Making Quality Baleage with Annual Forages

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Keys to Making High Quality Baleage

- Harvest at proper stage of maturity (early boot stage for grasses and bud to 1/10 bloom for legumes).
- Wilt forage to reduce forage moisture content to about 50% (± 10%).
- Wrap in 4-6 layers of stretch film to exclude oxygen.
- Allow to ferment a minimum of 30 days, preferably 60 days prior to feeding.

Baleage vs. Chopped Silage Fermentation Rate

Days post-ensiling	Baleage pH	Chopped silage pH
0	5.7	5.7
1	5.8	5.1
3	5.7	4.9
9	5.5	4.6
60	5.1	4.4

R. Lemus, 2010.

Advantages of Bale Silage vs. Hay

Agronomic advantages – fewer field losses (rain event losses), less tedding, less leaf shatter loss, lower storage losses (compared to outdoor-stored hay) and more timely harvest.

Animal advantages – lower feedout losses, less feed supplementation and higher milk production achieved via higher nutritive value forage.

Economical incentives – bale silage achieved with only one additional piece of equipment i.e. the wrapper.

Bale Silage Disadvantages

- Wrapper purchase
- Plastic ($3-6/bale) and labor costs
- Untreated sisal twine, plastic twine or net wrap needed
- Heavy bales, difficult to market
- Plastic disposal
- Short shelf life
- Fermentation failures (clostridial bacteria and molds)

Individual vs. In-Line Wrappers

Individual wrappers are usually less expensive and complete-wrapped bales are more easily marketed.

In-line wrappers use less plastic and, wrap bales more quickly, but baleage feed out rates must be fast enough to prevent aerobic deterioration.

Annual Forage Crops for Baleage Production

- Cool season annual grasses– annual ryegrass, oats, wheat, rye and triticale
- Cool season legumes – red, white, arrowleaf and crimson clovers
- Warm season annual grasses – forage sorghum, sudan grass, sorghum x sudan crosses and millet
- Warm season annual legumes – Alyce clover, cow peas and forage soybeans
- Brassicas – turnips, kale, forage rape, etc.

