FORAGE AVAILABILITY AFFECTS WHEAT FORAGE INTAKE BY STOCKER CATTLE[1]

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Story in Brief

Forage intake was estimated while beef steers grazed paddocks with varied levels of standing wheat forage. Standing crop of forage varied from 673 to 1297 lb dry matter/acre at the start of the trial. Herbage allowance varied from 4.7 to 36.2 lb/100 lb body weight/day for the seven-day trial period. Fecal output, forage intake and digestible organic matter intake responded in quadratic manner to standing crop level. Estimated peak fecal output, forage intake, and digestible organic matter intake occured at 966, 975 and 1113 lb forage dry matter/acre. Forage intake, and digestible organic matter intake increased with herbage allowance. The highest intakes were noted for herbage allowances in excess of 14.3 lb forage dry matter/100 lb body weight/day. Fecal output was relatively constant at the three higher herbage allowances; therefore the high forage intakes with the higher herbage allowances were primarily a function of forage digestibility. These preliminary observations suggest that nutrient intake will be depressed at standing crops less than 1000-1100 lb forage dry matter/acre while herbage allowances less than 15 lb forage dry matter/100 lb body weight/day appear to severely depress intake.

(Key Words: Cattle, Grazing, Intake, Forage Availability.)

Introduction

A frequent problem encountered by stocker cattle grazing wheat pasture is a lack of forage in the winter. However, little is known about the impact of forage availability on daily nutrient intake. A better understanding

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of the impact of limited forage availability on forage intake would aid in developing supplemental feeding programs to economically maintain a desirable level of gain.

The objective of this study was to develop relationships among wheat forage availability and daily intake of nutrients by stocker cattle. Data from the first of two trials is presented in this report.

Materials and Methods

In early February, 1991, a 14.5 acre wheat pasture was subdivided into eight 1 acre paddocks, a 2 acre paddock and a 4.4 acre paddock. The entire area had been grazed as one unit prior to subdivision. After subdivision, each unit was grazed further to reduce the amount of forage and provide an array of standing crops. The two larger paddocks allowed for observations at forage standing crops (lb dry matter/acre) similar to the smaller paddocks but with herbage allowances (lb forage dry matter/100 lb body weight/day) in excess of the allowances on the smaller paddocks. Forage standing crop in each paddock was determined at the initiation of te.. grazing by clipping forage to ground level inside a .25m^2 semi-circular frame at ten locations along paced transects.

Thirty beef steers (average body weight= 690 lb) were randomly allocated by weight into 10 groups of three head. Each group was then randomly assigned to a paddock. All steers had been grazing on this area prior to the trial. The steers grazed the trial paddocks for a total of 7 days.

Forage intake was determined using the ratio of fecal output to diet indigestibility. Fecal output was estimated using chromic oxide which was administered in a gelatin capsule twice daily throughout the trial period. Fecal samples were collected twice daily from each steer on four consecutive days following 6 days of marker administration. Dosing and fecal sampling required less than 10 minutes interruption of steer activities in the morning and evening.

Masticate samples were collected from each paddock two times during the 4-day fecal collection period. Three esophageally fistulated steers that were grazing an adjacent pasture were used for sampling.

All analyses were expressed on an ash-free basis. Masticate samples were analyzed for crude protein and in vitro digestibility. Fecal samples were analyzed for Cr content.

Regression analyses were conducted using GLM procedures. Paddocks were experimental units. Models contained forage standing crop (lb DM/ac) and herbage allowance (lb DM/100 lb BW/day) as independent variables. Regression relationships for standing crop used observations from the 8 one acre paddocks. Herbage allowance relationships used data from all 10 paddocks. In all figures, the solid black data points represent data from the eight 1 acre paddocks while the open boxes represent the two larger paddocks.

Results and Discussion

Fecal output responded in a quadratic fashion to standing crop (Figure 1a; Fecal output, %BW=.0028X - .000001X^2 - .0028; r^2=.77, $s_{y\cdot x}$=.0380, P<.025) with fecal output being relatively similar at the lowest and highest standing crops. Further analysis estimated that peak fecal output would have occurred at a standing crop of 966 lb dry matter/acre. The decline at the lowest standing crop suggests that forage availability limited intake. It is interesting to note the general pattern of decline at standing crops in excess of 1000 lb dry matter/acre. This decline may be explained by diet quality and/or selective grazing which possibly depressed intake and fecal output. The steers grazing the larger paddocks (open boxes) maintained higher fecal outputs than steers grazing on the small paddocks with similar standing crops.

