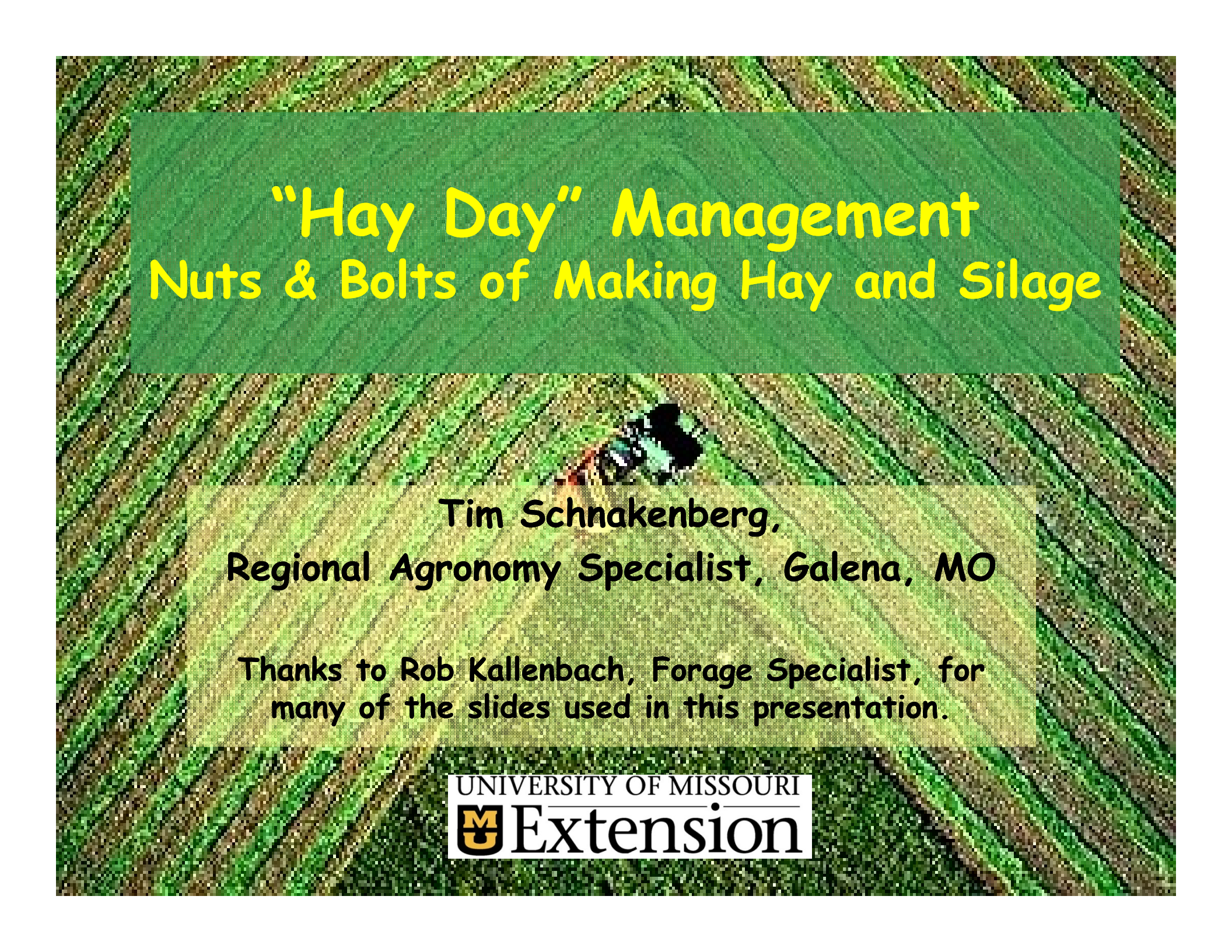


An aerial photograph of a green agricultural field, likely corn, with a tractor visible in the center. The field is divided into rows, and the tractor is moving through them.

