WRAPPED BALED SILAGE

Hay Making Crop Clinic
March 13, 2014

Goff's Equipment Service, Inc.
Litchfield, Connecticut
www.goffsequipment.com

Advantages of Baleage

- Greater harvest window – typically, only 2 good weather days are needed.
- Less field drying time - Cut one day, bale the next.
- Less weather risk - Cut one day, bale the next.
- Lower field losses – usually no tedding & raking is required, less crop lost.
- Better forage quality – harvesting the crop before it becomes over-mature.

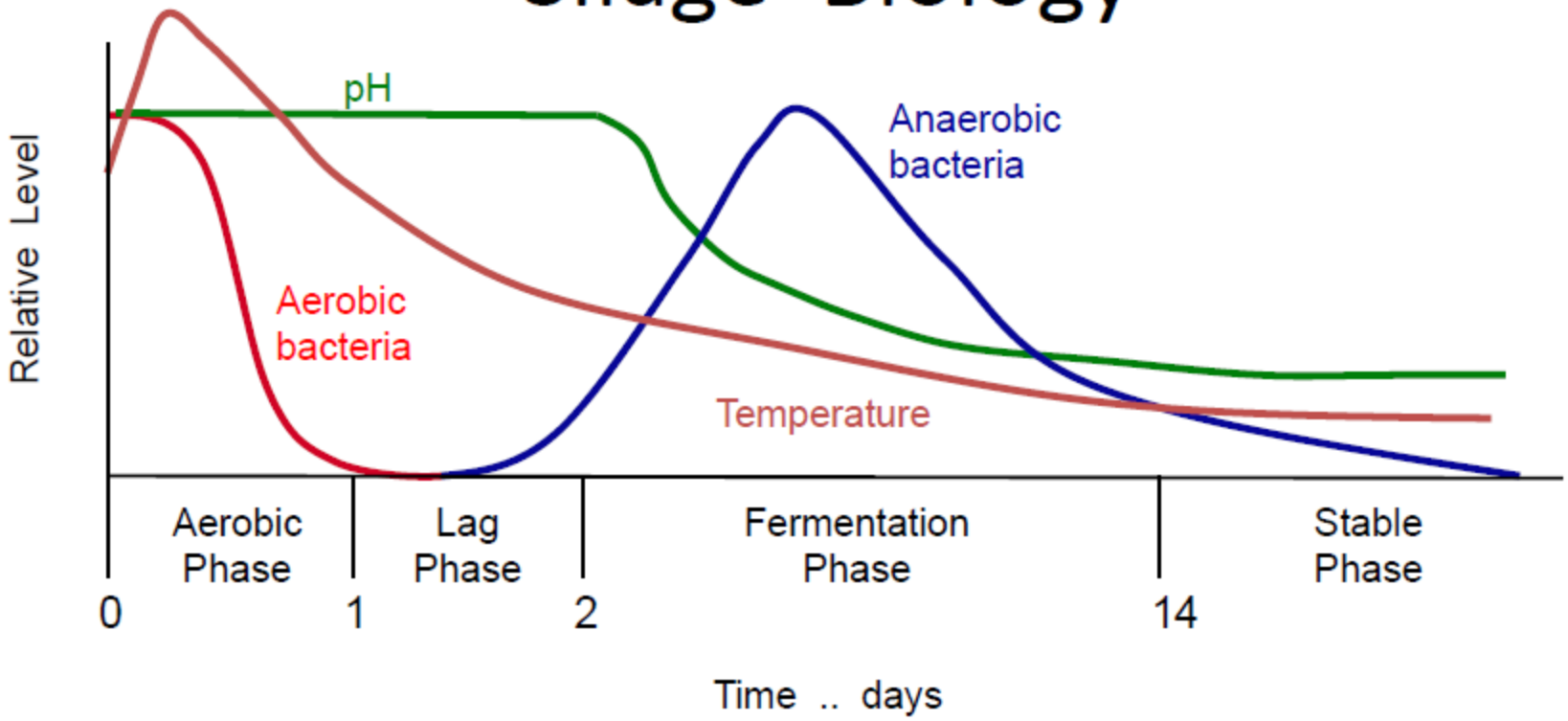
- Harvest and storage

✓ Less labor and fuel required. (no raking/ tedding)

✓ More uniform product

✓ Bales can be stored outside, so no taxable structures necessary.

