

## Forage Research Updates *Compiled and edited by Paul Peterson, University of Minnesotas*

### Wisconsin - Red Clover for Dairy-Quality Silage

by John Grabber, U.S. Dairy Forage Research Center-Madison

With adequate soil moisture, red clover yield can equal or exceed alfalfa in some environments. Red clover also boasts greater fiber digestibility and rumen-undegradable protein (RUP) than alfalfa, but milk production of cattle fed red clover is often below expectations.

Although bonding of *o*-quinones to proteins in red clover desirably decreases proteolysis during ensiling, it may leave insufficient amounts of rumen-degradable protein (RDP) for the production of rumen microbial proteins, a vital source of protein for cattle. Excessive bonding of *o*-quinones may also depress intestinal amino-acid absorption by dairy cows. Thus, disappointing performance with red clover may occur if protein is over-protected with *o*-quinones.

This study examined how cutting management during the first full production year influences RDP and RUP levels, forage yield, and concentrations of crude protein (CP), neutral detergent fiber (NDF), and acid detergent fiber (ADF) in red clover silage.

In 2003 and 2006 at Prairie du Sac, WI, 'Marathon' red clover was cut 'early' on June 7 or 'late' on June 14, then twice thereafter every ~40 days. For comparison, 'Pioneer 54H91' and 'WL345LH' alfalfa were cut 'early' on May 26, and thrice thereafter every ~32 days; or 'late' on the same schedule as 'early'-cut red clover. Herbage was ensiled at 63% moisture and analyzed via the Cornell Net Carbohydrate and Protein System. The 'early' harvest schedule improved seasonal distribution of yield, favorably decreased fiber components and RUP, and increased CP and RDP in the first two cuttings (Table 1). Overall, desirable RDP (15%) and NDF (40%) levels were obtained by taking a first harvest when buds were just starting to appear, a second harvest when flowers were just starting to appear, and a third harvest when ~1/3 of red clover plants were in bloom.

First-production year yields of red clover and alfalfa were not influenced by harvest schedule. Averaged across harvest schedules and cuttings, red clover and alfalfa had similar NDF, but red clover had lower ADF, CP, and RDP and higher RUP than alfalfa (Table 2). Overall, legume species had greater impact on protein quality than harvest schedule.

Results suggest a first cutting taken at late vegetative stage, followed by regrowth cuttings at later stages may be an effective strategy to produce red clover silage with desirable NDF (40%) and reasonably high RDP (15%) concentrations. Even with early cutting, RDP in red clover was much less than relatively mature alfalfa; so rumen microbial protein synthesis may still be impaired unless RDP supplements are fed with red clover. Before widespread adoption, effects of an earlier harvest schedule on red clover yields and stand persistence must be confirmed in other regions of the country.

**Table 1.** Yield (ton DM/ac) and forage quality (%DM) of 'early'- vs. 'late'-cut red clover silage in its first full production year.

Parameter	Cut 1		Cut 2		Cut 3	
	Early	Late	Early	Late	Early	Late
DM Yield	2.9	3.2	1.5	1.5	1.2	1.0
NDF	38	43	38	42	42	37
ADF	28	31	27	30	28	23
CP	21	18	24	20	22	25
RDP	16	13	17	14	16	18
RUP	4.6	4.8	6.7	5.5	6.1	6.6

**Table 2.** Total yield (ton DM/ac) and season-average forage quality (%DM) of 'early'- vs. 'late'-cut red clover and alfalfa silage in their first full production year at Prairie du Sac, WI.

Parameter	Red Clover		Alfalfa	
	Early	Late	Early	Late
DM Yield	5.6	5.7	5.4	5.5
NDF	39	41	38	44
ADF	28	30	29	34
CP	21	20	24	21
RDP	16	14	21	18
RUP	5.5	5.3	3.2	3.2