"Hay Day" Management

Nuts & Bolts of Making Hay and Silage

**Tim Schnakenberg,
Regional Agronomy Specialist, Galena, MO**

**Thanks to Rob Kallenbach, Forage Specialist, for
many of the slides used in this presentation.**

Typical Forage Harvesting Losses

30% Left

Field curing
-26%

Harvesting
-14%

Storage
-35%

Feeding
-30%



Optimum Management

70% Left

Field curing
-12%

Harvesting
-8%

Storage
-5%

Feeding
-8%

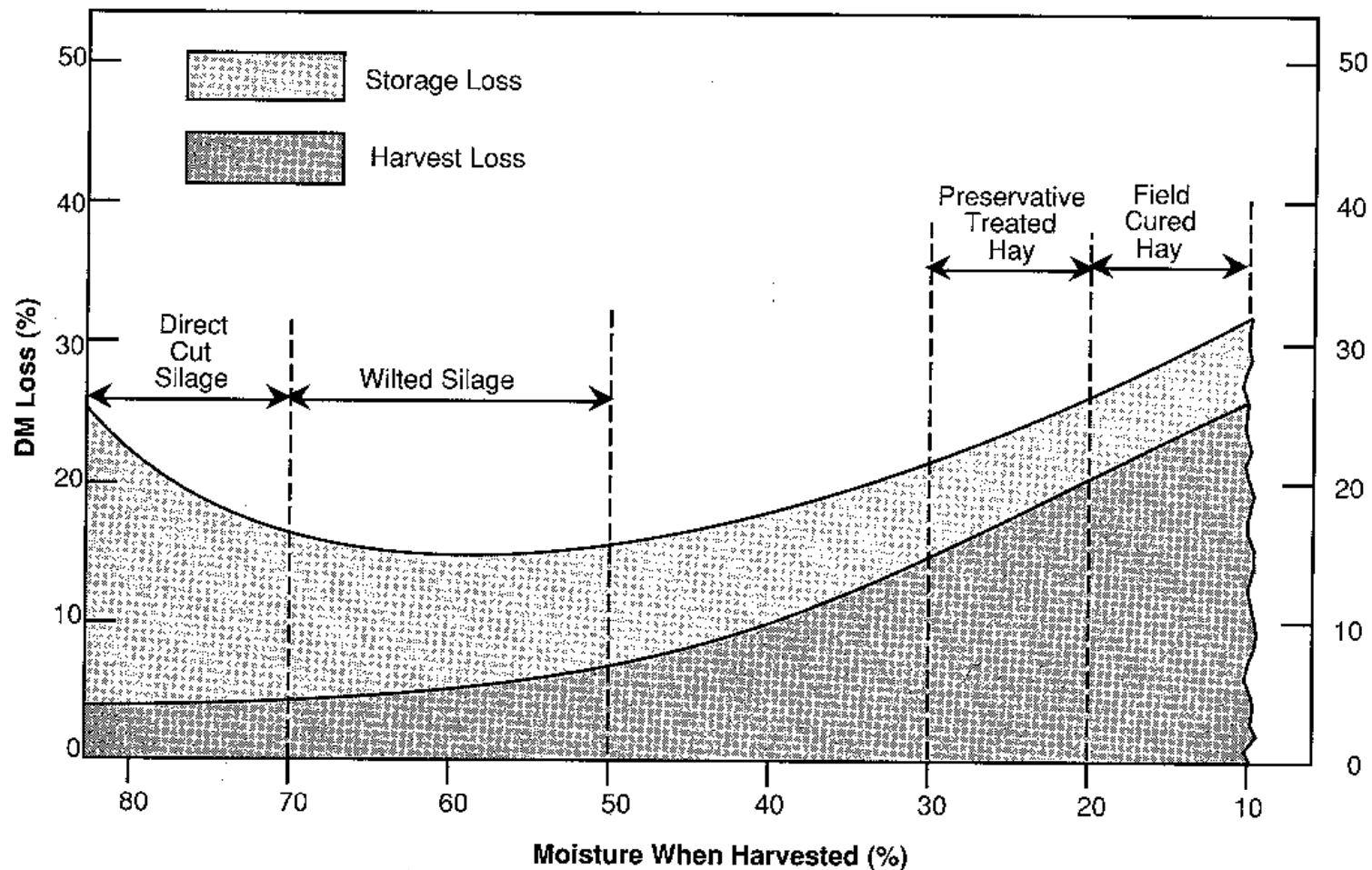


Key Factors

- Quality at time of harvest
- Harvest and preservation techniques
- Storage methods



Moisture Content Affects Harvest & Storage Losses



Source: Hoglund (1964)

Hay and Silage Making Losses

- Mechanical handling losses
- Leaching losses
- Respiration losses



Mechanical Handling Losses

- Mowing
- Tedding
- Raking
- Baling or Chopping
- Handling



Mowing & Conditioning Losses



Type of Mower	% D.M. Lost	% Leaves Lost
Sicklebar mower only	1	2
Sicklebar mower, fluted rolls	2	3
Disc mower only	3	4
Disc mower, fluted rolls	4	5

Raking & Tedding Losses



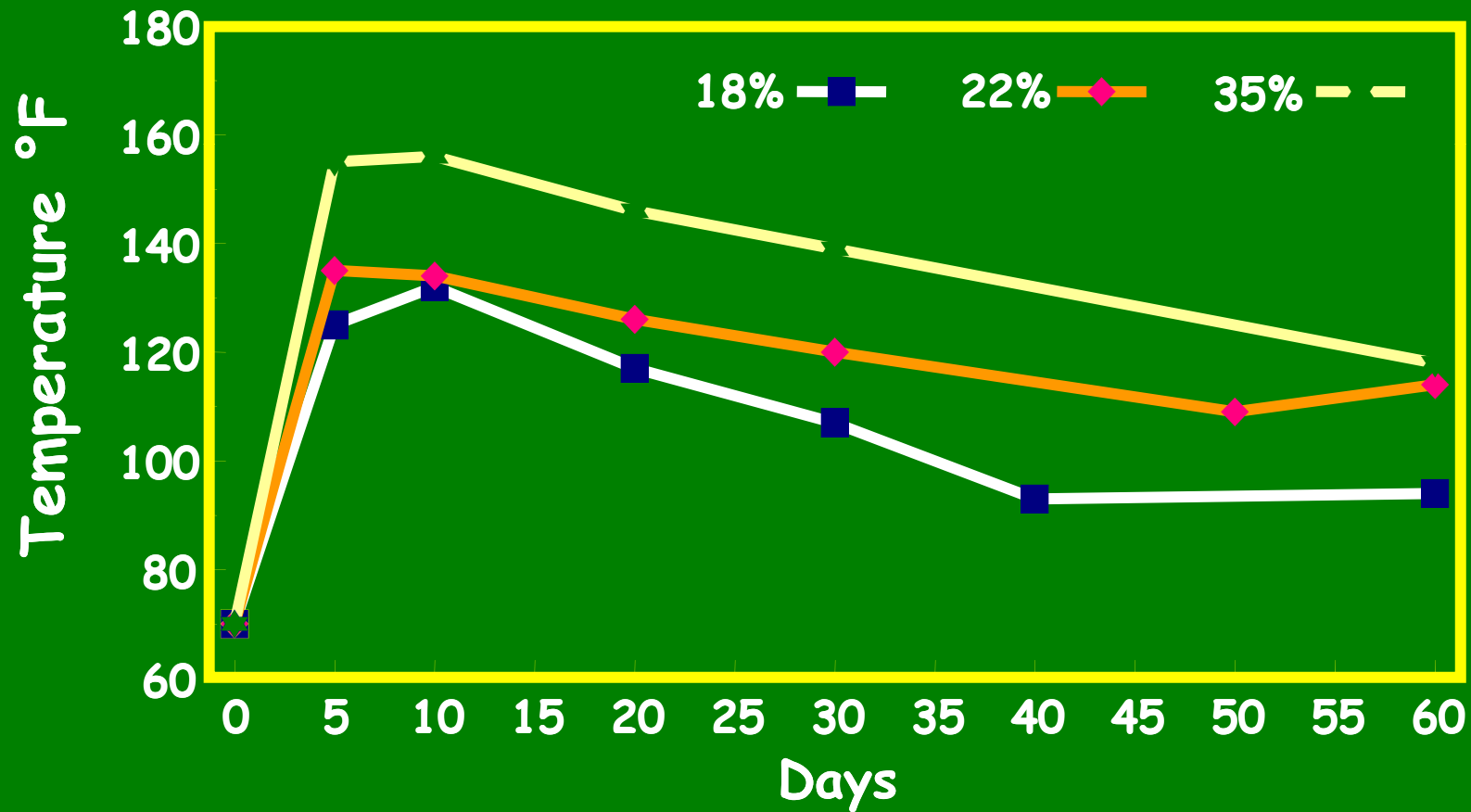
Moisture Content	Raking		Tedding	
	% D.M. Lost	% Leaves Lost	% D.M. Lost	% Leaves Lost
70%	2	2	1	2
60%	2	3	1	3
50%	3	5	3	5
33%	7	12	6	12
20%	12	21	12	21