Silage Biology



<u>Aerobic</u> = Able to live or grow only where free oxygen is present.
<u>Anaerobic</u> = Able to live or grow *without* air or free oxygen.

Shinners, et al., 2010

Silage Biology

- How Long Should Aerobic (Free Oxygen) Phase Last?

  - Short as possible – Wrap as soon as possible after baling to reduce oxidation and promote anaerobic ensiling.

- Why Should This Phase Be Short?

  - Valuable substrate (Dry Matter & Digestible Energy) is consumed, unwanted heat is produced.

- Is Prolonged Heating Bad?

  - Damages protein availability to the animal.

If high moisture forage (40-60%) is baled and not wrapped, it will begin to decompose rather quickly, due to explosive microbal activity from the availability of oxygen.

However, if high moisture forage (40-60%) is baled and wrapped in plastic, anaerobic microorganisms will ferment some of the carbohydrates (sugars) in the forage to lactic acid, which in turn will inhibit the growth of detrimental microorganisms.

When to cut?

- Cutting in the early maturity stages will produce good baleage and optimal feed value.
- Cut legumes at 10% bloom and grasses at boot stage or just as the head emerges.
- Remember, the baleage will be only as good as the forage that went into it. Poor quality forage makes poor quality baleage.
- In general, early-maturity forage has much higher sugar content, which is essential for proper ensiling.
- Coarse, stemmy, weedy and overly-mature forages will have reduced sugar content and will not ferment well.

Why cut early?

- Remember – If you cut during the early maturity (vegetative) stage, you will have another crop in about 28 days.
- If you cut at full maturity (reproductive) stage, your next crop will be available in about 42 days!
- Forages cut in the vegetative stage will be highest in carbohydrates (sugars), will ensile better and will have higher feed value. You may have the time to do one or two extra crops on the same acreage and will give your herd what they need to grow, not just survive.
- Early-cut forage requires less film thickness (# of wraps) than over-mature forage and will save you money in wrap.

Moisture versus Dry Matter (DM)

- Moisture is the amount of water (by weight) in the forage. When the water is removed, what is left is considered to be Dry Matter (DM). Dry Matter is what the animal digests.
- In order to compare the nutritive value of feeds that vary in moisture content, the composition of the feed must be expressed on a Dry Matter or moisture-free basis.
- However, in the field we usually monitor the moisture level when drying hay or baleage.
- Moisture and DM levels are directly related.

  For example:

  Forage containing 60% moisture will have 40% Dry Matter.

  Forage containing 40% moisture will have 60% Dry Matter.

Right Baling Moisture

- >65%: Danger of sour fermentation, botulism
- 55 – 65% Plenty of fermentation, surface condensation
- 45 – 55% Ideal, good fermentation
- 35 – 45% Some fermentation, more layers of wrap
- 25 – 35% Very little fermentation, feed quickly
- >25% Baled hay

- ***How do I determine the proper moisture content of my forage?***
- 1) “Dish rag” test. Take a handful of forage and wring it out like one would wring out a dishrag. If moisture can be expressed from the forage, it is generally above the 65% moisture range.
- 2) Commercially available testers are an option for measuring forage moisture levels. However, accuracy may be a problem. At least three moisture readings should be obtained to create an average value. Commercial testing equipment can be costly ($200-$400 range).
- 3) Koster moisture testers are heated, forced-air dryers that are used in silage production to dry down the forage. It takes longer than a microwave moisture test.
- 4) The best method to use is the microwave moisture test.

