Alfalfa Fall Harvest Management

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Past recommendations for fall cutting management of alfalfa have suggested a period of 4-6 weeks growth prior to the first killing frost as necessary for alfalfa survival in the Northeast. Research has indicated that this 4-6 week period prior to the killing frost enables the plants to build up carbohydrate reserves to carry them through the winter and provide energy for regrowth in the spring.

Recent research suggest that it is the length of the regrowth period following the third cut, rather than the length of time prior to the killing frost which is critical to alfalfa winter survival and stand life. Research from Pennsylvania has recommended that if a 45-50 day regrowth period from the last harvest occurs, a fall cut can safely be taken within the 4-6 week period prior to the killing frost. Experiments were set up at the University of Massachusetts Research Farm in South Deerfield to test this recommendation under Massachusetts climatic conditions.

The experiments were seeded in August, 1983 with 16 Kg/ha of Saranac AR alfalfa. The plots were managed so that the third harvest, described in (table 1), was taken at first flower to 10% bloom before August 30th. Fall cutting treatments were imposed in 1984, 1985 along with a low (180 lb/acre) and a high (625 lb/acre) rate of potash.

Imposing fall cutting treatments in 1984 did not adversely effect yields in 1985. Total yields were slightly higher in 1985 than in 1984, (table 1). Spring yields in 1986 (table 1) were decreased compared with the previous two years. It is difficult to determine if this reduction in yields was due to fall harvest management or a reduction in the stand due to isolated patches of ice covering the plots and resulting in winterkill of the plants in these areas. Stand counts taken in the fall of 1985 and then again in the spring of 1986 demonstrate a reduction in the number of plants over most of the plots.

TABLE 1. Alfalfa Yields 1984 to Spring 1986 (hay equivalent, ton per acre)

Fall harvest Treatment	1984 Total	1985				1985 Total	1986 First
		First	Second	Third	Fourth		
4 wks after 3rd harvest	6.36	2.79	1.62	1.87	.43	6.71	2.00
6 wks after 3rd harvest	6.51	2.45	1.60	1.82	.82	6.68	1.78
Immediately after killing frost	5.99	2.84	1.88	1.87	1.03	7.42	2.12

To assess how well the plots had over wintered, a visual rating of each plot was taken in the spring of 1986 (table 2). The plots were rated by several individuals to assess the weediness, health of the stand, and vigor of plants. The plots with the least amount of weeds, the healthiest stand and vigor were those plots harvested immediately after the killing frost. Those harvested 4 and 6 weeks following the 3rd cut had more weeds and poorer stands. In addition to the visual rating, plant samples were taken during the first harvest this spring to determine the percentage of weeds present. Sample separations indicated that the percentage of weeds was lower in those plots harvested after the killing frost compared with the other two treatments.

TABLE 2. Visual Rating of Plots for Weed Content, Standability, and Vigor Spring 1986.

Fall Harvest Treatment	Weed*	Stand*	Vigor*
4 wks after 3rd harvest	3.9	3.0	3.0
6 wks after 3rd harvest	3.7	1.9	1.8
Immediately after killing frost	1.9	3.5	3.6

*Ratings -Weed: 1 means less than 10% weeds, 5 means greater than 50% weeds.

-Stand: 1 means sparse stand, 5 means full stand.

-Vigor: 1 means poor growth appearance, 5 means vigorous health appearance.

Potassium fertility, the other treatment imposed along with fall cutting management, has not shown a significant effect on yields. Those plots receiving a low fertility treatment are producing yields similar to or at times even higher than those receiving the high fertility treatment. Plant tissues collected and analyzed for potassium content indicate that their is adequate potassium (K) available to the plants, (table 3). The potassium content in the plants at both fertility levels was well above the critical level of K needed for plant growth. It appears that there is sufficient potassium available in the soil so that fertility treatments have had no effect on yields or potassium content in the plant. Fertility treatments in 1986 have been cut back in effort to deplete the available soil potassium. The low fertility treatments have been dropped completely so that half of the plots receive no potash fertilizer, and the high treatments have been cut in half (from 625 lb/A to 313 lb/A).

TABLE 3. Potassium Concentration in Alfalfa Plants (Whole tops sampled at 10% bloom)

Fertilizer Treatments	%K in Plant*
180 lb K_2O/Acre	3.57
625 lb K_2O/Acre	3.90

*Critical K concentration for alfalfa is considered to be between 1.7% to 2.0% in the plant.

One additional measurement of alfalfa health and vigor is carbohydrate levels in the plant. It is important that the plants be cut when carbohydrate levels are high so as to insure stored energy for regrowth after cutting. Also the alfalfa plants should enter the winter with adequate levels of carbohydrates to sustain the plants through the dormant period and provide energy for regrowth in the spring. The old recommendation of not cutting alfalfa 4 to 6 weeks before the killing frost was based on the assumption that cutting during this time would deplete the carbohydrate reserves as plants entered winter and so make them more susceptible to winterkill. Preliminary data indicated that at least during the first year of fall cutting treatments, carbohydrate levels were high in the fall prior to the killing frost (Fig. 1). The plots harvested 4 weeks after the third cut exhibited a decline in carbohydrates following the harvest but had enough time to regrow, and through photosynthesis restore the carbohydrates before the killing frost.

Currently, the plots are still being managed as a four cut system with and without potassium fertility. Growth analysis samples are being taken to assess the relative growth rates and vigor of the plants. A third treatment to assess the effect of insect and disease on stand persistance under a four cut system has been imposed this spring. Roots have been sampled and rated for clover root (Sitona hispidulus) damage curculio and Fusarium crown and root rot.

Figure 1.