Baling Losses

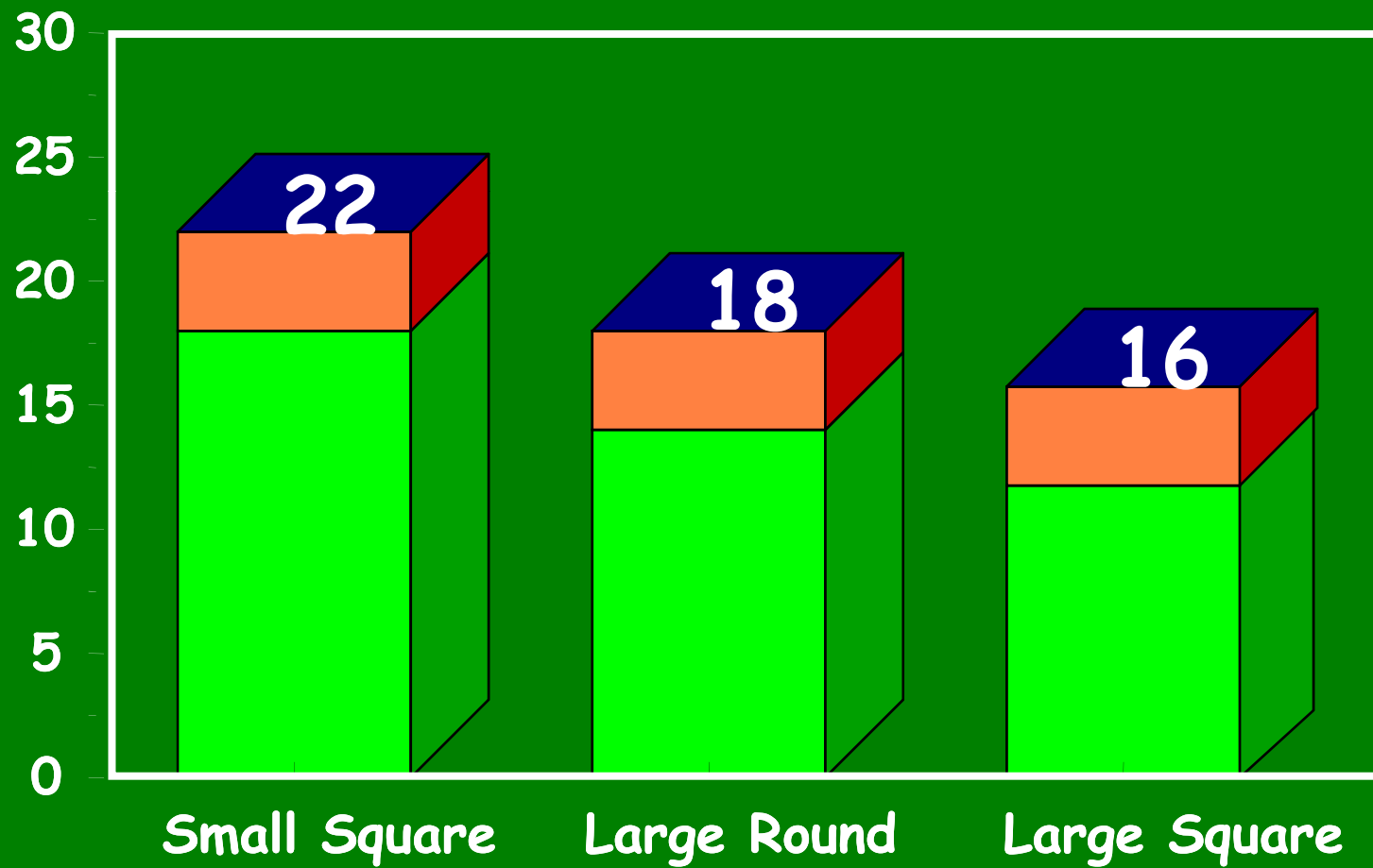


Moisture Content	Pickup + Chamber	
	% D.M. Lost	% Leaves Lost
25 % (with preservative)	1	2
20 %	2	3
12 %	3	4