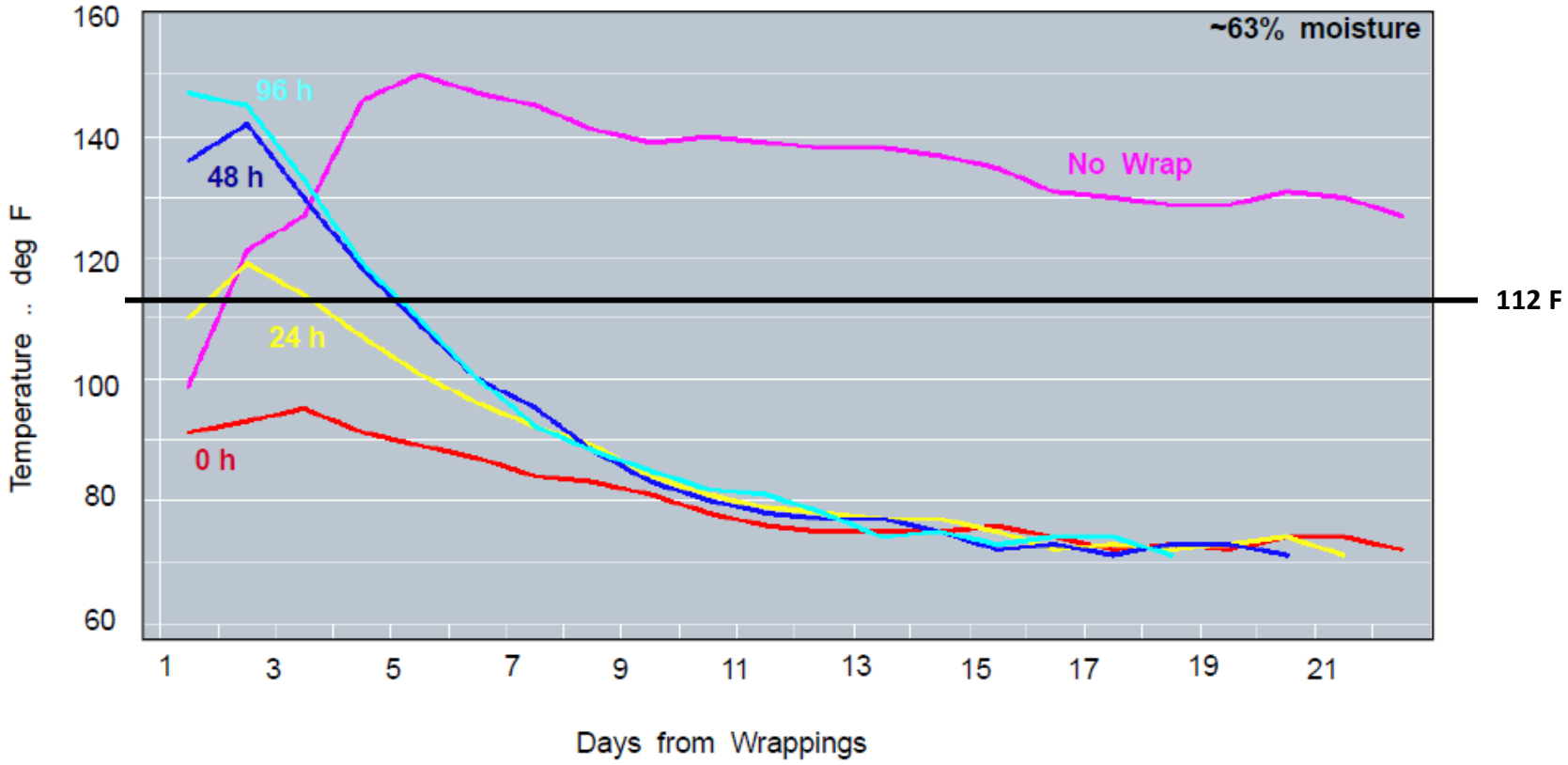
When & How to Bale?

