EFFECT OF DEFOLIATION FREQUENCY ON GROWTH OF IMPROVED PASTURE IN WESTERN OREGON

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A primary objective of pasture management is to maximize the production of protein and other digestible nutrients for grazing animals without deterioration of pasture condition. To reach this goal, pasture plants must be managed to use the available resources efficiently.

One of the basic resources which supports plant life is energy from the sun. Plants use their leaves and, to some extent, green stems to capture solar energy which is converted into carbohydrates for plant growth. Agriculturalists generally measure the amount of leaf area that a plant possesses relative to the soil surface under the plant. This measure, called Leaf Area Index (LAI), roughly corresponds to the number of leaves which a ray of sunlight must pass through to reach the soil surface.

In general, as the LAI of a pasture increases, its growth rate also increases until there is enough leaf area to capture all the incoming solar energy. The LAI at which greater than 95% of the usable solar radiation is absorbed is called the "optimum LAI." Optimum LAI for pastures in temperate areas during the spring-summer is believed to be about 4.5 to 5. Grazing, mowing, or other forms of defoliation often reduce LAI and, therefore, plant growth.

The objective of this study is to document the effects of frequency of defoliation on pasture yield and species composition. It is hoped that this information will aid in devising systems of pasture management which will minimize any detrimental impacts of grazing on plant growth rate.

EXPERIMENTAL PROCEDURE

The study was conducted on a typical perennial ryegrass (Lolium perenne L.) - subterranean clover (Trifolium subterraneum L.) hill pasture in western Oregon. The pasture is about one mile northwest of Corvallis. Elevation is 333 feet above sea level. Average annual precipitation is 40 inches. Canopy cover in the early spring of 1980 was 60 percent ryegrass, 20 percent subclover, 10 percent tall fescue, 5 percent annual grasses and forbs, and 5 percent other perennial grasses.

Four defoliation frequencies (mowed every 1, 3, 5, or 7 weeks) and three defoliation intensities (1.6, 2.2, or 2.8 inches stubble height after defoliation) were applied in 1980 and 1981. Study plots were 44.5 foot^2 in area. A rear-bagging rotary lawn mower was used to harvest forage from appropriate plots. The contents of the mower bag were weighed and a grab sample obtained for dry-matter determination.

A .89-foot^2 quadrat was hand clipped from each plot before each mowing. This material was separated into two components--grass and clover. Leaf Area Index was determined for each treatment by feeding these samples through an electronic planimeter. Data from the 1980 and 1981 growing seasons were analyzed as a factorial arrangement of treatments in a randomized complete block design with three replications. Information on defoliation frequency presented here was calculated by averaging the three defoliation heights.

RESULTS AND DISCUSSION

All the defoliation treatments applied reduced competition for light between ryegrass and subclover. As a result, canopy cover of subclover increased from 20 percent in 1980 to 50 percent in 1981 in all treated plots. During this same period, the canopy cover of clover in the unmowed control plots was reduced to almost zero; cover of annual grasses increased to 30 percent. These observations point out the importance of timely defoliation in maintaining clover in grass-clover pastures.

Increased forage production requires increased utilization of solar energy, other environmental factors being favorable. The higher LAI of less frequently mowed plots allowed a greater utilization of incident sunlight. As a result, total dry matter production increased as the interval between defoliations increased during both 1980 and 1981 (Table 1). Plants which were frequently mowed reacted by becoming leafier and more prostrate. This tendency, which can be seen in their lower leaf area to dry weight ratio, may have implications for forage quality. Since leaves are frequently more digestible than stems, leafiness is often a good indicator of forage quality.

Table 1. Average dry matter yield (lbs/acre), Leaf Area Index (LAI and Leaf Area/dry weight ratio (LA/dry wt) of plots under different defoliation treatments

Defoliation Intervals (week)	Components			
	Yield 1980	Yield 1981	1981 LAI	1981 LA/dry weight
1	5658.19[a1]	4576.66[a]	.52[a]	225[a]
3	5843.54[b]	5775.91[b]	2.57[b]	212[b]
5	7216.77[c]	6126.98[c]	3.77[c]	138[c]
7	9466.52[d]	9239.91[d]	7.60[d]	134[d]

1 Means within a column not sharing a common letter differ ($P<.05$).

CONCLUSIONS

These data suggest that pasture production may be increased by increasing the period of non-use between defoliations. This is an especially useful concept in intensive management systems such as rotational grazing where pastures are intensively grazed for short periods, then allowed to recover. Although a seven-week recovery period produced the most forage on this trial, LAI reached levels well above optimum. Optimum Leaf Area Index (presumably highest pasture growth rate) was reached at about six weeks after defoliation. It is recommended, therefore, that intensively grazed pastures in western Oregon be allowed a six-week recovery period before being grazed again to maximize forage production.