Effect of Moisture on Heat Retention in Big Bales

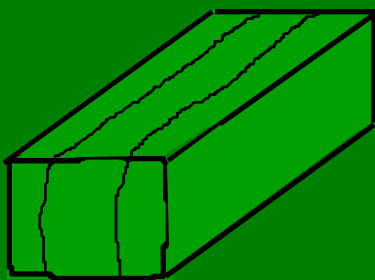


Maximum Moisture Content at Baling

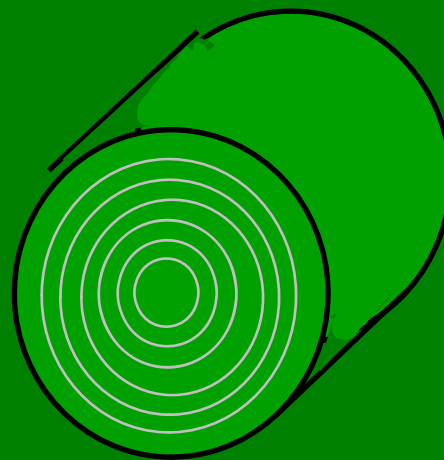


Shape Dictates Moisture Content at Baling

Small Square Bale



Large Round Bale



60 lbs. ÷ 21.3 sq.ft.

2.8 lbs./sq.ft.

1200 lbs. ÷ 122.5 sq.ft.

9.8 lbs./sq.ft.

Leaching Losses



- Can remove 40% of the nutrients in a single event
- Dramatically reduces the marketability of hay
- Minimizing drying time is the key

Sickle vs. Disc



- Clean cut
- Slower
- Low Horsepower



- Close cut
- Quicker
- Higher Horsepower
- Cumbersome to mount

Use wide swaths



- Maximizes solar drying capacity
- Can reduce drying time by 50%
- Gives hay a more even color

Mechanically Condition Hay



- Stems and leaves dry at nearly the same rate
- Breaks cuticle or waxy layer
- Can reduce drying time 30-50%

Flail (Impeller) Mowers

Figure 2

The two conditioner styles: impeller or flail-type (left) and roller-crimper (right).



Photo: Dennis Hancock, Univ. of Georgia

- Faster drying the first day - breaks vascular tissue
- Works best for thin-stemmed grasses over thick stem and leafy forages

Use a Tedder EARLY in the Process



- Use the morning after cutting
- Be sure hay is not too dry before finishing
- Can reduce drying time 20 to 30%

Practical Ways Producers Can Speed Haymaking

- Use weather forecasting to minimize exposure to rain
- Dry hay in wide swaths as opposed to narrow windrows
- Mechanically condition hay
- Ted hay in the morning ~ 65% moisture
- Use a preservative
- Make silage or baleage instead of hay

Minimize Ash Content When Harvesting Forages

- Internal and External Ash
- External - Dirt and Dust
- Normal Internal = 8% Legumes
= 6% Grasses
- Typical internal amounts found = 9-18%
 - 18% ash means 1 lb of "dirt" is fed out of each 5 lbs of hay or silage fed!

Tips to Minimize Ash Content

1. Use flat knives on disc mowers
2. Raise the cutter bar of a disc mower
3. Avoid harvesting lodged forage
4. Keep the windrow off the ground
5. Keep rake tines from ground contact
6. Windrow mergers keep hay from being moved laterally
7. Store hay off the ground
8. Store silage piles on concrete

Silage

- **Low harvest losses**
- **Totally mechanized handling**
- **Less dependant on weather**
- *but...*
- **High capital investment**
- **Less marketable than hay**



Big Balage

Lower initial cost than a conventional silage system

Lower harvest losses than hay

Easier to market than conventional silage

Flexible harvest options



Key Factors

- **Quality at time of harvest**
 - Balage only preserves and does not really enhance forage quality
- **Suitability of forage for ensiling**
- **Harvest and preservation techniques**
- **Storage methods**



