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Preventive management of forages with high moisture at harvest. Part 2

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Introduction

Producing high-quality forage is arguably the most important aspect for dairy cow nutrition and a key aspect in the dairy farming business. Fiber digestibility, which affects feed intake and milk production, is influenced by plant maturity at harvest[1-3]. To improve fiber digestibility, dairy farmers often harvest at earlier maturity stages and consider using brown midrib, BMR, male-sterile sorghum hybrids with high water-soluble carbohydrates content. However, these approaches can lead to high moisture content in forage[4], exceeding 70%, which increases the risk of poor fermentation and leachate production.

The previous article discussed strategies to decrease forage moisture content at harvest and ensiling. However, harvesting methods – such as the theoretical length of cut (TLC), use of kernel processors and roll-gap settings; packing density; and silo configurations also may affect leachate production[5] (Fig. 1). This second article will discuss harvesting methods to decrease the risk of leachate production.

Figure 1. Leachate production from a male-sterile sorghum hybrid harvested with a 6 mm theoretical length of cut and 2 mm kernel processing roll gap with 77% moisture content after compression with a manual press.

Effect of forage processing and packing density on leachate production

A literature review found controversial results regarding the effect of mechanical processing at harvest on leachate production[6]. Nevertheless, most of the studies reviewed compared chopping with not chopping grasses at harvest and did not report TLC or packing density. Not chopping grasses could cause poor packing and fermentation, increased drainage channels, and does not represent current practices.

However, two publications reported on the theoretical length of cut and leachate production. One study demonstrated leachate production decreased by 61% for corn silage harvested with a ~79% moisture content when increasing TLC from 6 mm to 32 mm, while there was no difference when moisture content was lower than 72%[7]. Similarly, another experiment reported a 39% decrease in leachate production when not chopping compared to chopping alfalfa harvested with 83.5% moisture[5]. In both experiments the silage that was harvested with shorter TLC had greater packing density than the silage harvested with longer TLC.

Reducing the TLC can increase packing density to pressures that could increase leachate production if ensiling forages with high moisture content, especially >75% moisture (Fig. 2) [7].

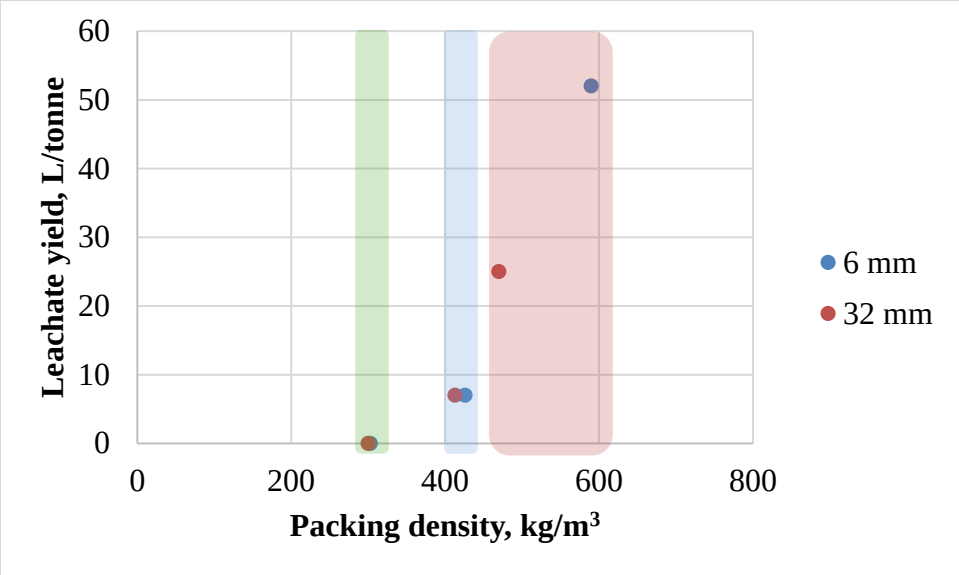

Figure 2. Leachate production plotted against packing density for samples harvested with theoretical length of cut of 6- or 32 mm with moisture content of 61%, 71% and 79% (green, blue and orange shaded areas, respectively). A TLC of 6 mm increased leachate production by 108% compared to 32 mm on corn silage with a 79% moisture. Adapted from Messer and Hawkins[7].