- When optimum moisture content is 45-60%. (40-55% D.M.)
- Windrow width should be almost as wide as the pickup on the baler and consistent size.
- Slow ground speed when baling, maintain rated PTO speed.
- High density, 4x4 or 4x5 bales best.
- Use only plastic or untreated sisal twine. (treated twine will degrade plastic bale wrap).

How soon after baling should you wrap?

- Ideally, forage should be wrapped immediately after baling. However, research has shown that forage quality is maintained as long as wrapping is done within 12 hours of baling.
- Any delay between baling and wrapping lowers the quality of the bale because undesirable microbal activity and excessive heating occurs while the bale is exposed to oxygen.
- Never allow more than 24 hours between baling and wrapping.

Wrap Timing



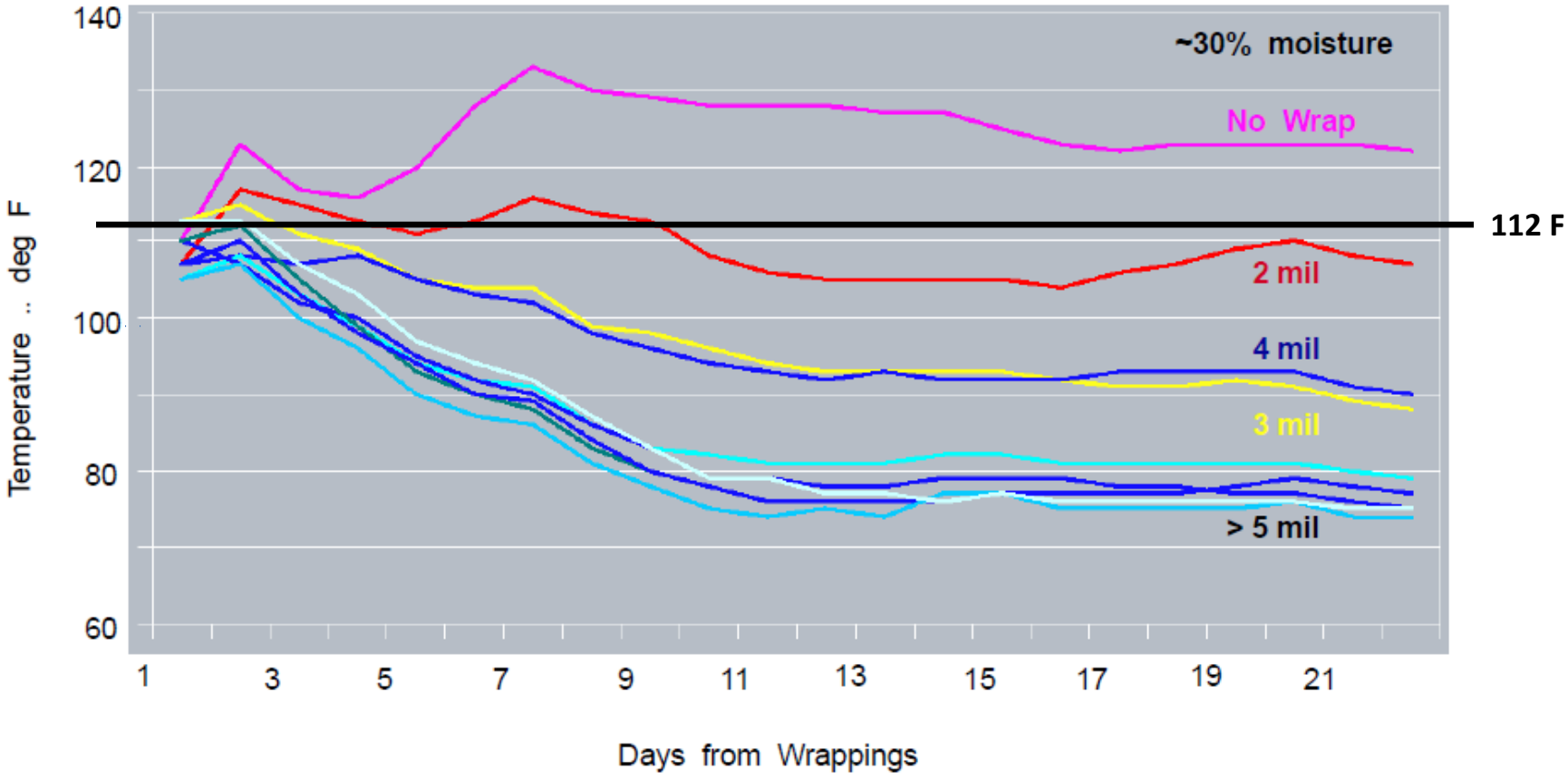
After Undersander et al., 1998

NOTE: At temperatures above 112 degrees F, heat damage occurs, reducing the amount of protein available to the animal.

Film Wrap Information

- Stretching increases cling and makes tight seal.
    - Stretching also reduces thickness by up to 25%
- High temps makes film more permeable.
- Tacky side toward bale.
- Don’t skimp – too little film will let oxygen penetrate the bale & cause mold growth, spoilage & losses.
- More layers increases distance O2 must travel.
- Generally, a minimum of 4 layers (2 turns at 50% overlap) – use more for low moisture bales.

Number of Wraps



After Undersander et al., 1998

NOTE: At temperatures above 112 degrees F, heat damage occurs, reducing the amount of protein available to the animal.

Getting the Most from Baleage

- Starts at cutting:
  - Lay wide, condition well, and don't cut too short.
- Consistent windrows almost as wide as the baler pickup is best. If raking, avoid raking soil into windrow.
- When to bale:
  - Moisture range (40-60%) (45-55% optimal)
  - Avoid baling wet areas – mud in forage will cause problems.
- Focus on uniform bale shape, size and density.

Getting The Most from Baleage

- Use good quality silage film.
