Speaker Bio: Dr. Jimmy Henning

Jimmy Henning is Extension Professor and Extension Forage Specialist in the Department of Plant and Soil Science at the University of Kentucky. His extension program focuses on hay and haylage production and nutritional quality as well as pasture establishment and management. He is a co-founder of the Kentucky Grazing Schools and the UK Forage Variety Testing program. He led in the implementation of forage variety trials for grazing tolerance to cattle and for preference by horses. He is part of a forage team that is actively serving the Kentucky horse industry through the Equine Pasture Evaluation program. Dr. Henning is a graduate of the University of Georgia and the University of Kentucky, College of Agriculture.

He began his career at the University of Missouri as a Forage Extension Specialist and has worked at the University of Kentucky since 1990. While at the University of Missouri, he led the educational program on hay quality using a mobile forage testing lab. Dr. Henning is a Fellow of the American Society of Agronomy and has received the Merit and Medallion Awards of the American Forage and Grassland Council. In addition he was awarded the Whiteker Award for Excellence in Extension by the UK College of Agriculture, which is the highest honor given by the College for extension programming.

Dr. Henning served as Extension Agriculture and Natural Resource Program leader (2003-2007) and then Associate Dean for Cooperative Extension (2007-2017). In 2017, he returned to the faculty and resumed his work in forage extension.

He is a native of Guymon, Oklahoma, and was reared in several towns and communities in Georgia. His outside interests include music and photography. He is married to the former Faye Fleming of Tifton, Georgia and they one daughter (married to Nicholas Watts) and two grandsons, Winston Thomas and Oakley Jimmy.

How good is our Kentucky haylage?
A summary of 2017-18 farm results

Jimmy C. Henning, Jeff Lehmkuhler, Brandon Sears, Corinne Belton, Levi Berg, April Wilhoit, Corinne Belton and Don Sorrell.

The ability to harvest moist forage as hay gives Kentucky producers many advantages, including timely harvest, higher forage quality, and less weathering loss over hay systems. The baleage system allows producers to utilize commonly available forage equipment (mowers, rakes, balers) rather than requiring choppers and silo structures or bags. Making high quality baleage requires timely access to bale wrappers. To make high quality baleage, producers should:

Cut at the proper stage of maturity.
Bale when the wilted forage is between 40 and 65% moisture content (MC).
Bales should be as tight as possible to help exclude oxygen and accelerate the ensiling process.
Wrap bales within 24 hours, and ideally the same day.
Move bales to the wrapping/storage site.
Wrap bales with a minimum of four and ideally six to eight layers of UV-stabilized, stretch wrap plastic.
Periodically check the wrapped bales and plug any holes present in the bales.

Baleage may be successfully made with individual or Inline bale wrappers. Individual bale wrappers are cheaper to purchase and require less labor on site, but their speed (baleage tons per hour) is less than inline wrappers. With individual wrappers, bales can be transported to various feeding sites using a hydraulic bale squeeze so as to not puncture the plastic. Wrapping bales individually requires more plastic, but the additional plastic on the flat edges of the bales gives greater puncture resistance when placed for storage.

Inline speed up the baleage operation and saves plastic over wrapping individually. This system will typically require greater labor, and is better when bales can be stored near the site of baling. The popularity and expanding availability of inline bale wrappers has resulted in greater application of the technology among Kentucky producers.

Most producers have had excellent results in making and feeding and even selling baleage. However, some producers have had animal performance problems and even deaths from feeding baleage. In nearly all cases, feeding problems with baleage are caused by poor quality arising from excessive moisture coupled with oxygen infiltration into the bale due to inadequate or punctured plastic wrap. These problem instances are few, but are often cited as a barrier for adoption of the technology.

To better understand the haylage system, and to possibly predict when problems will occur with baleage, a project was initiated to sample a wide variety of farmer-produced baleage. Forty-four samples were collected in Anderson, Estill, Fleming, Henry and Shelby counties from haylage made in 2017-18. A diverse mix of forages were tested, including soybeans, small grains, cool and warm season grasses, grass-legume mixes and alfalfa. Cutting dates ranged from late spring to late November. These samples were analyzed for nutritional quality and the extent of fermentation. This project was expanded to include Madison and Campbell counties in 2019 thanks to a grant from the Extension Assistant Director of Agriculture and Natural Resources in the UK College of Agriculture Food and Environment. Only the 2017-18 data are summarized in this report, but 2019 data are following similar trends.

Collecting fermentation data was crucial to evaluating baleage because it reveals baleage pH and concentrations of the volatile fatty acids (VFA) (acetic, propionic, lactic and butyric acids). Good baleage will typically have pH less than 5 and lactic acid concentrations greater than 3% (dry matter basis). Low baleage pH (from high lactic acid concentrations) keep the moist forage stable in storage and when fed. Good baleage will also have low concentrations of butyric acid (< 0.1% DM basis). Butyric acid is an indicator of the growth of clostridial bacterial, which are the source of the botulism toxin that has caused animal deaths from baleage in the past.

