Quantitative Effects of Clipping Treatments on Five Range Grasses

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Maximum sustained yield is the primary objective of management on forage producing areas but much remains to be learned before this objective can be attained. Valuable information has been produced by clipping to simulate grazing. Most clipping studies have measured yields from plots or bunches of grass—in the study reported below an attempt was made to determine the responses of different treatments.

Review of Literature

Several workers (Canfield, 1939; Weaver and Hougen, 1939; Stoddart, 1946; Whitman and Helgeson, 1946; Baker, Arthaud, Conard and Newell, 1947; Blaisdell and Pechanec, 1949; Kennedy, 1950; Sampson and Malmsten, 1926; Holscher, 1945; Thaine and Hendricks, 1951; and Albertson, *et al.*, 1953) have found that with an increase in frequency and amount of tissue removed by clipping there is a decrease in grass production. Most of the above studies were of mid and tall grasses. The responses of some short grasses and mid grasses have been somewhat different. Canfield (1939) found that clipping black grama resulted in decreased production each year for the 10-year study. This was true even of the least intensive clipping treatment which was removal of foliage to two inches at the end of the growing season. The most productive treatment for tobosa grass was to clip it to two inches at the end of the growing season or weekly to four inches in height. Lang and Barnes (1942) found that although mid grasses decreased in yield under frequent clipping, the frequently clipped short grasses produced considerably more forage than plots clipped at the end of the grazing season during the two years of study. Newell and Keim (1947) found that of eight grasses only buffalograss gave a higher yield during 5 years of study under frequent clipping.

There is relatively little information in the literature on the effects of clipping on tillering in perennial grasses. Probably the most basic study is that by Leopold (1949) who concluded that tillering is strongly influenced by auxin diffusing from the apical meristem and that removal of the apical meristem results in tiller formation in teosinte and barley. Similar stimulation of axillary buds of crested wheatgrass has been reported (Cook and Stoddart, 1953). Carter and Law (1948) found marked differences in abilities of six perennial grasses to tiller when subjected to three clipping intensities. Tall fescue and crested wheatgrass produced more tillers when

Table 1. Numbers of live culms in sods of 5 grasses subjected to different clipping treatments. Data are averages of 3 plots.

Species and frequency of clipping	Date Observed		
	1-3-54	*2-14-54*	*2-24-54*
Western wheatgrass			
1 inch at 2-week intervals	28	33	33
1 inch at 4-week intervals	28	38	42
At end of 14 weeks	28	45	52
Bluebunch wheatgrass			
1 inch at 2-week intervals	135	96	94
1 inch at 4-week intervals	135	87	93
At end of 14 weeks	135	102	110
Needle-and-thread			
1 inch at 2-week intervals	54	71	63
At end of 14 weeks	56	72	96
Kentucky bluegrass			
½ inch at 2-week intervals	132	166	*
At end of 14 weeks	132	200	*
Blue grama	*2-10-54*	*2-24-54*	*3-9-54*
½ inch at 2-week intervals	72	76	75
At end of 16 weeks	72	88	128

*No counts made of this species on this date.

clipped five times at 30-day intervals than did the controls, beardless bluebunch wheatgrass and smooth brome produced fewer culms when clipped than did controls.

Some relationships of apical meristem heights of grasses to resistance to grazing have been reported (Branson, 1953). In general, grasses with elevated vegetative apical meristems appear to be less resistant to grazing.

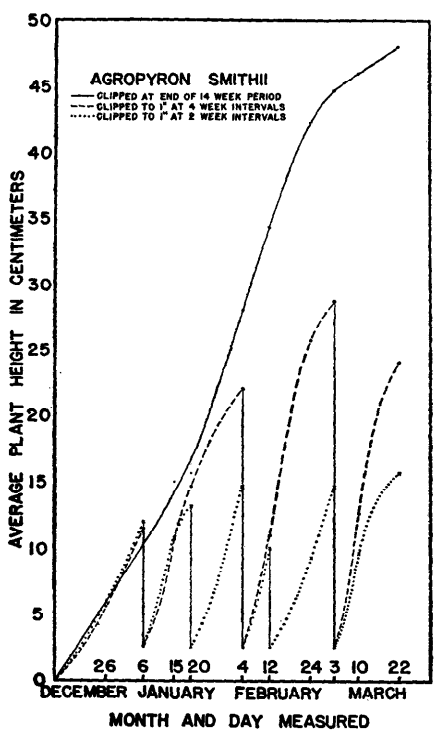

FIGURE 1. Average maximum leaf heights of western wheatgrass plants subjected to three clipping intensities.

Methods

Grasses studied were: western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), needle-and-thread (*Stipa comata*), Kentucky bluegrass (*Poa pratensis*), and blue grama (*Bouteloua gracilis*). Sods were removed from nearly pure stands, trimmed to equal size, then placed in boxes filled with soil. The boxes were 10 x 10 inches and 30 inches deep and had one removable side. All sods were trimmed to 6 x 6 x 4 inches except blue grama which was trimmed to 6 x 6 x 3 inches. Old and new top growth on each sod was removed when the boxes were placed in the greenhouse. Daylight was supplemented with fluorescent lights to give 16 hours of light. A day temperature of from 60 to 69° F. and a night temperature of 50 to 56° F. was maintained.