The relationship between masticate digestibility and standing crop (r^2=.41, P<.19) is presented in figure 1b. The distribution of points demonstrates the interaction of forage availability and herbage allowance. Note the higher digestibilities of diets from the two larger paddocks in relation to the small paddocks with similar forage standing crops (see standing crops around 1050 and 1200 lb dry matter/acre). This indicates that the higher herbage allowances in the large paddocks allowed for more selective grazing and hence higher diet digestibilities.

Forage intake response to varied standing crops resembled the fecal output responses (Figure 2a; Forage intake, %BW = 0.0117X - .000006X^2 - 3.5143; r^2=.77, $s_{y\cdot x}$=.1544, P<.03). Estimated peak forage intake would have occurred at 975 lb dry matter/acre. The decline in intake at higher standing crops (1200-1350 lb dry matter/acre) is not readily explained but is possibly due to highly selective grazing for green leaf material. These pastures had been subjected to very severe freezing temperatures without protection by snow or ice prior to the trial. As a result, there was a mixture of green and browned forage due to the freezing and desication.

The combined effect of higher fecal output and diet digestibility increased intake on the large paddocks (Figure 2a). This is best illustrated in figure 2b where intake is related to herbage allowance (r^2=.61; P<.04). Based on the limited data available from this study, intake was similar at the two high herbage allowances and were not different from other allowances