Making Good Silage

**Wilt forage to 50 to 60%
moisture**

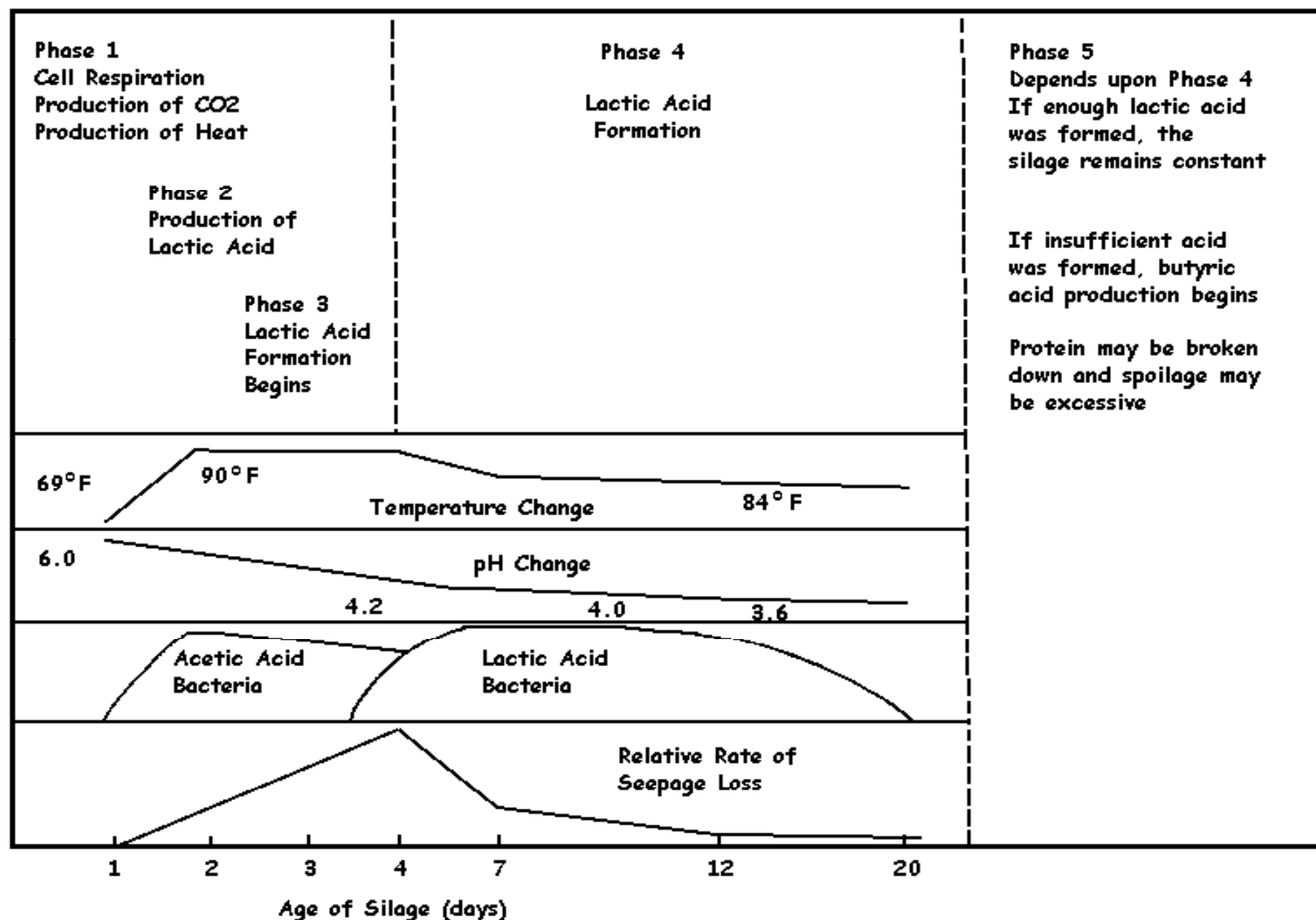
**Pack material tightly (Chop
3/8 to 1/2 in.)**

Ensile as quickly as possible
- Fast fermentation leads
to a more stable feed and
more nutrient retention



• KEEP THE OXYGEN OUT!

