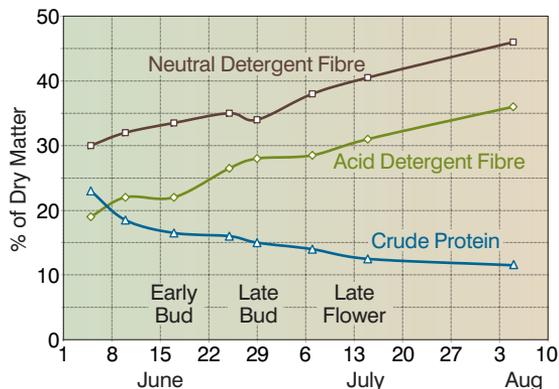


Effects of Environment on Forage Quality

Maturity of forage crops is the factor that has the greatest impact on quality. As crops mature, protein content decreases, fibre increases and the digestibility of the fibre is reduced. The higher level of fibre results in reduced energy content and dry matter digestibility. However, environmental conditions during the growing season can have a profound effect on quality, regardless of the stage of maturity of the crop.

Factors that accelerate maturity are abundant water, high temperature and high light. High light conditions result in an increase in cell wall (NDF) digestibility and a reduction in protein content. High temperature increases protein and cell wall content however, the digestibility of the cell wall decreases. High moisture generally reduces digestibility. Drought, reduced light and lower temperatures have the opposite effects.

The effect that temperature can have on nutrient content of alfalfa can be seen in the figure below. This work was done at Lacombe in the early 1990s when daytime high temperatures rarely exceeded 10 to 12°C, with abundant rain and prolonged periods of heavy overcast. Under these conditions, the quality of the alfalfa was higher than we would expect at each stage of maturity. In a 'normal' year dairy producers in this area would harvest the alfalfa at the early flower stage and would expect to see acid detergent fibre (ADF) at 32% and neutral detergent fibre (NDF) at 45% of the dry matter. However, un-



Environment	Quality Effect
Increased Light, Long Daylength	↓ Crude Protein
	↓ Cell Wall (NDF)
	↑ Cell Wall Digestibility
High Temperature	↑ Crude Protein
	↑ Cell Wall (NDF)
	↓ Cell Wall Digestibility
Drought	? Crude Protein
	↓ Cell Wall (NDF)
	↑ Cell Wall Digestibility

der the very cool growing conditions the fibre content was well below expected values (26% ADF and 37% NDF) at the early bloom stage and did not reach expected levels until the crop was in full flower. Although not tested, digestibility of the fibre was likely higher than would be expected at both stages of maturity since cool weather promotes improved digestibility.

These growing conditions are unusual. However, they do serve to demonstrate the great impact they can have on forage quality. Drought conditions are more common. Crops grown under water deficit also show much reduced levels of ADF and NDF and the fibre is more digestible. ADF levels in drought stricken forage are often in the 20% range and NDF in the low 30% range even when harvested at advanced stages of maturity. The explanation why reduced fibre levels occur under cool growing conditions and drought is the same. The activity of the enzymes responsible for production of fibre in the plant are reduced under these conditions. Not only is less fibre produced, but lignification of the fibre is also reduced resulting in greater digestibility. The combined effect is that digestibility is greatly enhanced under both conditions.

With drought affecting forages in many areas again this year, we can expect to see very high quality forage being produced. This is a mixed blessing in that we rely on forage to provide most of the fibre requirements of the cow. Drought-affected forages should be analyzed for fibre before they are incorporated in the diet of milking cows to ensure that total fibre and effective fibre requirements are met.

source: Rick Corbett, Western Dairy Science Coordinator