We Love P.M. Hay

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In order to cut higher quality hay and increase feed value by 15% without increasing cost, wait to cut forage until the afternoon instead of cutting in the morning. There are also changes in grazing management that can take advantage of this concept.

Forage is typically lower quality at sunrise (A.M.) and higher quality in late afternoon or sundown (P.M.). During the day, sunshine drives photosynthesis and causes the accumulation of simple sugars. About one-third of the sugar moves down to support root growth, water and mineral uptake. Another third supports growth in the tops, and the remaining third provides energy to drive these processes and is eventually lost from the plant by respiration. The soluble sugars consist of glucose, sucrose, fructose, fructans, and soluble starches. The relative concentrations depend on forage species and variety, soil moisture and fertility, air temperature, and the intensity of the sunshine and day length. These soluble sugars exhibit a linear increase in concentration in the plant between 9:00 a.m. - 6:00 p.m.

Forage preference studies have been conducted using cattle, sheep, and goats; all prefer the sweeter forage, P.M. cut, to the less sweet A.M. cut. Rabbits and horses have also shown a strong preference for P.M. forage. Individual preference studies have been done on ~100 animals around the world with only one showing a preference for A.M. forage.

When given a choice between two feed tubs, one containing A.M. and the other containing P.M., most test animals selected P.M. Sense of smell or taste is so keen that differences in alfalfa cut at three hour intervals could be detected.

Cool season, C-3 grasses (i.e., tall fescue, bromegrass, orchardgrass) produce the greatest changes in sugar concentration of forages tested. Warm season C-4 grasses (i.e., switchgrass, corn, Sudan, Bermuda) have daily shifts in sugar concentration, but not as dramatic. Legumes also undergo moderate changes in sugar concentrations. Alfalfa is common in a total mixed ration (TMR) so more studies have used this forage than any other.

Milk production feeding TMRs containing either P.M. or A.M. alfalfa were conducted in separate studies in Idaho and Utah. Cows receiving the P.M. hay produced 6% (Utah) and 8% (Idaho) more milk than the group receiving the A.M. hay. A third study conducted in Quebec, Canada, used haylage cut in P.M. and A.M. prior to ensiling. Cows receiving P.M. haylage produced 4% more milk. Animals often eat more of the ration containing P.M. than A.M. forage. Cows strip-grazed in England, produced 8% more milk when moved at 4:00 p.m. vs. 6:00 a.m.

Weight gain was assessed in a strip-grazing study in South America, where animals were moved every 24 hours. Strip- grazed cattle are often moved each morning. Moving a second group during mid-afternoon allowed the group to initially consume grass that was higher in sugar than in the grass grazed by the group in the morning. The group rotated in the afternoon benefited from grass leaves that had accumulated sugar during much of the day, whereas, the morning group consumed leaf tips that had low concentrations of sugars. Weight gains were measured in growing ewe lambs fed an enriched TMR containing P.M. or A.M. cut hay. In general, there was no significant difference in weight gain.

In England, many varieties have been selected to have higher sugar concentrations than others. Grazing studies have shown production advantages in livestock consuming sweeter varieties. Other benefits also accompany the P.M. vs. A.M. forage quality issue. There is a greater conversion of nitrate to protein in the presence of the elevated sugar concentrations. This trait has been used to graze highly nitrated pastures where nitrate poisoning occurred when animals grazed in the A.M. but not when they grazed in the P.M.

During summer harvest, several Idaho dairymen adopted another management approach - overlaying TMR with P.M.- cut green-chop forage to enhance intake and overall TMR feed value. Economic returns of feeding P.M. vs. A.M. forage to dairy herds were calculated at $300 million annually for 12 western states, based on $75/ton hay and $12/cwt milk. This return is greater now because hay and milk prices are higher.

There are economic incentives for dairys to insist on P.M vs. A.M. forage. The emphasis should be on the soluble sugar concentrations. This requirement would be in addition to the current analysis of ADF, NDF, CP, and calculated RFV. Thus, there is a need to develop forage tests for soluble sugars. The commonly used NIRS analysis would be a good starting point. However, as with other components, a good set of standard samples is needed to assure the validity of the analysis.