Results

In general, all but one lot of haylage had good visual and odor characteristics. Producers have reported no feeding issues to date. The one problematic sample contained high levels of butyric acid and the producer was advised that it could be a problem. Across all samples, forage nutritive value was high, with crude protein, total digestible nutrients (TDN) and relative feed value (RFV) averaging 15%, 56% and 100, respectively.

The stability of baled silage can be measured by the total amount of volatile fatty acids (VFA) produced as well as the VFA profiles. Total VFA across all samples averaged 6.0% which is on the low end of the desired range of 5.0 to 10.0%. The average lactic acid value for these samples was 2.4%, slightly below the desired value of 3%.

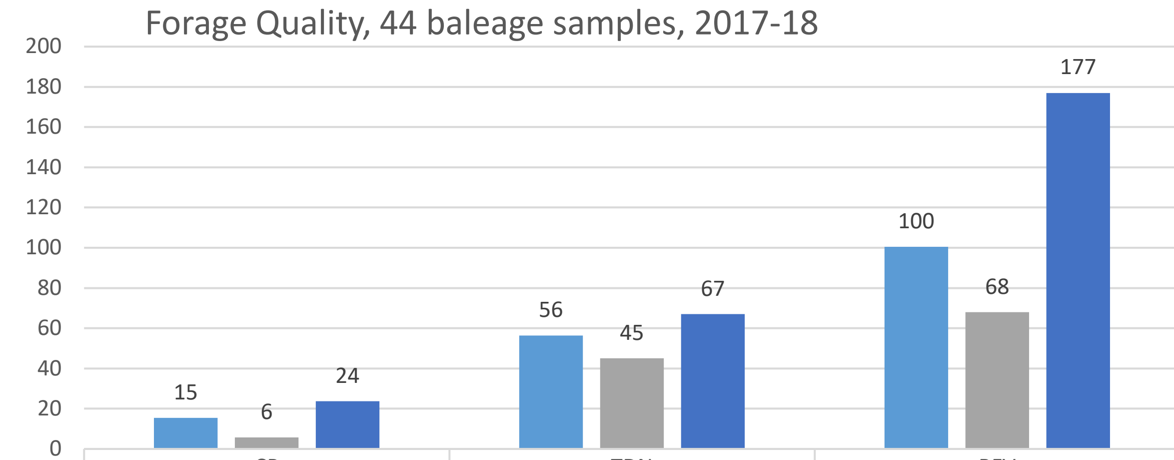
Discussion

Moisture content had the greatest impact on total acidity, explaining 76% of the variation (the high butyric acid sample was omitted from this analysis). Interestingly, for baleage with MC between 40 and 60% (a commonly recommended range), lactic acid concentrations failed to exceed the desired level of 3% in 14 of 16 samples. In this sample set, recommended lactic acid concentrations were met more frequently when MC were between 60 and 75%.

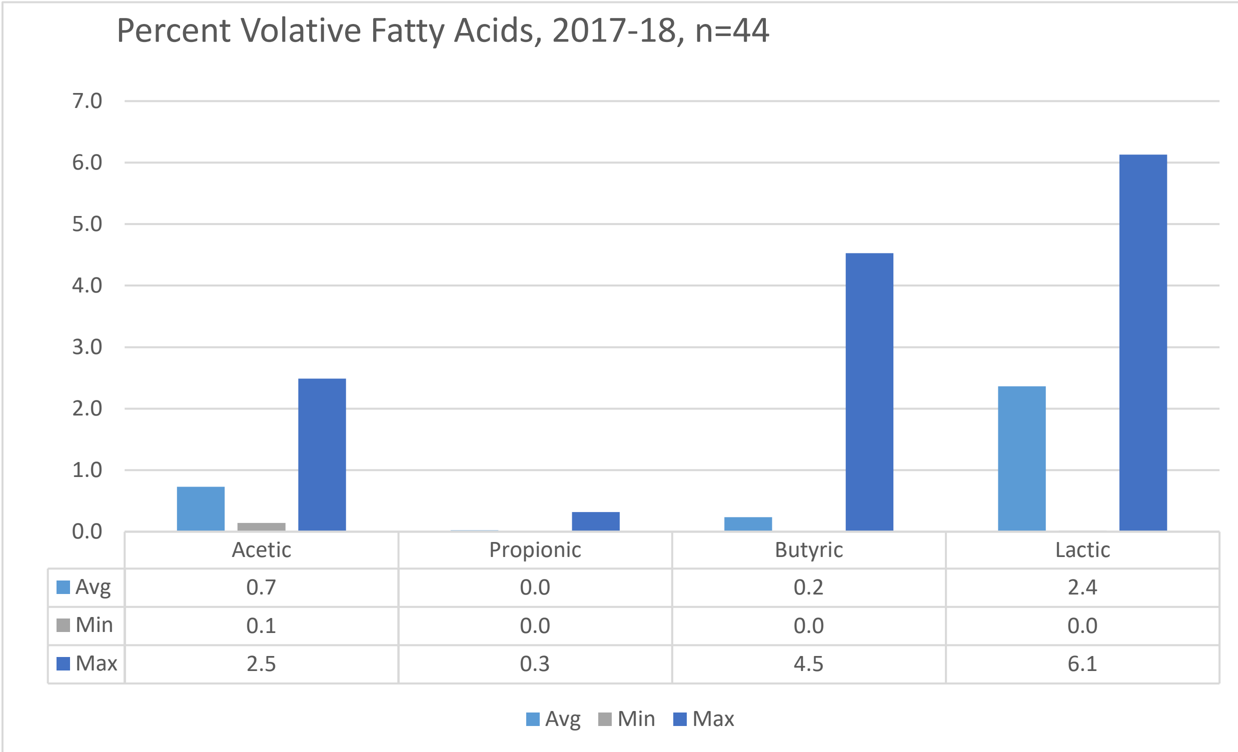
As mentioned before, only one sample had an 'off' VFA profile, having a butyric acid content of 4.5%. In good baleage, butyric acid should be less than 0.1%. The average across all samples was just above that value at 0.2%. Fifteen out of 44 samples had butyric acid values above 0.1%, but all but one of those were 0.4% or less. The excessive amounts of butyric acid is most likely due to the very high MC when baled (80%).