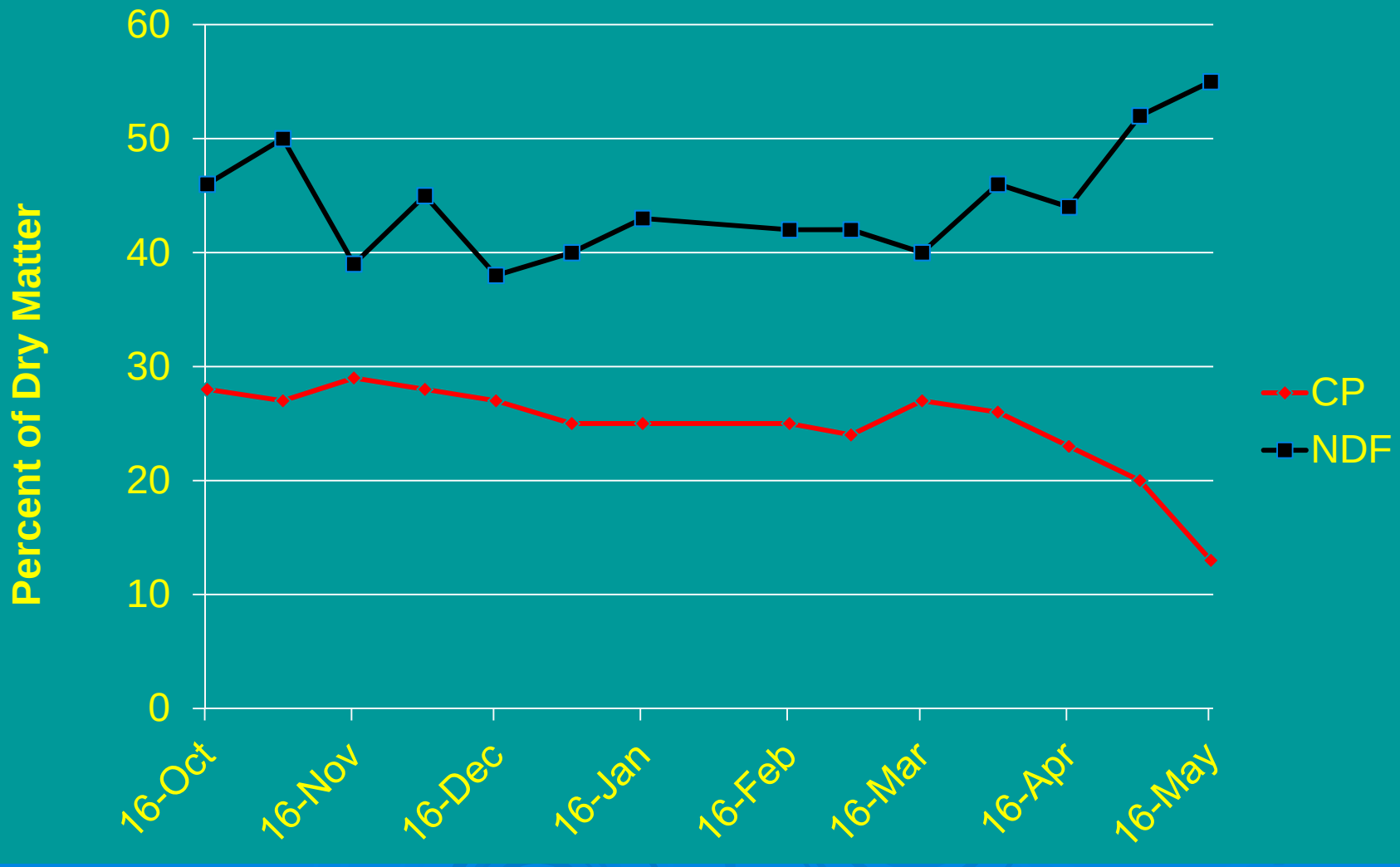
Types of Ryegrass

- Westerwold – true annual used in Gulf Coast states, heads out in spring.
- Annual – Requires cold weather to head out, may act as biennial in northern states.
- Perennial – used from Kentucky northward, grows from late spring through October.