What Happens in the Silo



Making Good Balage

**Wilt forage to 50 to 60%
moisture – upper end for
grasses – lower end for
legumes**

**Make bales as dense as
possible**

- Longer fiber slows
fermentation**

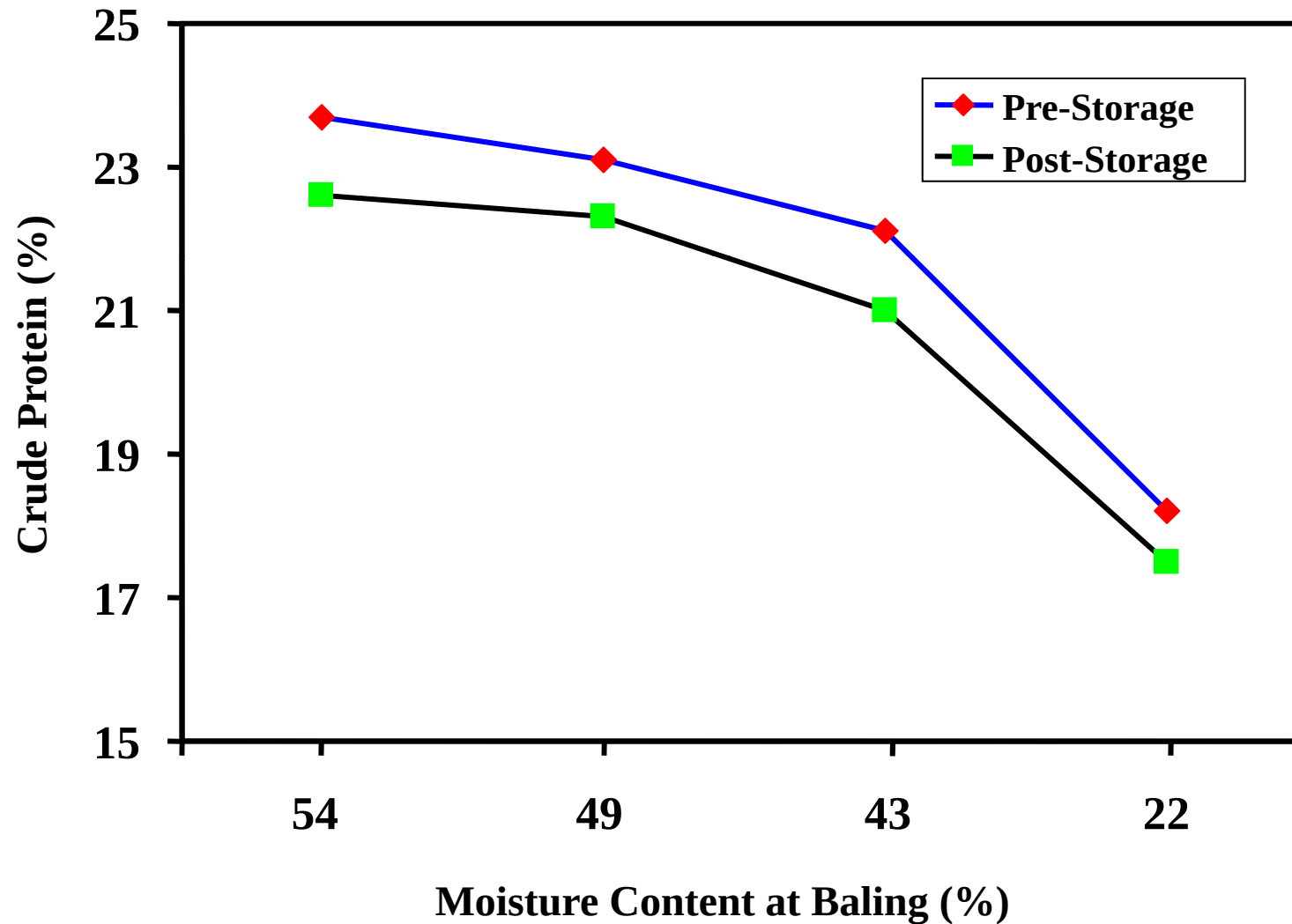
Wrap as quickly as possible

- Within 5 hours of baling**

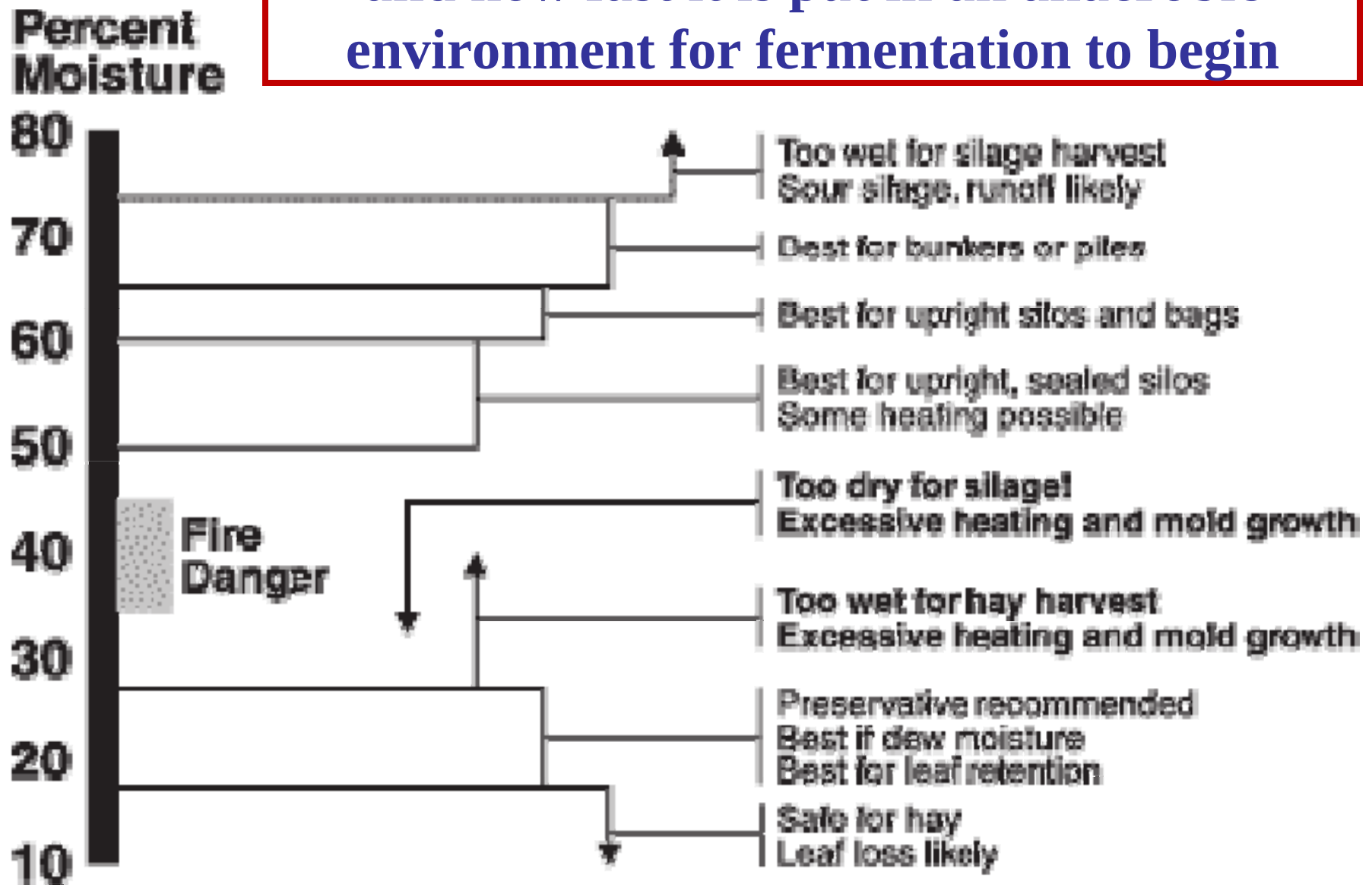


- KEEP THE OXYGEN OUT!**

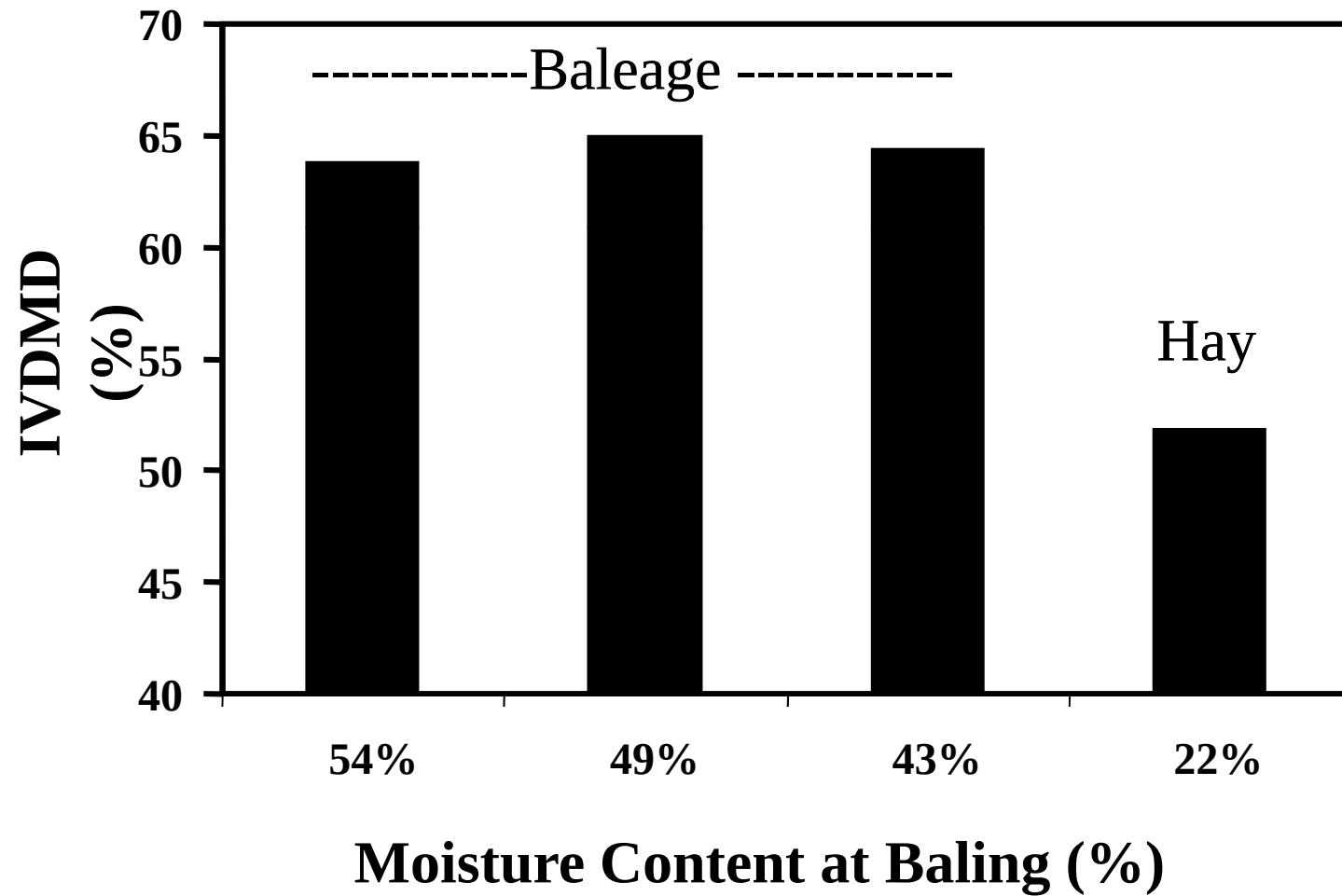
Crude Protein of Alfalfa Balage



**It's all about moisture content at harvest
and how fast it is put in an anaerobic
environment for fermentation to begin**



Digestibility of Alfalfa Balage



Red Clover Balage

Treatment	CP	NDF
	-----%	
RC balage	21.1	35.7
RC hay	16.3	49.8

(60% moisture at baling)



Ryegrass Balage Comparison to Hay

Treatment	CP %	TDN %	RFQ	ADG lbs/hd/ d
Ryegrass Hay	14.7 b	62.4 c	133 b	1.26 b
Ryegrass Balage	16.3 a	65.9 a	174 a	1.94 a
Bermuda Hay	16.1 a	62.9 b	116 c	1.56 b

Replacement Heifers Gain – No additional supplementation

Ryegrass hay received a light rain shower on it

Unpublished data, Calhoun, GA, 2009, Dennis Hancock

$P < 0.10$

Several types of wrappers are available



Platform Wrappers

Features:

Trailer or 3-point hitch

Round or square bales

Tractor hydraulics or gas engine

Plastic \$3.50 - \$4.50/bale for 4 layers

Some have a loader arm – most can be loaded with a front-end loader



Platform Wrappers

Concerns:

Plastic cost

Labor per bale

Most only accommodate four
ft. wide bales



Square Bale Platform Wrappers



Other Wrappers

End-to-End Individual Wrap

Concerns:

Labor

Plastic on bottoms of bales



Balage - Transport

- **Avoid handling if possible**
- **If bales must be moved, use a grapple to avoid puncturing plastic**



In-Line Wrappers

Features:

Bales end-to-end

Less labor for wrapping

Lower plastic cost (1/2 or less)



