2019 Haylage Field Day

UF/IFAS Range Cattle Research and Education Center
Ona, FL

Outline

- ***Introduction***
- DM concentration
- Inoculant/Additive
- General Management Practices
- Conclusions

Introduction

- Unofficial definition

Baleage = Forage preserved by fermentation in a bale with lesser DM concentration than hay (≤ 85% DM) but greater than silage (≥ 30-35% DM)

Haylage = Forage preserved by fermentation with lesser DM concentration than hay (≤ 85% DM) but greater than silage (≥ 30-35% DM)

Silage = Forage preserved by fermentation at ≤ 30-35% DM

Introduction

- In tropical and subtropical regions, silage has been used as a method of forage conservation for decades, primarily by dairy or feedlot operations

Introduction

- The development of machinery to wrap round bales has triggered the interest of beef cattle producers to produce warm-season grass silage

Introduction

- However, a perception was created that the fermentation process would increase forage nutritive value.
- Harvesting at the optimum regrowth interval is crucial to have baleage with acceptable quality.

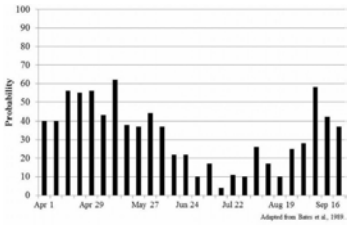
Weeks	Herbage Accumulation (kg/ha)	CP (%)	TDN (%)
2	1500	16	56
4	2100	13	57
6	3200	9	52
8	3600	7.5	48
10	4600	8.0	46

Introduction

- Warm-season grasses have undesirable characteristics for successful preservation by fermentation
  - High water concentration
  - Decreased concentration of water soluble carbohydrates (WSC)
  - The main WSC stores is starch, and LAB do not have the ability to ferment starch directly (McDonald et al. 1991)

Introduction

- However, it may be the only option to preserve forages in tropical and sub-tropical regions during the summer



Introduction

	Target Values
Dry matter (%)	> 30%
pH	< 5
Lactic acid (%)	6-8
Acetic acid (%)	< 2
Propionic acid (%)	0-1
Butyric acid (%)	< 0.1
Mold count (cfu/g)	< 300,000

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Dry matter concentration

Dry matter concentration

Intake and apparent digestibility of Big Bluestem hay and Baleage

Item	DM (%)	DM Intake (% BW)	DMD (%)	DDMI (%)	NDFD (%)	DNDFI (%)
Hay	89	1.5	545	0.83	590	0.66
Baleage	45	1.7	504	0.91	537	0.66
P value	--	0.07	0.03	0.67	<0.01	0.97
SE	--	0.08	46.6	0.06	43.4	0.06

Burns and Fisher (2012) CS 52:2413-2420

DM concentration

	High DM	Low DM	P value
DM (%)	53	22	<0.01
pH	4.4	4.7	<0.01
Lactic acid (%)	4.3	2.8	<0.01
Acetic acid (%)	1.2	3.9	<0.01
Ammonia (%)	7.6	13.7	<0.01

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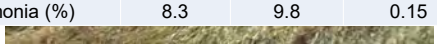
Fermentation Enhancer

https://www.youtube.com/watch?v=9sTKjVxFmKQ&t=210s

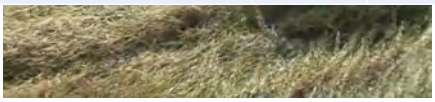
Fermentation Enhancer

	Control	Molasses	*P* value
DM (%)	22	24	0.64
CP (%)	13.1	12.3	0.18
WSC (%)	0.4	1.0	<0.01
IVTD (%)	53	58	<0.01
pH	4.8	4.6	<0.01
Lactic acid (%)	2.7	3.6	<0.01
Acetic acid (%)	0.8	0.9	0.13
Ammonia (%)	8.3	9.8	0.15



Fermentation Enhancer

	Control	Molasses	*P* value
Digestibility (%)	56	59	0.07
Intake (% BW)	1.4	1.7	<0.01