- Avoid treated twine. It deteriorates silage film.
- How to wrap:
  - Stretch to 70 – 80% of original width.
  - Minimum 5 (high moisture) to 8 layers (low moisture)
  - Avoid rainy conditions (film loses tackiness)
- Wrap close to storage site
  - Less chance to tear or puncture bales.

Getting The Most from Baleage

- Handling:
  - Minimum possible, avoid after 12 hours from wrapping.
  - Use squeeze (bale hugger), avoid over-pinching bales.
- Storing:
  - Avoid woods, sharp stubble, poorly drained areas, wildlife. Repair punctures ASAP.
  - Stacking OK where possible as it saves room, but avoid stacking high moisture (soggy) bales.
  - Store round bales on end – more plastic, less “squish”

Troubleshooting Baleage

- Caramelized or Tobacco Smell:
  - Heat damage – long delay from baling to wrapping.
- Molds:
  - Oxygen infiltration - insufficient wraps, punctures, low density, long delay between baling/wrapping. Low moisture.
- Rancid Odor:
  - High moisture, clostridia, low sugar (over mature forage)
- Heating, mold at feedout:
  - Low moisture, high pH, feedout rate too slow.

Frequently Asked Questions

- Is baleage higher in quality?
- How soon after wrapping can I feed baleage?
- How long can it be stored?
- What type of feeding system do I need?
- What should I do with the used plastic?
- Can I wrap dry hay as an alternative to inside storage?
- What if I feed a molded bale? What about Botulism?
- How much does it cost to wrap baleage?
- How many bales can be wrapped per hour?
- What will I need for equipment?

References

- **This presentation was adapted from the following publications:**
- ***Wrapped Baled Silage, Dr. Kevin Shinners, et.al., University of Wisconsin, 2010***
- ***Baleage: Frequently Asked Questions, Brandon Sears, Ray Smith, D.W. Hancock, Michael Collins, J.C. Henning, et.al., University of Kentucky***
- ***Botulism in Cattle, Dr. Limin Kung, Jr., University of Delaware, Newark***
- ***After Understander et.al., 1998***
- ***Silage – How and Why, Bernard Adam, Innovation Agricole Adam, Inc. 2002***