Texas Dairy Matters

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Preventive management of forages with high moisture at harvest. Part 1

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Introduction

Producing sufficient quality forage in regions with water scarcity and frequent droughts is essential to meet nutritional requirements of dairy cows[1]. Fiber digestibility is key when feeding lactating dairy cows, as it influences both feed intake and milk production[2]. It is important to note that fiber digestibility is affected by the plant maturity at harvest. Dairy farmers often harvest forages at early plant maturity stages to achieve greater fiber digestibility[3]. Another practice being considered to increase fiber digestibility is to grow BMR male-sterile sorghum hybrids, which can have high sugar content at harvest allowing for good silage fermentation[4]. However, with these strategies the moisture content, MC, is often too high for ensiling, above 70%[5], which could increase risks of undesired fermentation and leachate production (Fig. 1). This first article will discuss strategies to decrease leachate production risks through decreasing MC of forages at harvest and ensiling.

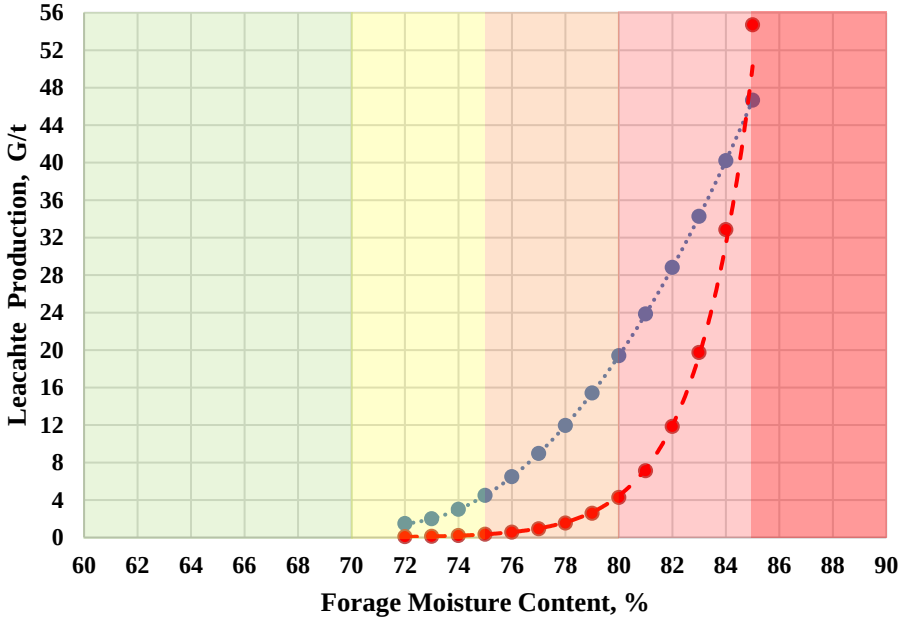

Figure 1. Predictions of leachate production based on crop moisture content at ensiling. Adapted from Bastiman and Altman, 1985[6] (blue dotted line) and Haigh, 1999[7] (red dashed line).

Preventive management to decrease silage effluent and abnormal fermentation risks include:

- Strategies to decrease forage MC at harvest and ensiling:
  - Selection of crop hybrids and planting date.
  - Wilting or drying in the field.
- Harvesting methods.
- Silage inoculants.
- Use of absorbents.
- Packing density and silo configurations.

Leachate production prediction equations

"All models are wrong, but some are useful", said the British statistician George E. P. Box. The first statistical model was developed in 1957 and predicted that leachate production would increase linearly from 0 to 106 Gallons/ton from 70% to 88% forage MC at ensiling[8]. More recent and improved models proposed that this association is not linear but quadratic[6] or exponential[7], represented by the blue and red lines respectively, Fig. 1. The value of the predictions from these models is questioned since there is large variation between predicted and measured leachate production. This might be partially explained by variations in harvesting methods, packing density and silo configurations[9].

Regardless, what we can derive from these models, especially the last two, is: 1) The trend -- higher forage MC at ensiling increases leachate production risks, and 2) The response -- most likely non-linear, meaning that the higher the forage MC the greater the rate at which leachate production will increase. What this means is that not every crop with an MC above 70% would have the same risk of leachate production. There is a greater risk of leachate production with crops that have an MC above 80%, and especially above 85% MC; and minimal risks for crops between 70-72% MC that will be ensiled in horizontal silos. This low risk could be further decreased if factors such as harvesting methods, packing density, silo configurations and use of absorbents are considered.

Strategies to decrease forage MC at harvest and ensiling

Decreasing forage MC at harvest and ensiling is the most important preventive management strategy to decrease leachate production risks. Hybrid selection and planting date are important to achieve a forage MC content that would have minimal risks of leachate production. For instance, sorghum hybrids that are photoperiod sensitive would dry down more slowly than male-sterile forage sorghum hybrids that are medium or late maturity[10]. Similarly, early-maturity male-sterile sorghum hybrids would dry down faster than late-maturity, male-sterile sorghum hybrids. Planting date should be considered based on expected plant maturity and forage MC at harvest. If using late-maturity male sterile sorghum hybrids, it would be wise to plant earlier in the season to allow the hybrid enough time to grow and dry down.

Wilting or drying in the field is a practice adopted by dairy farmers and in the Texas Panhandle is favored due to the predominant sunny and dry conditions. It is possible on dry, sunny days to reduce the forage MC from 80% to 65% in three to six hours[8]. However, this practice would increase harvesting costs compared to direct cut and chopping.

Conclusion

Decreasing forage MC at harvest and ensiling is the most important preventive management strategy to decrease leachate production risks. Several male-sterile forage sorghum hybrids may reach an MC of 70% to 72% at harvest, allowing for minimal risks. Other factors that may influence leachate production and abnormal fermentation risks include harvesting methods, silage inoculants, use of absorbents, packing density and silo configurations.

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