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# HERBAGE YIELD AND INTAKE OF GRAZING STEERS

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A study was conducted at the Squaw Butte Experimental Range in southeastern Oregon during the springs of 1970 and 1971 to determine the influence of early-growth crested wheatgrass (Agropyron desertorum) production on the relative intake of grazing steers. Stocking rate on the study area was selected to control the effect of direct competition among animals for the available herbage, following the model of Petersen, Lucas, and Mott (1965). Trials 1 to 8 were conducted in 1970 and trials 9 to 12 in 1971. Each trial consisted of either a three or four day collection period (table 1).

In both years, mature herbage from previous year's growth was made less available to the grazing animals by either rotobeating or mowing in early April. Herbage yield was measured during each trial by clipping 0.9 $m^2$ plots.

In both 1970 and 1971, eight yearling steers averaging 275 kg were selected for the study. All animals were accustomed to the fecal collection harnesses and bags prior to grazing trials. Total fecal production during each trial was used as an index of relative intake, assuming that dry matter digestibility (DMD) of early-growth herbage remained constant with advance in season. Yield samples were considered to be representative of the diet and provision was made to test the validity of the assumption concerning constant DMD. In 1971, estimates of the diet were also obtained using esophageally fistulated steers. Dry matter digestibility of both clipped and dietary samples was estimated using a modification of the Tilley and Terry (1963) in vitro method (Handl, 1972).

All samples were dried in a forced air oven at 50°C, ground to pass a 20-mesh screen in a Wiley mill and stored in air-tight glass jars. Representative dietary samples were composited over days and animals for each trial. Herbage and dietary samples were analyzed for Kjeldahl nitrogen. All values were expressed on a dry matter basis. Statistical analysis of fecal production data was by analysis of variance of a completely randomized design with unequal observations per trial. Least significant differences (LSD) were used to compare trial means.

## Results and Discussion

### Herbage Yield and Fecal Production

Herbage yields on the study area during trials in 1970 and 1971 are shown in table 1. Fecal production among trials 1, 2, 4, and 5 was not different

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(P > 0.10) (table 1). The higher fecal production during trial 3 was partially attributed to an abrupt change in weather conditions prior to the initiation of the trial. No change in fecal production would have been expected since herbage production increased by only 5 kg/ha from trial 2 to trial 3.

Table 1. TRIAL DATES, FECAL PRODUCTION (kg), DRY MATTER DIGESTIBILITY (DMD) (%), AND DRY MATTER INTAKE (DMI) (kg), AT VARIOUS HERBAGE AVAILABILITY LEVELS (kg/ha).

| Trial no 1/ | Dates | Herb prod | Fecal prod 2/ | DMD 2/ | | DMI 2/ | |
|---|---|---|---|---|---|---|---|
| | | | | Clip | Diet | Clip | Diet |
| | 1970 | | | | | | |
| 1 | Apr 28-30 | 135 | $2.3^{a}$ | $68^{b}$ | | $7.1^{a}$ | |
| 2 | May 4-7 | 162 | $2.3^{a}$ | $65^{a}$ | | $6.6^{a}$ | |
| 3 | May 11-14 | 167 | $2.9^{b}$ | $65^{a}$ | | $8.4^{b}$ | |
| 4 | May 18-21 | 195 | $2.5^{a}$ | $64^{a}$ | | $7.0^{a}$ | |
| 5 | May 25-28 | 262 | $2.5^{a}$ | $64^{a}$ | | $7.0^{a}$ | |
| 6 | June 6-8 | 208 | $2.9^{b}$ | $60^{a}$ | | $7.2^{b}$ | |
| 7 | June 11-13 | 134 | $3.2^{c}$ | $58^{a}$ | | $7.6^{b}$ | |
| 8 | June 16-18 | 82 | $2.3^{a}$ | $57^{a}$ | | $5.3^{a}$ | |
| | 1971 | | | | | | |
| $9^{d}$ | Apr 14-17 | 49 | $2.6^{a}$ | $55^{a}$ | $51^{a}$ | $5.8^{a}$ | $5.4^{a}$ |
| $10^{d}$ | Apr 27-30 | 92 | $2.6^{a}$ | $62^{b}$ | $55^{a}$ | $6.8^{b}$ | $5.8^{a}$ |
| 11 | May 13-17 | 176 | $2.4^{a}$ | $66^{c}$ | $66^{b}$ | $7.2^{b}$ | $7.2^{b}$ |
| $12^{d}$ | June 5-8 | 372 | $2.4^{a}$ | $62^{b}$ | $66^{b}$ | $6.2^{ab}$ | $7.0^{b}$ |

1/ A 'd' indicates significant difference ($P < 0.01$) in DMI estimated from clipped and dietary samples.

2/ Groups of numbers within a column were analyzed separately. Means within groups and columns followed by the same letter are not different at the 10% probability level.