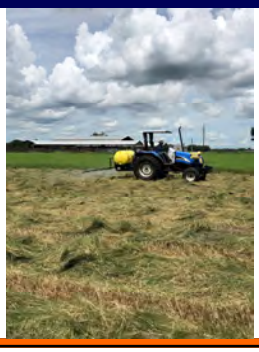


Inoculants

Inoculants

Item	Inoculant									
	Control	B500	BPII	ESA	F20	F600	HQ	VS-3	*P* value	SE
pH	4.6^{b}	4.95^{ab}	4.9^{a}	4.8^{ab}	4.8^{ab}	4.91^{ab}	4.7^{ab}	4.6^{b}	0.007	0.1
Lactic acid, % DM	2.23^{a}	0.60^{ab}	0.91^{ab}	1.64^{ab}	1.59^{ab}	0.47^{b}	1.64^{ab}	1.97^{a}	0.01	0.68
Acetic acid, % DM	2.45^{ab}	3.32^{a}	2.35^{ab}	2.46^{ab}	2.41^{ab}	1.84^{ab}	2.03^{ab}	0.32^{b}	0.04	0.32
Propionic acid, % DM	0.35	0.39	0.29	0.40	0.35	0.57	0.31	0.27	0.40	0.15
Butyric acid, % DM	3.24	3.90	3.19	4.78	4.11	4.73	4.22	3.88	0.64	1.1
Isobutyric acid, % DM	0.15	0.17	0.20	0.25	0.11	0.11	0.14	0.09	0.28	0.3
Ammonia, % CP	21.2	28.0	29.6	26.1	18.6	20.6	21.6	19.8	0.09	6.1

Propionic Acid



Propionic Acid

	Propionic acid (% Green Forage)			Contrast	SE
	0	0.5	1.0		
DM (%)	27.6	29.4	29.9	Linear	0.41
CP (% DM)	14.6	14.5	14.9	NS	0.14
ADF (% DM)	37.9	35.1	34.9	Linear	0.42
NDF (% DM)	66.8	62.9	62.5	Linear	1.30
TDN (% DM)	55.3	56.6	56.5	Linear	0.44

Propionic Acid

	Propionic Acid (% Green Forage)			Contrast	SE
	0	0.5	1.0		
pH	5.0	4.4	4.5	Linear	0.07
Lactic acid (% DM)	2.10	4.40	3.53	Quadratic	0.65
Acetic acid (% DM)	0.40	0.85	0.77	Quadratic	0.07
Propionic acid (% DM)	0.13	1.15	2.96	Linear	0.04
Butyric acid (% DM)	3.59	0.43	0.07	Linear	0.15
Ammonia (% N)	14	11	14	Quadratic	0.8

Propionic Acid

Propionic Acid

	Propionic Acid (% Green forage)			Contrast	SE
	0	0.5	1.0		
pH	5.6	5.4	4.5	Linear	0.18
Lactic acid (% DM)	0.03	1.47	5.68	Linear	1.17
Acetic acid (% DM)	5.00	2.39	2.16	Linear	0.23
Propionic acid (% DM)	1.78	2.40	3.80	Linear	0.30
Butyric acid (% DM)	5.09	3.93	0.38	Linear	0.91
mAmonia (% N)	57	42	21	Linear	7.7

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General Management Practices

- Do not bale forage and leave the bales on the ground because they will pick up moisture and create “hot spots” after ensiling

General Management Practices

- Do not guess DM concentration! Wilting time is different among forage species.
- Sudangrass, millet, and sorghum require special attention because they take longer to wilt due to thicker stems

General Management Practices

- Wrap with a minimum of 6 layers of plastic. If film wrap is used, it can save 2 layers of plastic wrap

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Conclusions

- Select forage species with greater nutritive value and harvest at the optimum regrowth interval. Remember, ……in……out.
- Bailing and wrapping at the target DM concentration is crucial to obtain desirable fermentation. The target DM concentration may vary according to forage nutritive value, but in general, wilting to a 50% DM is a safe recommendation

Conclusions

- Additives to promote fermentation may improve fermentation and nutritive value
- Further research with inoculants are necessary to have more predictable and consistent effects of inoculants in warm-season grass baleage

Thank you

Thanks to the Southeast Dairy Inc. and the Milk Check-Off Research and Education Committee for funding the haylage research at the Range Cattle Research and Education Center

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