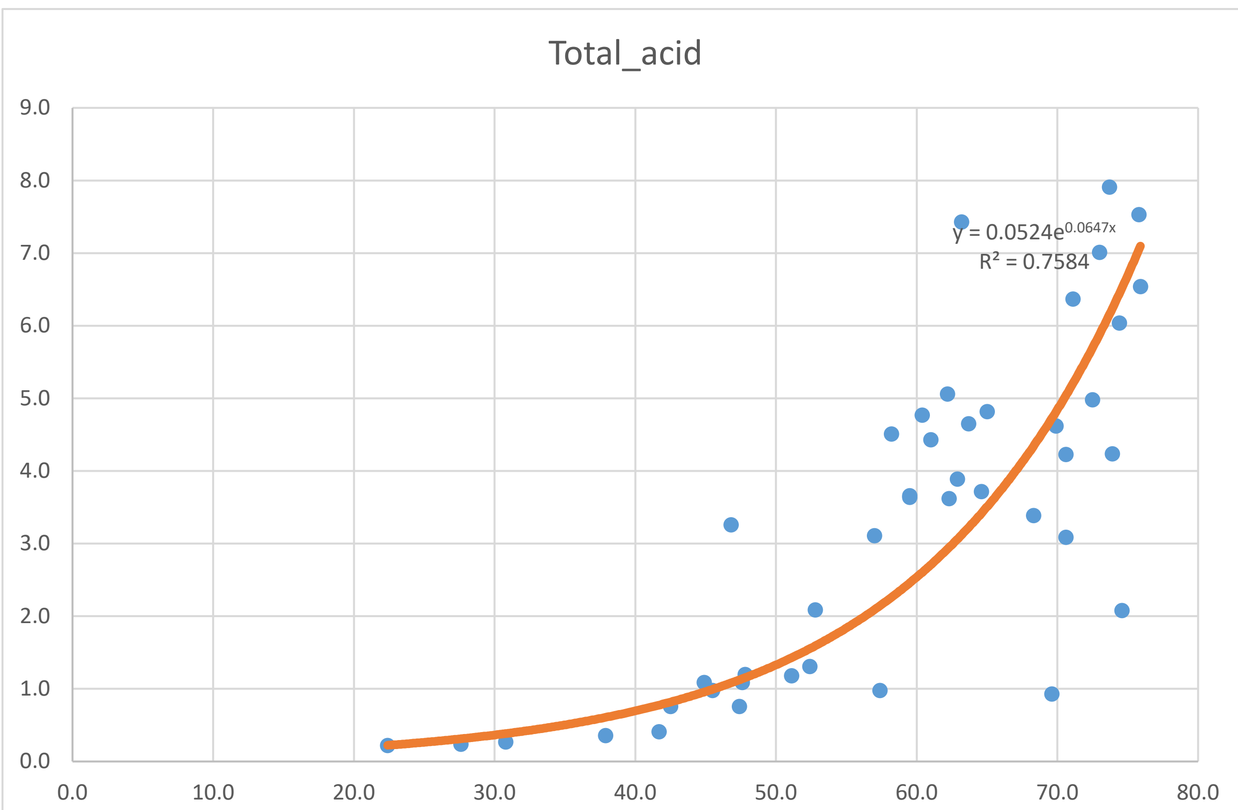
Conclusion

Baleage is a system which can readily produce high quality forage in Kentucky. VFA profiles were variable, and very highly correlated to MC. Baling at MC on the wetter end of the recommended range (60% or above) produced higher levels of 'good' VFAs in these samples. Very wet baleage (80%) leads to high levels of 'off-type' VFAs.



	CP	TDN	RFV
Avg	15	56	100
Min	6	45	68
Max	24	67	177


Percent Volative Fatty Acids, 2017-18, n=44
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Acetic
Propionic
Butyric
Lactic
Avg
0.7
0.0
0.2
2.4
Min
0.1
0.0
0.0
0.0
Max
2.5
0.3
4.5
6.1
Avg
Min
Max


Total_acid
y = 0.0524e^0.0647x
R² = 0.7584
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0