Analysis of the data at the completion of the first four trials in 1970 showed no differences ($P > 0.10$) in fecal production among those trials. Because no differences were detected, it was surmised that the critical level of herbage production limiting herbage intake was less than 135 kg/ha. Following trial 5, stocking rate was increased from 0.56 steer/ha in trials 1 to 5 to 2.50 steers/ha in trials 6 to 8 by fencing off four ha. Herbage yield during these three trials was reduced from 208 to 82 kg/ha over a 13 day period. Data from these trials were analyzed separately from trials 1 to 5 because of changes in pasture conditions. Fecal production was significantly different ($P < 0.10$) among trials 6 through 8 (table 1). No explanation is given for the higher fecal production during trial 7 than trial 6. Lower fecal production during trial 8 than either trials 6 or 7, indicated that dry matter intake (DMI) was probably limited at the 82 kg/ha level of herbage availability.

Fecal production among trials 9 to 12 was not different ($P > 0.10$) (table 1). Assuming DMD remained constant during all trials in 1971, DMI would not have increased when herbage production increased from 49 to 372 kg/ha.

Digestibility and Intake

Estimates of the influence of advance in season on DMD were determined by linear or quadratic response curves. The quadratic variable was significantly different ($P < 0.10$) from zero for only the clipped sample in 1971. Differences in DMD among trials were tested by an LSD, using the standard error of the regression as an estimate of variance.

Dry matter digestibility was not different among trials 2 to 5, but DMD of the available herbage during trial 1 was significantly higher ($P < 0.10$) (table 1). No change was detected in the DMD values of the available herbage from early to mid-June (trials 6 to 8). A significant ($P < 0.10$) increase in DMD of both dietary and clipped samples was noted in 1971 (table 1).

Because estimated DMD did not remain constant with advance in season, quantified estimates of DMI were calculated using the fecal production-indigestibility ratio. Dry matter intake values shown in table 1 are means of the observations within each trial. Analysis of variance was used to calculate experimental error and means were compared with an LSD test. A paired "t" test was used to compare DMI estimated from the DMD of clipped and dietary samples.

Except for the third trial in 1970, DMI among trials 1 to 5 was not different ($P > 0.10$) (table 1). Higher intake during trial 3 was partially attributed to weather conditions prior to the trial. Dry matter intake was not limited when herbage production equaled or exceeded 135 kg/ha in trials 1 to 5. Estimated DMI during trial 8 was significantly lower ($P < 0.10$) than trials 6 or 7 (table 1). DMI was not limited at the 134 or 208 kg/ha herbage availability levels during trials 6 to 8.

In 1971, DMI estimated from DMD of clipped samples was significantly higher ($P < 0.10$) than DMI estimated from DMD of dietary samples in both trials 9 and 10 (table 1). Estimated DMI, using DMD from clipped and dietary samples was equal during trial 11. But, during trial 12, DMI estimated from DMD of the dietary sample was significantly higher ($P < 0.10$) than DMI estimated from DMD of the clipped sample. Even though the area was mowed in 1971, mature herbage was available to grazing steers during trials 9 and 10. During these trials, steers may have consumed more mature herbage than was included in the samples of available herbage. This would account for the lower estimate of DMD in dietary samples. Sample preparation and leaching of soluble carbohydrates from dietary samples may have also influenced estimates of DMD (Hoehne, Clanton, and Streeter, 1967). Dry matter digestibility estimated from the dietary sample during trial 12 was higher than DMD estimated from the available herbage. Also, protein concentration in the diet was five percentage units higher than in the available herbage (15% vs 10%). This indicated that structural features of the plant influenced selectivity of the diet during trial 12. Dry matter intake estimated from DMD of clipped or dietary samples showed that DMI was not limited when herbage production equaled or exceeded 92 kg/ha or 176 kg/ha, respectively.

## Summary and Conclusions

Total fecal collections were made from yearling steers grazing a crested wheatgrass range to relate fecal production to relative dry matter intake at varying levels of herbage availability. Herbage production during each trial period was estimated by clipping 0.9 $m^2$ plots. Composite samples from these plots were considered to be representative of the diet. It was assumed that dry matter digestibility of the available herbage remained constant with advance in spring season. To check the validity of this assumption, in vitro plus pepsin digestion was used to estimate DMD. Dietary samples were collected from esophageally fistulated steers during the second year to consider the influence of selectivity on estimated DMD. Because DMD did not remain constant with advance in season, quantified estimates of DMI were calculated using the fecal production-indigestibility ratio. In 1970, DMI was not limited when herbage availability equaled or exceeded 135 kg/ha. In 1971, results showed that DMI was not limited at herbage production levels equal to or greater than 92 kg/ha or 176 kg/ha using estimates of DMD from clipped or dietary samples, respectively.

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