Furthermore, kernel processing can further decrease particle size and increase leachate production. In immature corn silage harvested with 75.6% moisture, the effect of chopping combined with processing decreased particle size by 8% and doubled leachate production compared to not processing[7].

Effect of theoretical length of cut on leachate production of male-sterile sorghum

We conducted an experiment testing the effect of the TLC on leachate production harvesting sorghum with 77% moisture, 2 mm kernel processing roll gap settings, and a TLC of

6 mm or 20 mm. A total of 3.8 kg of sorghum was ensiled in 1.25-gallon mini silo buckets with sandbags in the bottom to collect leachate production. Increasing the length cut from 6 mm to 20 mm decreased leachate production by 30% (Fig. 3)[8].

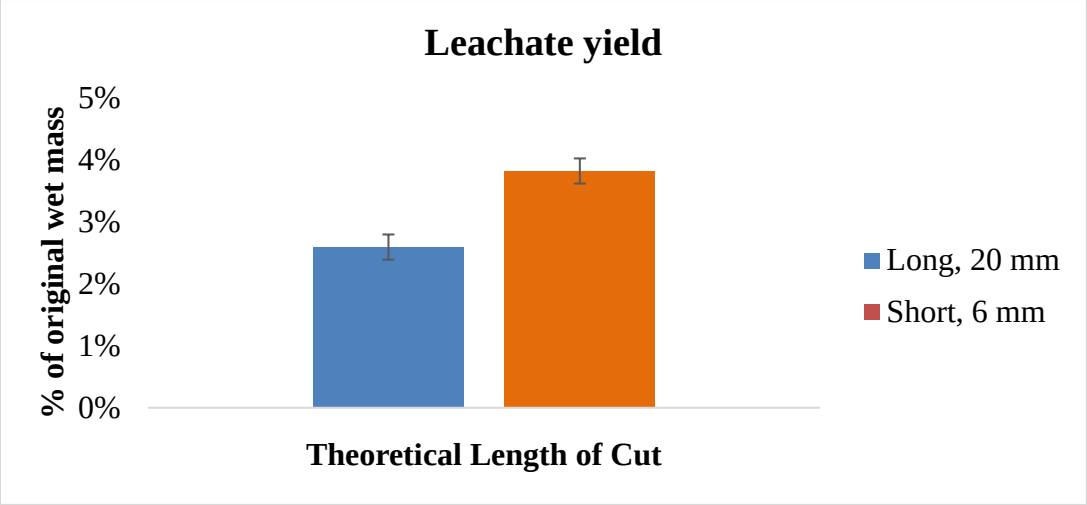

Figure 3. Leachate yield (%) from male-sterile sorghum forage harvested with theoretical length of cut 20 mm or 6 mm and ensiled for 39 days.

Effect of silo configuration and packing density on leachate production

Increasing vertical pressure linearly increases packing density and leachate production of silages[9]. Vertical pressure is different between silo types and configuration. In tower silos, silage can experience up to 73 pound-force per square inch (PSI) in the bottom layers, whereas in bunker silos, silage usually experiences 1-4 PSI of pressure[9]. Gebrehanna et al. (2014) suggested for stack silos up to 12 feet (roughly the loader height), a maximum forage moisture content of 72% to 77%, whereas for stack silos higher than 12 feet the maximum forage moisture content should be 73%[10].

In summary, to reduce risks of leachate production in forage harvested with slightly high moisture content (between 70 to 72% moisture), use moderate to long TLC (3/4 inch or slightly greater), do not utilize kernel processing and consider silo types and configuration to have an appropriate packing density. For forage with moisture higher than 73%, while the strategies mentioned in this article would still decrease leachate production risks, delaying harvesting or wilting would be a much safer approach.

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