Effects of Harvest Management on Dry Matter and Crude Protein Yields of *Medicago Sativa* L.

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Introduction

Medicago sativa L. commonly called alfalfa, is probably the world's most important forage (hay) crop with the largest production in the United States, Argentina and Canada. Without alfalfa, it is doubtful if the dairy industry in these countries would have been as successful as it has been.

Alfalfa may be productive up to 15 or more years if judiciously managed, but indiscrete management may wipe out an otherwise promising crop. This experiment was conducted to determine the effects of cutting frequency on alfalfa DM and CP yields, and longevity of stand.

Materials and Methods

The experiment was conducted on a Chalmers silty clay loan (Typic Haploquall, fine-silty, mixed, mesic) soil located on the Purdue University Agronomy farm. The alfalfa cultivar used was Apollo which was seeded at the rate of 11.21 kg/ha on April 16, 1976, using a Brillion seeder. The experimental design was a randomized complete block with six replications, each with eight treatments. Individual plots measured 6.10m x 1.83m. Fertilizer application was made annually in two split doses at the rates of 112 kg/ha P_2O_5 and 336 kg/ha K_2O. There were two harvest dates: an early cut initially harvested on May 11, and a late cut, initially harvested on June 1. The interval between cuts were 4, 5, 6 or 7 weeks giving annual harvests of 6, 5, 4, and 4 respectively. All plots were harvested with a Carter Harvester. Samples were dried using hot air ovens at 70°C for 5 days before being ground for laboratory analysis. Total N concentration was determined by the Kjeldahl procedure outlined in AOAC (1).

Results and Discussion

Dry matter and crude protein yields for the three years are presented in Table 1. Dry matter yields showed significant differences (P 0.01) between early and late hay harvests in all three years of the experiment. There were also significant differences among intervals between cuts. Testing for interaction between cutting dates and intervals between cuts indicated a significantly higher yield at the 6-week cutting interval in 1978 and 1979. These results indicate that the dry matter yield of alfalfa depends on maturity as well as on the interval between harvests. Harvests based on fixed calendar dates seem unrealistic as they do not consider the physiological stage of development of the plant. Moreover, they totally disregard the fact that plant maturity on a certain date may vary among years, locations and cultivars, Smith (8). The high hay yields obtained in this experiment from the late cuts resulted from the 3-week gap between the early and late cuts, enabling the late cuts to accumulate higher DM than the early cuts. These results are consistent with the findings of Bishop and Gramshaw (2), Pacuta (4), Ral *et al.* (5), and Schmid *et al.* (7). Apparently, the early 4-week harvests sufficiently weakened the alfalfa plants resulting in a markedly reduced yield in 1980.

The CP yields showed significant differences particularly in 1980; in 1978 and 1979, only the date by frequency interaction showed a significant difference. The trends

TABLE 1. *Comparative CP and DM Yields (kg/ha).*

CP/DM: Cut	Weeks between cuts 4	5	6	7
	1978			
CP: Early Cut	2162	2247	1989	2171
CP: Late Cut	2050	2071	2551	2244
DM: Early Cut	11062	12114	10470	11549
DM: Late Cut	10838	11184	13027	12971
	1979			
CP: Early Cut	2431	2475	2153	2352
CP: Late Cut	2392	2168	2354	2370
DM: Early Cut	12540	12995	11881	13193
DM: Late Cut	13437	12141	14154	14367
	1980*			
CP: Early Cut	546	798	832	912
CP: Late Cut	746	837	838	887
DM: Early Cut	3142	4525	4725	5226
DM: Late Cut	4396	4928	4925	5102

* 1 harvest only—all treatments cut same day in 1980.

in 1978 and 1979 were similar and indicated that at 4 and 5 weeks between harvests, the early cut had a higher CP yield, but at the 6 and 7 weeks between cuts, the trend was reversed. The CP of the first cut was lower than that of the second cut at the 5 week harvests and agrees with the finding of Schmid *et al.* (7).

The probable reason for a reversal in trend after the 5-week intervals between cuts was that generally CP accumulation did not vary much, whereas DM yield varied greatly among treatments. The early cuts generally had a higher CP concentration and lower DM yields while the late cuts had somewhat lower CP concentrations but high DM yields. Since the CP yield is a product of the DM yield and CP concentration, the expected trends occurred.

The data of this experiment indicate that the livestock producer can produce the quality of alfalfa forage desired by altering the cutting interval. A short cutting interval results in higher CP concentration and reduced DM yield while a longer cutting interval results in lower CP concentration and higher DM yields.

Thus, farmers with beef cow herds would harvest their hay at long intervals whereas dairy farmers whose animals require high quality alfalfa hay and silage, in terms of CP, would harvest at shorter intervals. It must be stressed, however, that too short a cutting interval is detrimental to alfalfa persistence. Farmers faced with this problem may want to apply the findings of Ossom *et al.* (3) which suggested that number of stems rather than number of crowns per unit area may be a better indicator of stand vigor and persistence.

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