

## **The Long and Short of Alfalfa Cutting Height**

*by Michael Bertram, Marshfield Agricultural Research Station; Nick Schneider, Winnebago County Agricultural Agent; Ron Wiederholt, former Clark County Crops and Soils Agent; and Daniel Wiersma, formerly of Marshfield Agricultural Research Station*

Current recommendations regarding cutting height of alfalfa are designed to maximize yield while maintaining high quality forages and stand longevity. Forage growers frequently cut forages at a height of 3 inches or more. However, reports indicate that there may be an advantage to cutting alfalfa closer, leaving an inch or less of stubble height (@gricuture Online, 1999). This article will discuss the influence of cutting height on yield, quality and persistence of alfalfa.

### **Alfalfa Yield and Cutting Height**

Research indicates that DM yields and nutrient yields are higher for shorter cutting heights as compared to leaving taller stubble (Sheaffer et al., 1988). Obtaining higher yields requires that the plants are healthy and that carbohydrate root reserves are adequate for plant regrowth following harvest.

Early Wisconsin studies using Vernal alfalfa showed that forages harvested three or four times/season produced more total forage when cut at a 1 inch height versus cutting at 3 inches or more (Kust and Smith, 1961, Smith and Nelson, 1967). A tall stubble height was needed to maintain high yields only when cutting frequencies increased to five or six times/season.

North Dakota research, looking at cutting height since the mid-1960s, shows similar results where shorter cutting height leads to higher yields. In a recent North Dakota two-year study using three- or four-cut systems, annual alfalfa yields were reported to be 1.6 tons/ac higher when cut at 1 inch compared to 5 inch heights (@gricuture Online, 1999).

A 1997 study from West Virginia reports that alfalfa cut at 1 or 2 inches yielded as much as 38% more than alfalfa cut at 4 inches (Belesky and Fedders, 1997).

Research at the Marshfield Ag Research Station (MARS) conducted in 1999 demonstrated a reduction of a 1/2 ton of DM/inch as cutting height increased from 2-6 inches above the ground when combined across three harvests for the year (Wiersma, 2000).

Follow-up studies in 2000-2001 evaluated cutting height in mid-May, late-May, early-June, and mid-June. An average yield reduction of 0.13 tons of alfalfa occurred for each inch increase of cutting height during the first harvest. These yield reductions were consistent across the four spring harvest dates.

These studies clearly show that there is a forage yield benefit to cutting at shorter heights when alfalfa plants are not under stress or low in root carbohydrate levels.

### **Alfalfa Quality and Cutting Height**

One reason to leave taller stubble is to improve the quality of the forage harvested. The lowest sections of the alfalfa plant are typically higher in fiber and have fewer high-quality leaves present. If growers raise their cutting height to leave these high fiber basal stem sections in the field, they may increase forage quality. The study at the MARS showed this change in quality was greatest for first harvest alfalfa since the proportion of stems to leaves is highest at this time.

A Nebraska study (Ogden and Kehr, 1968) where the top half of a full bloom alfalfa canopy was separated from the bottom half, indicated that a larger percentage of the digestible nutrients and less fiber was found in the top half versus the bottom half of the plant.

Buxton et al. (1985) showed that the digestibility of stem sections decreased with increasing maturity while leaves did not. The lower stem portions (bottom two thirds) decreased in quality at a faster pace than did the upper portion of the stem. This occurs due to the lower stem sections which have been growing for the longest period of time and tend to be more fibrous and woody compared to the less mature upper-stem sections.

Studies at the MARS and on-farm research in Clark County, Wisconsin, confirmed quality diminishes modestly when alfalfa is harvested closer to the soil surface. Crude protein was reduced by less than 1% of DM when cutting height was increased from 2 inches to 6 inches. Depending on location and year, Relative Feed Value increased from 0.9 to as much as a seven unit/inch increase in cutting height.

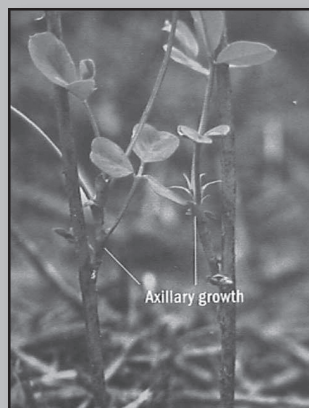
Milk/ac summaries from the previously mentioned locations indicates the most milk/ac is generated at lower cutting heights. The quality improvement obtained by increasing the cutting height is not enough to offset the yield reduction. The amount of quality gain must be weighed against the yield loss due to leaving taller stubble. If growers are harvesting in a timely manner, there should be no reason to forego yield for a slight quality increase due to leaving taller stubble.