Characteristics of Annual Ryegrass

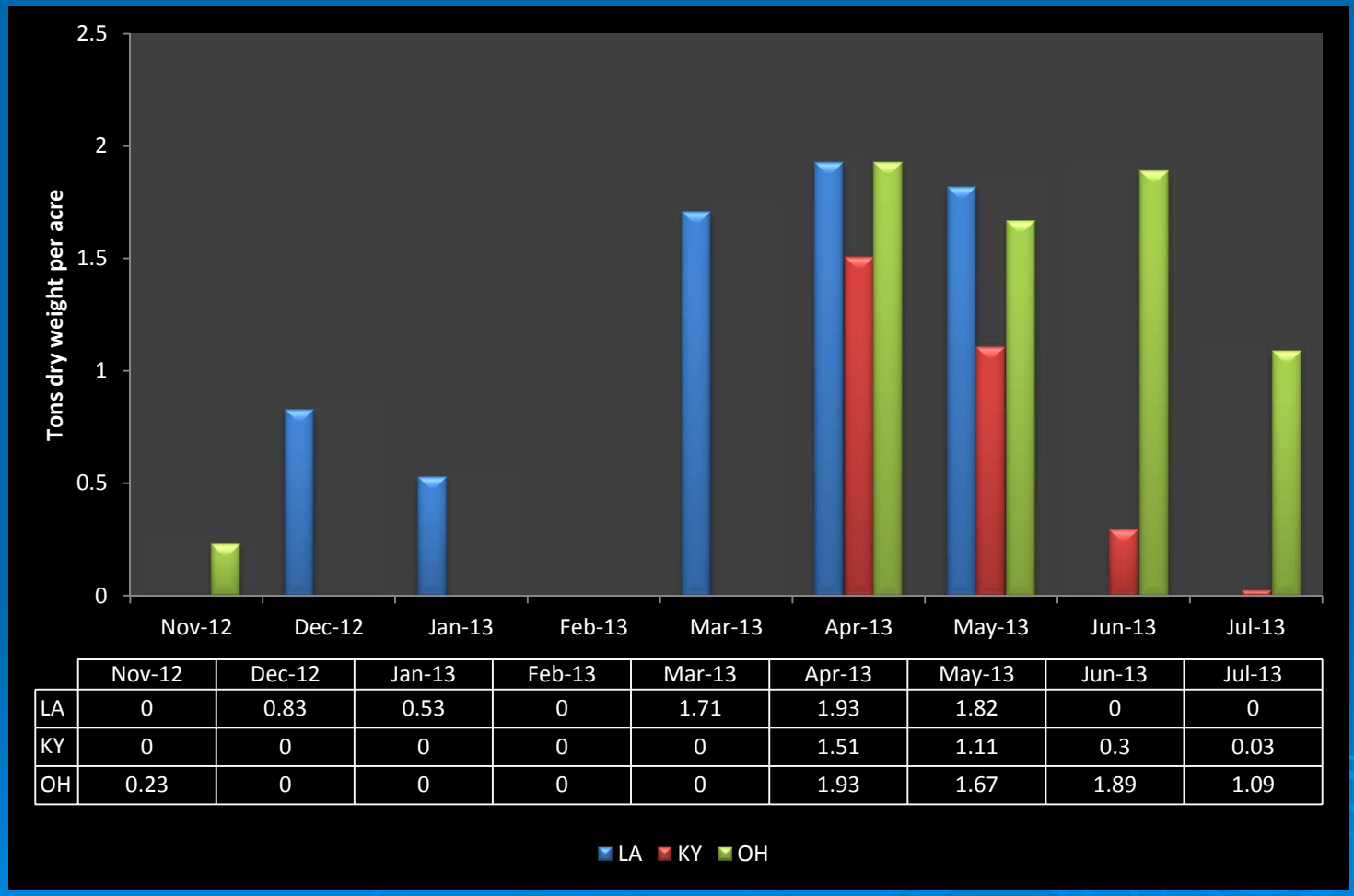
- Extremely nutritious bunch type pasture forage that thrives in mild climates worldwide.
- Nearly three million acres grown in U.S.; 80% grown in Southeast.
- Tolerant of variable soil conditions.
- N fertilizer is major soil nutrient required.
- Fall plantings limited to areas with January temperatures above 14º F.
- Yields 3-7 tons dry matter/acre.

Seasonal changes in ryegrass-oat pasture nutritive value (McCormick et al, 2001)



*Two year average values

Seasonal Variations in Ryegrass Production: Annual Ryegrass Variety Trials, (2012-2013) (Franklinton, LA; Lexington, KY; Charleston, OH)



	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13
LA	0	0.83	0.53	0	1.71	1.93	1.82	0	0
KY	0	0	0	0	0	1.51	1.11	0.3	0.03
OH	0.23	0	0	0	0	1.93	1.67	1.89	1.09

Best Management Practices for Ryegrass Baleage Production

1. Select a late maturing variety unless ryegrass is over-seeded on summer hay fields.
2. Clip or graze to 3-4 inches and apply 200 lb of ammonium nitrate.
3. Harvest at early boot for high nutritive value.
4. Wilt forage until dry matter is in the 40-60% range.
5. Reduce bale size compared to conventional hay.