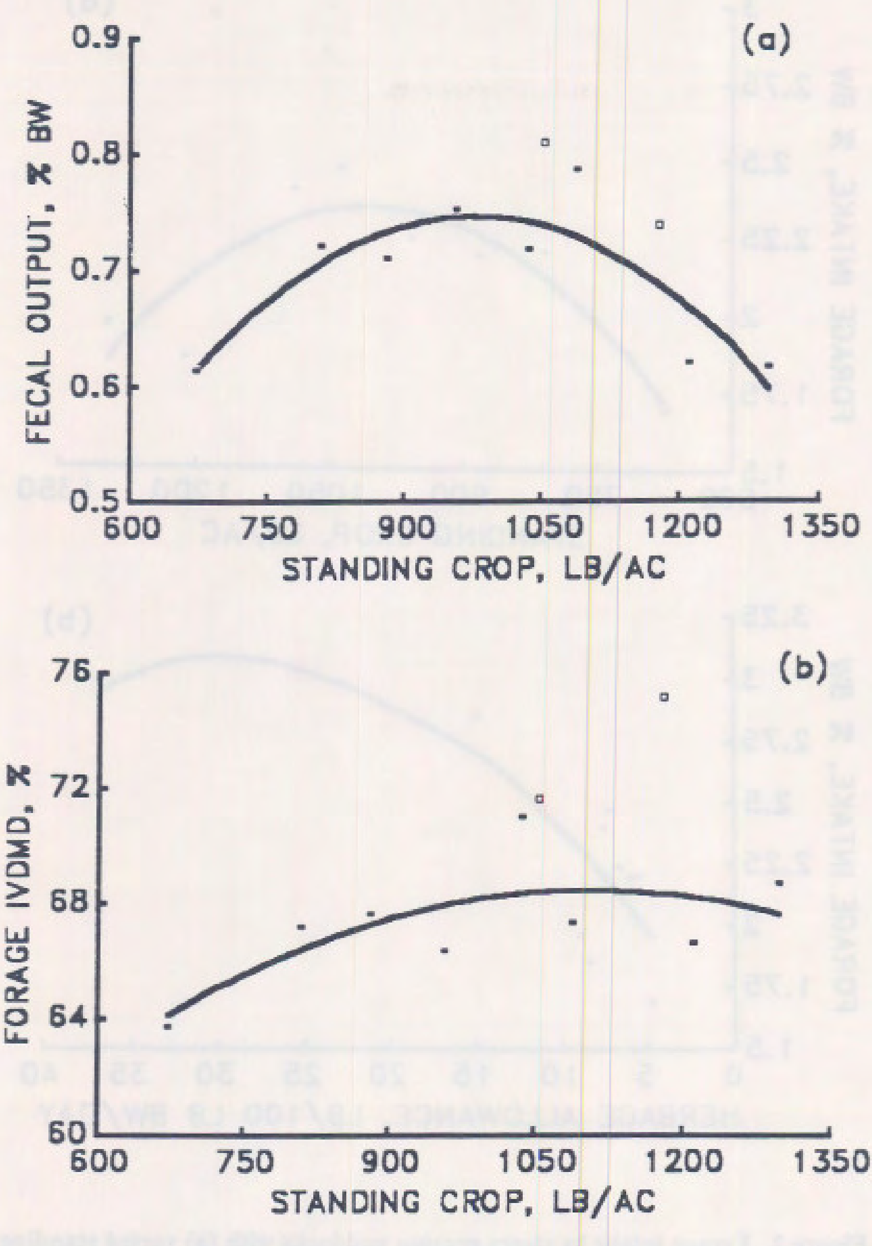

Figure 1. Relationships between standing crop and (a) fecal output of steers and (b) in vitro digestibility of esophageal masticate.

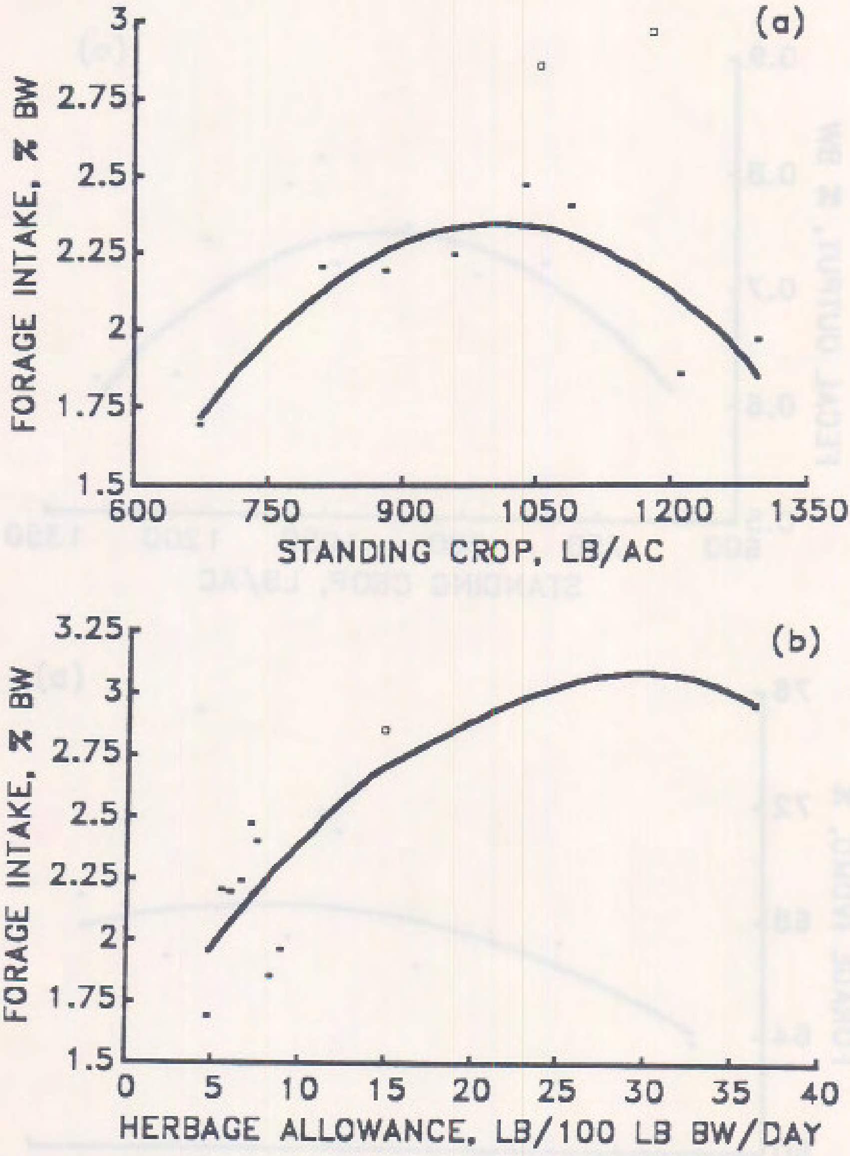

Figure 2. Forage intake by steers grazing paddocks with (a) varied standing crops and (b) varied herbage allowances.