Measurements were made of maximum leaf heights and growing point heights at approximately 10-day intervals. Tiller numbers were made uniform for all sods of each species to reduce the variability. Tiller numbers were determined for all sods during and at the end of the growth period. The two wheatgrasses were clipped at three intensities: three sods were clipped to one inch at two-week intervals, another set to the same height at four-week intervals, and a third set of three pots was clipped at the end of 14 weeks. Needle-and-thread, Kentucky bluegrass and blue grama were clipped to one-half inch at two-week intervals and at the end of 14 weeks. Weights of herbage and roots were determined at the end of 14 weeks.

Results and Discussion

The effects of the clipping treatments on maximum leaf heights are clearly shown in Figure 1. Recovery from the most severe clipping treatment was much slower than for the intermediate intensity. The growth of unclipped plants followed the usual plant growth curve. The cumulative height growth was greatest in plants clipped at four-week intervals and least in the plants clipped at the end of 14 weeks. Cumulative height growth for the three treatments was 48.0 centimeters for plants clipped at the end of 14 weeks, 80.3 for those clipped every two weeks, and 86.2 for those clipped at four-week intervals. However, total weights of tops

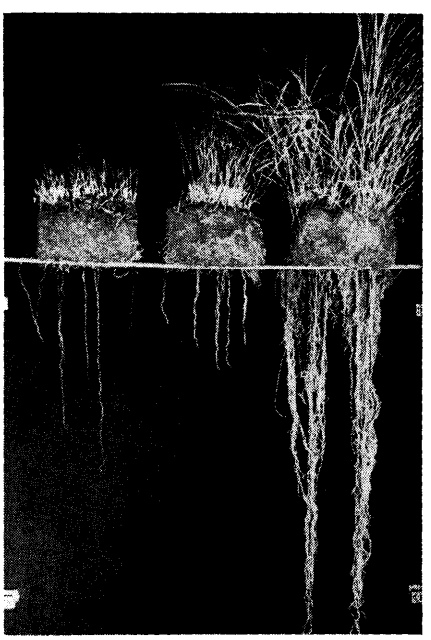

FIGURE 2. Tops and roots of bluebunch wheatgrass plants subjected to three clipping treatments.

Table 2. Total yields of tops and roots of five species of grasses subjected to different clipping treatments. Data are averages of three plots.

Clipping frequency	Western wheatgrass	Bluebunch wheatgrass	Needle-and-thread	Kentucky bluegrass	Blue grama
			Top weights (gms.)		
2-week intervals	15.8	31.1	19.7	12.7	12.2
4-week intervals	30.5	38.3	*	*	*
At end of 14 weeks	73.5	84.3	163.1	91.6	33.0
			Root weights (gms.)		
2-week intervals	1.1	.7	12.5	.5	.8
4-week intervals	3.4	.7	*	*	*
At end of 14 weeks	75.0	75.0	105.2	33.7	26.2

*These plants received only the two clipping intensities indicated.

were directly related to intensity of clipping (Table 2).

The numbers of live culms, for all species except bluebunch wheatgrass, increased during the experiment (Table 1). There was no apparent reason for the decrease in culms of bluebunch wheatgrass when counted on February 14. Possibly the decrease in culm numbers represents the normal growth habit of this species. New basal tillers were apparent in the unclipped bluebunch wheatgrass plants at the end of 10 weeks. In general, the final number of live culms was greatest in plants receiving the least intensive clipping treatments. In none of the plants studied was there any evidence that clipping stimulated tiller development. These results are contrary to those reported by Leopold (1949). It is possible that the clipping intensities were too severe to permit stimulation of tiller development.

The yields of tops and roots of all species decreased as the clipping intensity increased (Table 2). The clipping treatments had a more marked effect on root production than on shoots. In bluebunch wheatgrass the root production of the control plants was over 100 times as great as that of the clipped plants but the yields of tops were only slightly more than twice as great. These relationships can be seen in Figure 2. The data suggest that the effects of heavy grazing would be exhibited by plant roots before they are apparent above ground.

In the five grasses the growing points (apical meristems of only two species, western wheatgrass and bluebunch wheatgrass, reached a height that would permit their removal by grazing animals (Table 3). Growing point measurements were of unclipped plants reserved for dissection. If growing point height above the height that permits removal by grazing animals determined resistance to grazing, these two species would be expected to be the least resistant.

Summary

Root and shoot production was studied in five western range grasses subjected to three clipping intensities. Growth of both roots and shoots was inversely proportional to the intensity of clipping. However, root production was more detrimentally affected than top production. In all species the numbers of culms were greatest under the least severe of the clipping treatments.

In the five species, the growing points (apical meristems) of only two species, western wheatgrass and bluebunch wheatgrass, reached a height that would permit their removal by grazing.

Table 3. Growing-point heights of five grass species. All heights were measured in millimeters from point of origin on large or tallest shoots.

Species	Date Observed 12-26-53	1-15-54	2-5-54	2-16-54	3-3-54	3-10-54	3-22-54	4-9-54
Western wheatgrass	0	0	10	70	130	130	230	260
Bluebunch wheatgrass	0	0	135	150	.....	250	390	390
Blue grama	0	0	0	0	0	4	4	4
Kentucky bluegrass	0	0	0	0	0	0	0	0
Needle-and-thread	0	0	0	0	0	0	0	0

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