Baleage Management

6. Use plastic or untreated sisal twine.
7. Use 6 layers of plastic stretch film.
8. Use bale handlers to avoid tears in individual-wrapped bales.
9. Store individual bales on end in well-drained area.
10. Consider use of inoculants on low-sugar crops

Ryegrass Stored as Baleage, Haylage or Hay for Milk Cows (McCormick et al., 1998)

	Haylage	Baleage	Hay
pH	4.53	4.81	---
Protein, %	19.2	19.8	13.1
In Vitro Digestibility, %	79.2	78.7	71.1
Forage intake, lb DM	20.3	17.3	17.2
Grain intake, lb DM	19.8	20.2	23.5
Milk Yield, lb/hd/d	63.5	60.5	58.3

Note: Hay harvest delayed two weeks after silages to avoid rain damage.

Rain-damaged Ryegrass Hay vs. Ryegrass Baleage for Heifers (Hancock, 2010)

Forage	CP	TDN	RFQ	ADG
	%	%		(lbs/hd/d)
Ryegrass hay	14.7	62.4	133	1.26
Ryegrass baleage	16.3	65.9	174	1.94
Bermuda hay	16.1	62.9	116	1.56

Lactation Study Comparing Ryegrass to Summer Annual Baleage Crops (McCormick et al., 2008)

Baleage crops were made from boot stage annual ryegrass (mid April), early headed signalgrass (late June) and vegetative forage sorghum (late June). In February of the following year, baleages were individually fed to mid-lactation Holstein cows (12 per diet) in total mixed rations.

Baleage pH and Mold Scores

Crop	pH	Mold score*
Ryegrass	5.08[a]	1.0[a]
Signalgrass	4.77[b]	1.1[a]
Sorghum	4.32[c]	1.6[b]

*1 = slight to 5 = extensive surface mold

Quality of Baleage Crops

Crop	%DM	%CP	TDN, %
Ryegrass	29.2[b]	17.9[a]	65.7
Signalgrass	43.1[a]	19.7[a]	63.3
Sorghum	25.2[c]	15.8[b]	59.4

Forage Effects on Lactation Performance.

Crop	Milk yield, lb/d	Milk fat, %	FCM, lb 3.5%
Ryegrass	65.8	3.37	64.2
Signalgrass	63.1	3.52	63.1
Sorghum	61.6	3.31	59.2

Brown Midrib (BMR) Summer Annuals

BMR sorghum x sudan

BMR Forage sorghum

BMR summer annuals: Growing in popularity due to improved digestibility. They typically are lower in lignin and higher in water soluble carbohydrates than conventional summer annuals. In the past BMR varieties have yielded less than conventional sorghum, but evaluations at our research farm and others indicate that most newer releases are comparable to conventionals in yield per acre. The BMRs are prone to lodging if allowed to mature to seed-head stage.

Summer Annual Bale Silage Crops (McCormick et al., 2007)

Item	Forage sorghum (BMR)	Forage sorghum (Non-BMR)	Sorghum x sudan	Pearl Millet
pH	**4.15**	**4.33**	**4.95**	**5.21**
WSC (sugars)	**13.7**	**9.2**	**7.6**	**6.6**
Lignin,%	**2.88**	**5.25**	**5.14**	**3.46**
IVTD, %	**79.6**	**60.8**	**58.6**	**68.0**
Intake, lb. DM/d	**6.30**	**3.82**	**2.40**	**0.91**

BMR Forage Sorghum (2011)


5250
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568

Summary

- Other than alfalfa, annual grass crops with high nutritive value and sugar content are some of the best candidates for high quality bale silage production (ryegrass, cereal grains, crabgrass, BMR summer annuals, etc.). For most grass crops, optimum stage of harvest is early boot and optimum bale silage dry matter is between 40 and 60%.
- More cold tolerant annual ryegrass varieties are being developed for use in the upper South and Midwest. However, forage production shifts from fall/spring in the deep South to late spring/summer in the upper South and Midwest.
- Particle length of bale silage limits intake and lactation performance compared to precision-chopped silage.
- Areas lacking information for baleage include: 1) Use of inoculants and preservatives, 2) Relationship between moisture concentration, baleage pH and clostridial fermentations 3) Effect of baleage fermentation on plant nitrate concentrations and 4) baleage nitrogen fractions and proper protein supplementation for milk cows.

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