HUBBARD DAIRY SERVICES

Timely Topics

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DROUGHT FEED CONCERNS AND FEEDING STRATEGIES

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In drought years, both the quantity and quality of feeds are affected. Keys to feeding through a drought year are knowledge and flexibility. Know the dairies feed inventory needs, know the quality of drought stressed forages and the potential problems with feeding them and be flexible in using and feeding alternative nontraditional feeds.

A. Forage Quality and Problems

Nitrates

- Plants most likely to accumulate nitrates during drought are: sorghums, sorghum-sudan hybrids, sudangrass, pearl millet and several weed species. Corn will accumulate nitrates, but quantities decrease as grain yield increases. Alfalfa and small grains can accumulate nitrate also.
- Fermentation may reduce nitrates levels (0 to 50%).
- Test all forages grown under drought conditions for nitrates.
- Animals most susceptible to nitrate toxicity are those receiving all forage diets (growing heifers and far-off dry cows). Lactating cows are less likely to encounter nitrate toxicity as the forages are diluted with other feeds and when fed with grain (starch), the rumen bacteria are more efficient at converting the nitrate into microbial protein than with an all forage diet.
- Nitrate levels (ppm) below 3,000 are safe, at 3,000 to 6,000 they are moderately safe if limited to 50% of the total diet DM or less and above 9,000 are very toxic and can cause animal death.

Prussic Acid (Hydrogen cyanide)

- Sorghums, sorghum-sudan hybrids, sudangrass and other related species along with choke cherry, elderberry, flax and some types of birdsfoot trefoil are the plants most likely to cause prussic acid poisoning.
- Drought stunted plants accumulate prussic acid.
- Freezing ruptures cells and releases cyanide. Wait 4 days after a killing frost before grazing prussic acid accumulating plants.
- New regrowth of frosted or drought stress plants are extremely high in prussic acid.
- Prussic acid is volatile and dissipates as the plant dries. Harvesting prussic acid forages for hay and using a mower-conditioner will reduce concentrations more than ensiling.

- Prevention is the best solution to the problem. Forages should be less than 500 ppm of hydrogen cyanide for safe feeding and forages above 1,000 ppm as the only feed will cause death.

Molds and Yeast

- Growth occurs when plants are stressed by weather extremes – very wet to drought conditions.
- Molds gain entrance into plant tissue via injury from hail and insects, through roots during the seedling stage and by soil contamination of the plant material. Most crops are contaminated before harvest.
- Molds require oxygen, temperatures between 50 and 104 º F, moisture above 13% and can live between a pH of 4 and 8. Molds generally grow on a dry surface whereas yeast grows on a moist surface.
- Most molds and yeast are not harmful to the animal other than they decrease the nutrient content of the feed and may cause palatability problems. However, if concentrations are high enough, digestive upsets or other health problems are possible.
- ***Penicillium molds*** are **green to green–blue molds** that occur with stalk and ear rot. They produce ochratoxin and also a compound called patulin. Ochratoxin is degradable in the rumen, but diets should contain less than 250 ppb (Kuldau and Woloshuk, 2002). Patulin can be produced during storage when air is allowed to enter the silage mass and feeds do not ferment properly. In studies at the University of Minnesota, patulin has shown to alter VFA production in fermenter studies, but had not affect on rumen fermentation or health of animals when fed through fistulas.

Mycotoxins (Whitlow et al, 2000; Kuldau and Woloshuk, 2002)

Mycotoxins are toxic substances produced by certain species of molds (fungi). The presence of molds does not always mean mycotoxins have been produced, but is good warning sign as to a likely possibility of mycotoxin problems.

- **Aflatoxin** is a potent liver toxin and carcinogen produced by *Aspergillus flavus* and *parasiticus* (**yellow to yellow green mold**).
- Feeds most commonly found in are corn and cottonseed. *Aspergillus* does grow well in corn and alfalfa silages, but may be found in these feeds at time. **Dietary limit is 20 ppb** as aflatoxin can be transferred into milk where limits are set at 0.5 ppb. Animal symptoms include decreased milk production and reproduction. Aflatoxins alter nutrient metabolism.