One study reported that alfalfa clipped to a 4 inch height had significantly greater weed content than plots clipped to 2 inches or less (Belesky and Fedders, 1997). This weed competition could reduce stem numbers or yield, and may reduce overall forage quality, particularly if the weeds were grasses.

Finally, recent concerns about high mineral potassium (K) levels in high quality alfalfa forages have led to the recommendation that growers reduce cutting height. By harvesting the entire stem, K concentrations are lower due to a dilution effect.

### **Alfalfa Stem Growth and Development**

Alfalfa growth in the spring is primarily from crown buds and depends on temperature and available root energy reserves. Shoot growth after the first harvest originates from both crown and axillary buds. When alfalfa is cut very short (1 inch or less) most of the axillary buds are removed and new shoots must come from the crown buds. In a field study, Wolf and Blaser (1981) reported that stems originating from axillary buds contributed less to the yield of alfalfa than stems originating from crown buds. The total number of stems that develop from either axillary or crown buds is variable, but is dependent on developmental stages at the time of harvest, health of the crown, cutting height, and other environmental factors.



*Photo 1. New stems emerging from axillary buds of alfalfa*



*Photo 2. New stems emerging from crown buds of alfalfa*

In theory, leaving tall stubble and leaves at the base of the plant provides more photosynthetic area and energy for new stem growth following harvest. However, the basal leaves of the plant are of questionable worth (Brown et al., 1966). They may photosynthesize very slowly and shade out the plant base which can prevent new shoot development. Leaving tall stubble appears to be beneficial only if the plant is under stress and does not have root reserves to initiate regrowth of the stem.

New shoot development is initiated when the alfalfa plant reaches the reproductive stage of development. After stem removal, new shoot growth continues and the total number of new stems generated from the crown buds and axillary buds is determined in the first 14 days of the new growth cycle. During this 14 day period, many environmental and management factors may determine the total number of shoots that grow. For example, moisture stress during the first 14 days reduces stem numbers, while lack of moisture after

this period will only reduce stem weight (Brown and Tanner, 1983). Flooding stress during the early regrowth period or lack of sunlight (cloudy weather) can also reduce the number of stems/plant.

### **Stand Longevity and Cutting Height**

When changing alfalfa management practices, growers want to be certain that stand longevity is not jeopardized. Cutting alfalfa shorter can reduce stand life if other stress factors exist. Frequent cutting of alfalfa at very early maturity stages often depletes root carbohydrate reserves. When carbohydrate reserves are low, energy for stem regrowth is low and results in poor plant recovery after harvest.

Cutting height research shows that early plant decline or death does not occur for alfalfa when proper crop management practices are used. When plants are healthy and not under stress, it appears that short cutting heights will not reduce stand longevity.

### **Fall Cutting Height of Alfalfa**

When harvesting alfalfa in the fall, increased cutting heights may be warranted for the purpose of catching snow. Longer stubble catches snow and may help keep the snow cover for a longer period of time. Adequate snow cover can help to protect alfalfa plants from cold temperature extremes or fluctuating late winter temperatures.

Belesky and Fedders (1997) report a higher incidence of root heaving for 1- or 2-inch cutting heights compared to a 4 inch cutting height. However, the total number of crowns remained lower for the 4 inch cutting height at the end of the experiment. For Wisconsin conditions, it appears that leaving a 4 inch or greater stubble height in the late fall may be helpful to prevent root heaving in the spring.

### **Variety Response to Cutting Height**

Many research studies of alfalfa cutting height were conducted in the 1960s. These studies used primarily Vernal alfalfa. Belesky and Fedders (1977) examined cutting height effects on three varieties including a grazing tolerant variety. No significant yield differences occurred among varieties at the various cutting heights. There is little reason to expect differences among varieties due to different cutting heights. Future research should address cutting height effects on modern alfalfa varieties (including fast vs. slow recovery varieties) and quantify the yield, quality and mineral content of forages cut at various heights.

### **Recommendations**

- Cut healthy, non-stressed alfalfa fields at 1 inch heights to achieve maximum DM and nutrient yields.
- In fields where plants are experiencing stress with either moisture or flooding, or where the crop has been cut early and frequently, root carbohydrate reserves may be low and cutting height should be adjusted upward to avoid additional stress or plant death.
- Adjust cutting height to avoid injuring plants, contaminating the forage with soil, or picking up rocks.
- If harvesting forages in the fall, leave a 4 inch or greater stubble to help capture snow.