3 h/wk

- 2% BW Grass Hay
  - Mid-maturity
  - Slightly higher quality hay to meet slightly higher requirements.

- Vitamin-Mineral supplement according to directions.
Increasing Nutritional Needs

- Increase the quality of hay as work load or production level increases.
  - Moderate to Heavy Work Load
    - Mid-maturity to immature grass hay.
  - Intense Work
    - Immature grass hay or legume.
  - Lactation or Growing horses.
    - Immature to mid-mature.

*Then add concentrates as needed to balance diet.
Feeding Management

Making changes

- Make changes slowly when going from low plane of nutrition to high
  - Ex: Grass hay to alfalfa hay
    - Replace 25% every 3 days until target reached
Feeding Management

**Making changes**

- Make changes slowly when going from low plane of nutrition to high.
  - Ex: Turning out on pasture
    - Start with 1 hr./day
    - Increase by 1 hr. every 3 days up to 4 hrs.
    - When grazing for 4 hrs. then can leave out
Grazing Behavior

• Horses graze from top down.

• Select young immature plants & leaf blades
  – Damages growth reserves
  – Causes “roughs” and “lawns” in pasture
  – Allows weeds to flourish

• Avoid grazing around elimination areas
Grazing Behavior
Estimating Body Weight

Healthy Horse

Horse Type

Measurements

Height (H) : _ inches
Girth Circ (G) : _ inches
Body Length (L) : _ inches
Neck Circ (N) : _ inches

Calculate