- **Deoxynivalenol (DON)** or vomitoxin is produced by *Fusarium* molds (**pinkish, reddish to white mold**). Does not appear to have a marked affect on dairy cattle, although some field reports have associated it with digestive upsets (diarrhea), reproductive problems, and decreased milk production and feed intake. Presence of DON may be an indicator of other unidentified toxins in the feed that reduce feed intake and milk production. **Maximum level in dairy cattle diets is unknown, but probably between 0.3 and 6 ppm.**

Mycotoxins (continued)

- **Zearalenone** also is produced by *Fusarium* molds and often present in DON contaminated silages. Zearalenone has estrogenic like properties and causes various reproductive problems (abortions, breeding problems and enlarged mammary glands in virgin heifers). Somewhat degraded in the rumen, but **doses exceeding 500 ppb have caused reductions in milk production and reproductive problems.**

- **T-2 toxin** is another very potent mycotoxins produced by *Fusarium* molds, but generally not found in silage. **Dietary levels greater than 100 ppb can decrease milk production and cause diarrhea.**

- **Fumonisin** is produced by *Fusarium vertillioides* and *proliferatum*. Fumonisin can cause liver and kidney damage at 148 ppm or more. **Maximum recommended dietary level is 30 ppm**.

- Cows that are under stress, sick, or have a compromised immune system such as transition or fresh cows are the most susceptible to mycotoxins.

Mycotoxin treatments

- Dilution of contaminated feed with clean, uncontaminated feeds to a safe dietary level.
- Feed clay binders (sodium bentonite) at about 1% of the diet DM or other absorbents (aluminosilicates).
- Activated charcoal at 20 to 40 grams/day may be a better absorbent for zearalenone and vomitoxin than clay minerals.
- A slight increase in energy, protein and antioxidant nutrients (vitamin E, selenium, vitamin A, trace minerals) in the diet is suggested when diets contain mycotoxins.

Testing for mycotoxins

- Several methodologies exist – ELISA, TLC (Thin Layer Chromatography) GC (Gas Chromatography) and HPLC (High Pressure Liquid Chromatography). ELISA tests are quick, but false positives can occur in silages. ELISA positives need to be followed up on using more accurate methods (HPLC or TLC).
- Sampling for mycotoxins analysis – Take a double sample, one from a visibly moldy area and one from an area not moldy. Freeze or dry samples (below 140 º F) before sending to labs to avoid mycotoxin accumulations during shipment.

B. Drought Forage Quality

- Predicting the effect of drought on forage nutrient content and quality is difficult. Test all forages to know nutrient content.
- Generalizations:
  - Legumes and grasses - Drought (sunshine, warm temperatures and limited water) promote carbohydrate production, increase leaf over stem growth and delay maturation increasing forage quality, but reducing yields.
  - Corn – Quality depends on severity of drought, when the drought stress occurred in relation to plant maturity and the maturity and moisture content of the corn at the time of harvesting for silage. Low grain corn silage harvested at 32-36% DM can have good digestibility whereas stunted corn with reasonable grain content but harvested at 40% DM or greater will have poor digestibility.

Corn silage	NFC %	NDF %	Lignin %	NE_L-3X, Mcal/lb
Normal (32-38% DM)	40.0	45.0	2.6	0.65
Normal (>40% DM)	41.1	44.5	3.1	0.61
Low grain (35% DM)	30.3	54.0	3.0	0.63
Low grain (>40% DM)	31.3	54.0	3.5	0.59

C. Drought Feeding Strategies (lactating cows > 30 days in milk)

Forages

- You must provide a minimum amount of good effective rumination fiber is needed. During short forage supplies years, hay quality is often very good, increasing the quantity needed to meet minimum fiber requirements increases.
- Minimum forage fiber guidelines
  - Forage NDF (hay, haylages or corn (cereal) silages) minimum – 18% of diet DM; NFC maximum is 38% of diet DM.
  - Total NDF should not be less than 27% of diet DM.
  - Low quality hay (< 125 RFV) should be chopped to improve digestibility and intake.

Alternative fiber feeds (NDF is % of DM)

Most alternative feeds are good sources of chemical fiber, but lack cud chewing fiber. They substitute for starch (corn) in minimum forage diets.

	Feed							
DM basis	Gluten feed		Wet distillers	Beet pulp	Brewers grains	Soyhulls	Cottonseed	
	Wet	Dry					Hulls	Whole
NDF, %	42	36	40	46	47	60	85	50
Maximum % of diet	30	20	20	10	20	10	25	10