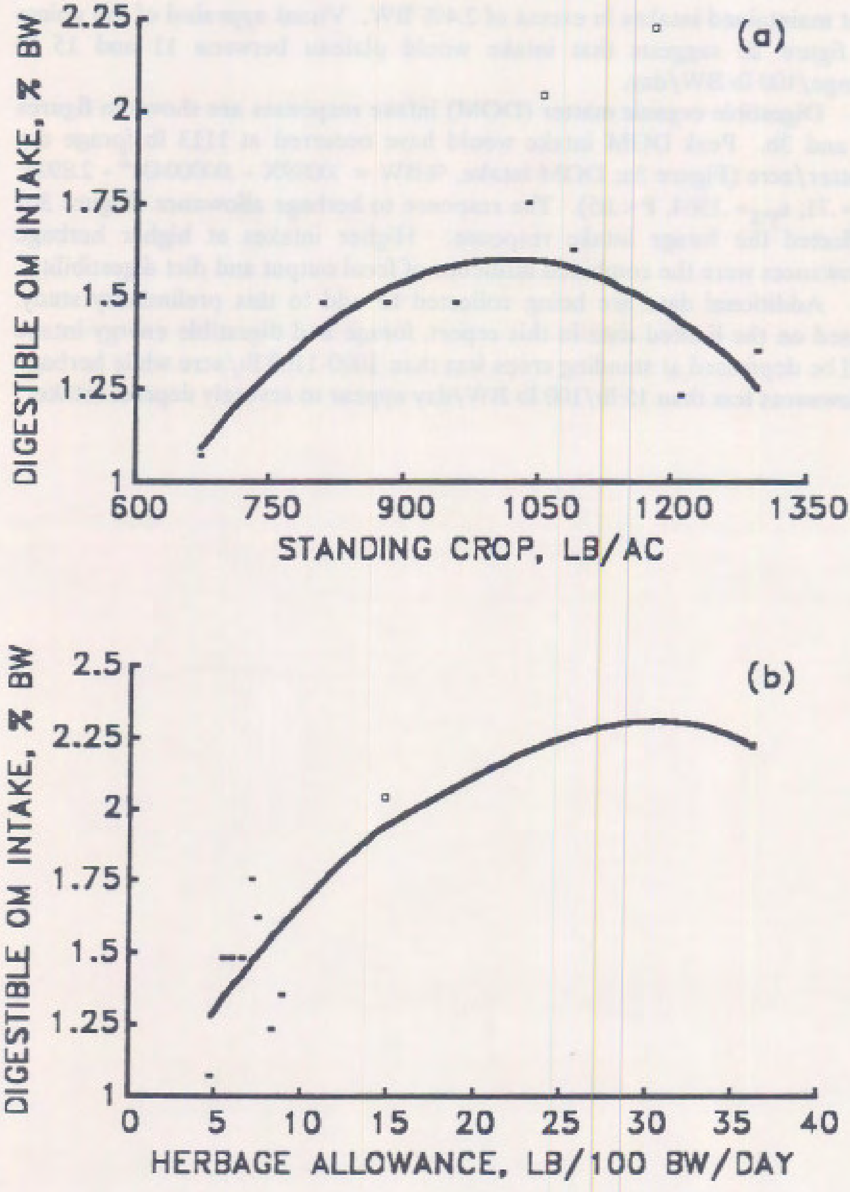

Figure 3. Digestible organic matter intake by steers grazing paddocks with (a) varied standing crops and (b) herbage allowances.

that maintained intakes in excess of 2.4% BW. Visual appraisal of the points in figure 2b suggests that intake would plateau between 11 and 15 lb forage/100 lb BW/day.

Digestible organic matter (DOM) intake responses are shown in figures 3a and 3b. Peak DOM intake would have occurred at 1113 lb forage dry matter/acre (Figure 3a; DOM intake, %BW = $.0089X - .000004X^2 - 2.8925$; $r^2 = .71$, $s_{y \cdot x} = .1364$, $P < .05$). The response to herbage allowance (Figure 3b) reflected the forage intake response. Higher intakes at higher herbage allowances were the combined influence of fecal output and diet digestibility.

Additional data are being collected to add to this preliminary study. Based on the limited data in this report, forage and digestible energy intake will be depressed at standing crops less than 1000-1100 lb/acre while herbage allowances less than 15 lb/100 lb BW/day appear to severely depress intake.