In-Line Wrappers

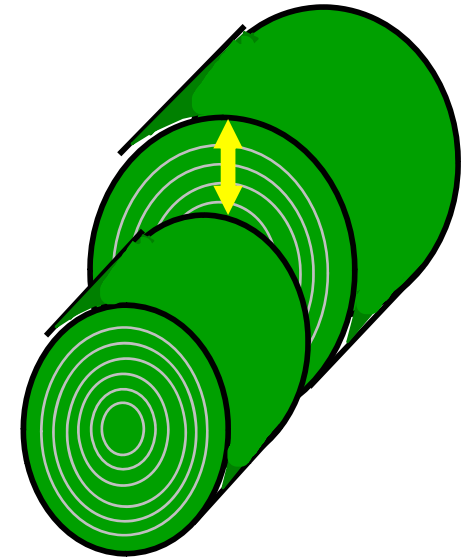
Concerns:

Uniformity of adjacent bales (both size and density)

End of rows need to be sealed by hand

A hole in the plastic can spoil a large area

Feedout rate (need to feed two or three per day to keep ahead of spoilage)



Balage - Wrapping

- **Wrap with at least four layers of 1-mil plastic with 50% overlap. 8 mil total is ideal for long-term storage**
- **Use high-quality plastic**



Alfalfa Silage & Hay

Alfalfa silage & hay from the same field
2, 4, or 6 layers of stretch film - platform wrapper

Hay 6 layers

2 layers

4 layers

Storage Treatment	Consumption
2 layers	53%
4 layers	84%
6 layers	88%
Hay	64%

Balage - Storage

Store in a well drained site

**Store bales where animals
won't damage them**

Weeds encourage rodents

**Storing on the flat side
prevents squatting**

Patch holes promptly



Crops to Wrap

Legumes

Alfalfa

Red clover

Soybean

Cool Season Grasses

Tall fescue

Wheat / Triticale / Rye

Annual Ryegrass

Warm Season Grasses

Forage sorghum

Sudangrass

Pearl millet

Immature corn

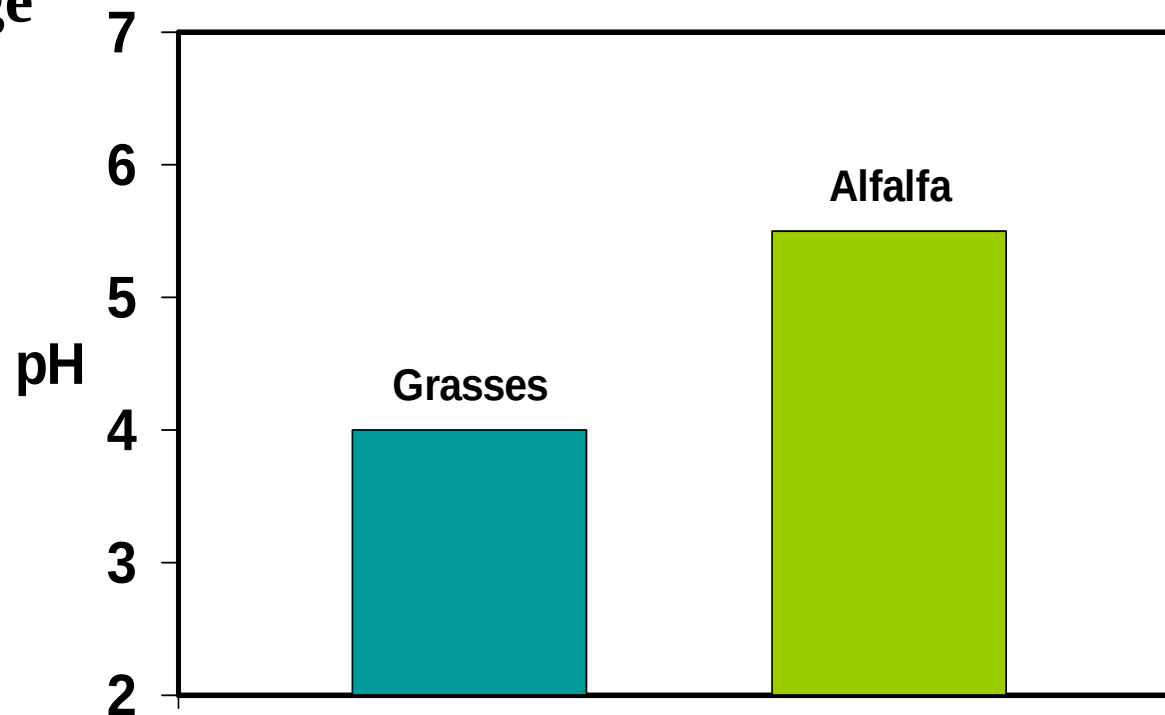


Legume-Grass mixes work best



Grasses vs. Legumes

- Grasses tend to ferment better than do legumes – more water-soluble carbohydrates
- pH near 4 for all grass treatments
- Much more acid production than in alfalfa silage



When to Wrap

Wrap as soon as possible
after baling

Definitely on the same
day – Start a little on the
wet side

Delayed wrapping
prevented adequate
fermentation as reflected
in the higher pH value

Suggestions:

Hot, summer day – 2 hrs

Cool, fall day – 8 hrs

(Depends on weather and
type of forage)

pH 4.5



pH 6.2



Other tips

**Do not use treated sisal twine.
The treatment breaks down
the plastic**

**Inoculants are a good option if
the moisture isn't right –
Speeds up lactic acid
formation.**

Don't wrap in the rain

**Bales should be fed within one
year of wrapping**

**Wrapping area and storage
areas should be close**

