

# There can be issues with corn silage replacements

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What makes modern corn silage such a great lactation cow forage? This feed is incredibly consistent, taking some of the variability out of the daily ration, and cows respond favorably to boredom in the ration.

Corn silage is one of the highest-tonnage forages available, topping 20 tons per acre with natural rainfall and upward of 30 tons per acre on irrigated ground (approximately 7 to 10.5 tons of dry matter per acre). Corn silage is high in neutral detergent fiber digestibility (60 percent), and in a ton of wet corn silage there are 185 pounds of neutral detergent fiber digestibility assuming 44 percent neutral detergent fiber and 35 percent dry matter (DM).

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Corn silage is also high in starch content that is pretty well digestible because it is high-moisture corn. In most cases, it will average 75 percent in vitro starch digestion seven-hour. So in a ton of wet corn silage there are 280 pounds of starch (40 percent starch); 210 pounds disappear in the rumen to drive microbial protein production and produce volatile fatty acids, which are then converted to glucose via the liver to drive milk production.

There are also 52 pounds of highly digestible protein that come along for the ride from a ton of wet corn silage.

Yes, corn silage is the total package, and there are few types of forage that can replace it entirely. However, there are several different forages that can partially replace it – but there can be issues with these alternative forages.

There are several common forages from the sorghum and sudangrass families dairy producers can grow in place of corn silages due to lack of water, delayed corn planting, it being too dry to plant and mid-season hail damage, insects or the wrong herbicide. **Table 1** compares the pounds of basic nutrients of crude protein (CP), fermentable starch (fStarch), sugar and fermentable fiber (fNDF) based on an acre of production (tons per acre).

	Corn silage	BMR pearl millet	BMR sorghum/sudangrass	BMR sudangrass	Forage sorghum	Non-BMR sudangrass	Grain milo
DM (tons/ac)	8.5	7.5	6.5	7.0	6.0	7.5	6.0
CP (lbs/ac)	1,377	1,650	1,677	2,240	1,236	2,400	1,224
fNDF (lbs/ac)	3,754	5,568	4,990	4,732	3,480	4,032	3,024
fStarch (lbs/ac)	4,212	360	181	77	830	83	970
Sugar (lbs/ac)	213	1,200	695	840	521	520	390
fStarch+sugar	4,425	1,560	876	917	1,351	630	1,360
fStarch+sugar+fNDF	8,179	7,128	5,866	5,649	4,831	4,635	4,384

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These are the nutrients a dairy must buy on a regular basis that forages supply to make milk.

Before my email inbox gets flooded with seed salesmen across the country telling me they found “this” and “it will do that,” I used average values from Cumberland Valley using their global search engine. So there is a wide range of values in the aforementioned data. Also, forage sorghum in Wisconsin is not quite the same critter it is in Texas.

I also want to thank Tom Kilcer, a retired agronomy researcher from New York, who has been considering these and other alternate forages for most of his life for his East Coast tonnage numbers. I also took the tonnages from my personal, real-world experiences and what little tonnage values have been published in research publications.

All the tonnages are based on DM tons per acre, since DM is what we feed on the farm. It might be great coffee-shop bragging rights to claim 32 tons per acre wet, but at 72 percent moisture it is the same DM as 22.4 wet tons per acre at 40 percent DM.

Both are about 9 tons of DM per acre, so their inventories will run out at the same time if fed at the same DM pounds to the same number of cows.

Looking at trends per acre, whether your corn silage is 6.5 percent CP or 10.5 percent, the national average is 8.1 percent. Run the numbers for your operation and see how the alternative forages rank against your corn silage values. I bet corn silage still comes out on top. As I said before, it is just hard to replace good silage corn. The calculation is easy:

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*DM tons per acre x CP percentage x 2,000 pounds = pounds of protein per acre*

*Fermentable NDF (fNDF) = DM tons per acre x NDF percentage x neutral detergent fiber digestibility 30-hour*

*Fermentable starch = DM tons per acre x starch percentage x the 7-hour in vitro starch digestion value*

I am looking at benchmark numbers here, and I fully realize moisture, particle size, rate of passage and a whole host of other variables will impact digestibility on each farm. The bottom line is: There are few forages that match corn silage's nutritional contribution and tonnage to the farm, and that is an issue.

Another issue that happens with the sorghum and sudangrass families is the threat of prussic acid following a killing frost. Brown ascyanogenic glucosides are converted into prussic acid in the rumen and are readily absorbed into the bloodstream, where they can interfere with respiration, causing paralysis. There is treatment for this condition but poor prognosis of recovery.

Harvest should be delayed by at least a week to allow the ascyanogenic glucosides to dissipate from the plant.

These species of plants are also prone to nitrate poisoning. This happens after an extended dry period, and when rain finally does come, the plant suddenly takes up enormous amounts of nitrogen from the soil in the form of nitrates.

Nitrates are broken down in the rumen to nitrites. Normally, nitrites are converted into ammonia and are used by rumen microbes as a nitrogen source. But when too much of the nitrates are eaten over a short period of time, the conversion of nitrites to ammonia cannot keep up, and the nitrites are absorbed directly into the blood system. Here, the nitrites react with the iron in the hemoglobin, and the blood cells cannot carry oxygen, and the animal suffocates to death.

Again, delaying harvest a week after rainfall will help reduce the risk of nitrate poisoning. Fermentation also reduces the total nitrate levels. Waiting until sudangrass is at least 18 inches high and sorghums are 26 inches high also reduces the risk of nitrate poisoning.

Because these plants are prone to pulling excess nitrates, great caution should be placed on safety during the fermentation process. As I said earlier, the fermentation process will cut the risk of nitrate poisoning. During fermentation, much of these nitrates are converted into nitric oxide or brown silo gas which, if breathed, can be fatal.

Nitric oxide helps keep silage stable. Most have seen the brown-orange stain on the face of the silage when plastic is first removed, if not the brown gas itself. Higher levels of nitrates will produce higher levels of nitric oxide and more staining. Because of this, sudan and sorghums must be covered quickly to avoid this risk.

Removing the covers early can also be dangerous if the silage is still fermenting and producing nitric oxide. Always let sudangrass and sorghum ferment 10 days to two weeks before trying to feed.

I know a farmer who got very sick from nitric oxide when he left half a wagonload of BMR sorghum-sudan to sit on the wagon overnight because they had finished filling the bag. The next morning, he unloaded the wagon on the ground and proceeded to shovel some of the greenchop into a small feed wagon.

When he got very lightheaded and dizzy, he noticed the brown gas collecting around the pile, so he ran out. The last load he had chopped came from the low ground next to the creek on his farm. This particular field had seen plenty of manure with its close distance from the farm, so the greenchop was filled with nitrates. Just be careful with silages gases; they are very unforgiving.

Corn silage is hard to replace tonnage-wise and nutrition-wise, and that is why it is the fastest-growing forage on U.S. farms today. Sorghum and sudangrass families can replace some of the tonnage and these nutritional qualities, but they can have issues.

Prussic acid, nitrate poisoning potential and excess nitric oxide production during fermentation can all wreak havoc on a farm. Managing harvest and fermentation can reduce these risks and need to be kept in mind when dealing with these forage families.

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**PHOTO:** Yes, corn silage is the total package, and there are few types of forage that can replace it entirely. However, there are several different forages that can partially replace it – but there can be issues with these alternative forages. *Photo by Fredric Ridenour.*



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