

Coping with Poor Quality Forages - Murray Feist Ruminant Nutritionist, Agriculture Knowledge Centre, Saskatchewan Ministry of Agriculture

The 2010 haying season has had many challenges. The main quality issues with this year's hay crop can be attributed to two factors: advanced maturity of the crop and the effects of weathering and rain.

Effects of Advancing Maturity

The continual rains hampered the ability to get into the field. Moisture has a negative effect on hay quality by delaying maturity. In the practice of producing alfalfa hay for dairy production, a common concept is to harvest alfalfa at an early stage of maturity in an attempt to target 20 per cent crude protein, 30 per cent acid detergent fibre (ADF) and 40 per cent neutral detergent fibre (NDF). For each day past early bloom, protein will decrease by 0.5 per cent per day, ADF will increase by 0.7 per cent per day and NDF will increase by 0.9 per cent per day.

The following table shows how advancing maturity will reduce nutrient values. The data shows early crops have excellent protein and energy levels with low fibre content. As the plant matures, ADF and NDF content increases thereby decreasing energy in the plant. As well, when forage NDF increases, feed intake decreases. A combination of declining feed intake with lower energy content means producers must provide energy in the diet by providing a forage source of higher energy or supplementing with grains and concentrates.

Effect of maturation on hay quality. Adapted from Pioneer Forage Manual, A Nutritional Guide, 1990. (Note: all values are reported on a dry matter basis).

Crop	Protein %	Energy (TDN)	ADF %	NDF %
Alfalfa, pre-bud	23	67	28	38
Alfalfa, early bloom	20	66	30	40
Alfalfa, mid-bloom	17	62	35	46
Alfalfa, mature	15	57	41	53
Alfalfa-grass, mid-bloom	15	57	38	55
Alfalfa-grass, mature	12	53	42	52
Brome, late vegetative	14	62	35	63
Brome, late bloom	8	42	49	81
Orchardgrass, late vegetative	18	68	31	55
Orchardgrass, early bloom	15	64	34	61
Wheat Straw	4	42	54	85

Effects of Weathering and Rain

Once cut, the effect of weathering has been a widespread issue in hay crops this year. Each subsequent rain further deteriorates a crop by leaching soluble protein and plant

sugars. Rain also has a negative effect on swathed hay crops by knocking off leaves, thereby decreasing protein and energy content and increasing fibre content. By reducing the weight of leaves in a bale, the stems comprise more of the weight resulting in more fibre and less energy and protein. Another factor in 2010 is the number of rain days and the volume of rain on the crops. As shown in the next table, the more rain volume a crop is exposed to, there is an increase in nutrient and dry matter losses.

Processing forages (e.g. crimping) to speed up drying can cause losses in nutrients. Aggressive conditioning or raking will also increase total leaf loss before baling.

Effects of Weathering - Adapted from Rotz and Muck, 1994. Rotz, 2003, Western Canadian Dairy Seminars.

	Dry Matter Loss (% of crop yield)		Nutrient Content Changes (% Dry Matter)		
	Range	Normal	CP	NDF	TDN
Legumes					
5 mm	3-7	5	-0.4	+1.4	-1.5
25 mm	7-27	17	-1.7	+6.0	-7.0
50 mm	12-50	30	-3.5	+14	-14.0
Grasses					
5 mm	1-3	2	-0.2	+0.9	-0.5
25 mm	4-14	8	-0.2	+5.3	-3.0
50 mm	8-27	15	-2.7	+11.0	-6.0

As an example of weathering, an alfalfa hay cut at mid bloom yielding 2,400 pounds per acre (when baled at 15 per cent moisture, that would amount to 2,040 pounds of dry matter) should have a nutritional profile of 17 per cent crude protein, 62 per cent total digestible nutrients, 35 per cent acid detergent fibre and 46 per cent neutral detergent fibre. Should that crop experience 25mm of rain in the swath, dry matter yield would drop by 17 per cent (or a loss of 350 pounds to 1,690 pounds). Crude protein would drop by 1.7 per cent from 17 per cent to 15.3 per cent, total digestible nutrients would decrease by 7 per cent from 62 per cent to 55 per cent and neutral detergent fibre would increase by 6 per cent from 46 per cent to 52 per cent. The exposure to rainfall is detrimental to quality as it reduces available protein in the hay and significantly degrades tonnage produced, decreases energy and increases fibre content of the hay. This hay will lose its value as a late gestation/early lactation feed and will be more suited for mid-gestation diets.

Mixing and Feeding Poor Quality Hay

Forages that are harvested at an advanced stage of maturity or have been exposed in the swath to the detrimental effects of rainfall will require feed testing and analysis before feeding. Forages that are of poorer than optimal quality are challenged by high fibre, low protein and low energy content. Higher fibre content in forages will reduce dry matter

intake due to rapid gut fill with fibre. The consequence is that inadequate levels of protein and energy will be consumed, nutritional needs will not be met and the animals will lose body condition. Poorer quality forages often require additional protein and energy supplementation in order to meet the animal's requirements. Feeds chosen for supplementation may include grains, commercial concentrates, protein supplements and other sources of forage that contain less fibre and higher levels of protein and energy.

Moulds and Mycotoxins

Producers are reporting numerous cases of moulded forages and grains. The mould organisms and spores by themselves are relatively non-toxic compared to most other chemicals and biological agents. The presence of moulds may reduce the palatability of the feed which reduces feed intake. Moulds also reduce the nutritional content of the feed, depending on how extensive the growth was. Moulds feed on the plant material, consuming protein, energy and vitamin components in the feed. Significant reduction in the levels of vitamin E and beta carotene (precursor of vitamin A) can occur.

The three primary concerns for mould ingestion are: (1) aspiration of spores and the development of fungal pneumonia; (2) mycotic rumenitis which may be associated with grain overload or fasting; and, (3) abortion, which is a rare event (<1 per cent).

Mycotoxins: In contrast to moulds, low levels of mycotoxins can cause considerable health problems in the herd. Often, these problems are relatively non-descript and difficult to diagnosis. Problems are usually seasonal in nature and may be associated with a change in feed.

Some laboratories will identify the species of moulds and measure the number of mould organisms present in a sample. This is indicated as cfu/gm (colony forming units per gram). This provides limited information because it does not indicate whether the moulds have produced mycotoxins. To determine if mycotoxins are present, the sample must be tested specifically for mycotoxins. These tests can be performed on grain, forages and straw. Mycotoxin testing has its limitations since they are not always uniformly distributed in the feed. A representative sample is important because mycotoxin levels will vary within and between fields due to location, temperature and moisture differences.

Fusarium Head Blight can produce mycotoxins, the most common of which is Deoxynivalenol (DON) or vomitoxin. The presence of DON is used as a "Marker" toxin. It indicates the potential for the existence of other mycotoxins in the feed. A joint study between the Canadian Grains Commission and Manitoba Agriculture, Food and Rural Initiatives showed that the largest percentage of DON is found within the infected grain kernels. Very little, if any, DON is found in the leaves and stems of the plants.

If there are concerns with suspect mouldy feed, there are several laboratories that can perform tests for mycotoxins.

For more information on dealing with poor quality feed, please contact the Agriculture Knowledge Centre at 1-866-457-2377 or your local Regional Services Office.