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EFFECT OF PLANTING DATE AND GRAZING MANAGEMENT ON PRODUCTIVITY OF DUAL-PURPOSE WINTER WHEAT

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Story in Brief

During the 1997-98 wheat pasture year we used 14 pastures planted to Tonkawa hard red winter wheat to determine the effect of planting date and grazing management on cattle performance and grain yield. Planting dates were August 28 and October 2, 1997, and within each planting date pastures were grazed 1) "season-long" at stocking rates that ranged from about .33 to .83 steers/acre up until the time of first hollow stem or 2) at a stocking rate similar to the highest for the season-long cattle but cattle were removed from the pastures earlier (i.e., after about 80% of the grazing days of the season-long cattle). The later pastures are referred to as intensive-early stocked pastures, and were included to determine if the decrease in grain yield with increasing stocking rate that we have previously observed could be overcome or moderated by grazing management that affects the duration and (or) frequency of plant defoliation. The "trade-offs" between early- and late-planted wheat, averaged across stocking rates, for season-long grazing were as follows: weight gain/steer, 138 lb greater for early-planted wheat; gain/acre, 94 lb greater for early-planted wheat; grain yield, 12 bushels/acre more for late-planted wheat. Weight gain/acre for IES cattle was about 80 to 85% of that for season-long cattle when compared within planting date.

Key Words: Wheat Pasture, Cattle Performance, Grain Yield

Introduction

In our wheat variety by stocking rate studies at the Marshall Wheat Pasture Research Unit, beef production (live weight gain/acre) has typically increased with increasing stocking rate; whereas, grain yield decreased with increasing stocking rate even though we terminated grazing at the first hollow stem stage of wheat growth. In these studies, wheat was planted in early September (typically beginning on Labor Day). The *"optimum"* planting date for hard-red winter wheat that is planted for grazing and grain (i.e., dual-purpose crop) remains a topic of considerable debate. Therefore, during the 1997-98 wheat pasture year, we used a single variety (Tonkawa) and incorporated two planting dates in our study. The target planting dates were the first few days of September and September 20.

A second objective was to determine the effect of a very high stocking rate during the fall/winter-grazing period followed by an early pull-off date, as compared with more moderate stocking rates and pull-off dates at first hollow stem, on cattle and grain production. In essence the question is: Can the decrease in grain yield with increasing stocking rate that we have previously observed be overcome or moderated by grazing management that affects the duration and(or) frequency of plant defoliation?

For intensity early stocking (IES) grazing programs on native range, stocking rates are typically doubled and cattle are removed around mid-July versus late August or early September for season-long grazing programs. Weight gain/animal for IES cattle is typically about two-thirds that of season-long cattle. We have "borrowed" the term IES from the native range literature, and use it in this paper to designate the treatment whereby cattle were removed from wheat early (i.e., prior to first hollow stem). Cattle that remained on pasture to the first-hollow stem stage of wheat growth are referred to as season-long (SL) cattle.

Materials and Methods

Cattle were fall-weaned steers (4-breed black composite bulls bred to 4-breed composite cows) from western Nebraska. After arrival on October 10, 1997, the steers were held in drylot and fed a cool-season perennial grass hay (about 9.7% crude protein, DM basis) and 2 lb/steer/d of a pelleted protein supplement with Deccox® . Steers that grazed early-planted wheat went directly from drylot to the experimental wheat pastures. Steers that grazed the late-planted pastures, had grazed wheat pasture adjacent to the main cattle facility from October 28 to December 5 (38 d) prior to placement on the experimental pastures. This may have given them some advantage in that they were already "adapted" to wheat pasture at the beginning of the experimental period for late-planted wheat.

We typically apply nitrogen and phosphorus in amounts, based on soil tests, for yield goals of 3000 lb forage dry matter and 50 bushels of grain/acre. Additional information regarding the 1997-98 study is included in Table 1.

We planted the "early-planted" wheat on August 28, 1997, because planting conditions were excellent at that time and rain was in the forecast for the first few days of September. Initial stand establishment was excellent. Seedlings were exposed to near record high temperatures and strong, drying south winds during early September. Maximum air temperatures during September were 99, 98, 97, 98, 93, 99, and 101, for September 7, 8, 15, 16, 17, 18, and 19, respectively. While our target planting date for the "late-planted" wheat was September 20, the area received a total of 2.24 in of rainfall on September 22 and 23 that delayed planting until October 2.

Results and Discussion

Early- versus Late-Planted Wheat. Weight gain/steer and gain/acre are shown in Figures 1 and 2, respectively. Weight gain of cattle that grazed early-planted wheat was excellent and averaged 337 to 279 lb/steer depending on stocking rate; whereas, cattle on late-planted wheat was only about 56% of that of cattle grazing early-planted wheat. Gain/acre increased linearly up to 232 lb/acre on early-planted wheat. Gain/acre on late-planted wheat was only about 43% of that from early-planted wheat.

Grain yields are shown in Figure 3, and were excellent. Grain yield did not decrease with increasing stocking rate as we have previously observed. This is probably related to the near ideal weather from the time cattle were removed from the pastures and grain harvest. Thus, the total amount of stress on the wheat was minimized. With the exception of the late-planted pasture that was grazed at the highest stocking rate, grain yield from late-planted wheat was about 12 bushels/acre more than early-planted wheat.

Results in Comparison With Those of Clipping Trials. The 1997-98 season was the first in which we used more than one planting date for grazing trials at Marshall. The use of two planting dates was motivated in part by results that we observed in small plots. We have been conducting small plot planting date experiments at the North Central Research Station near Lahoma since the 1991-92 season. Four planting dates, ranging from late August to early October, were included during the first five seasons. The 1996-97 trial included five planting date treatments ranging from late August to late October. Each treatment was replicated four times. To simulate grazing, the plots were mechanically clipped and the forage removed once in the fall and once in the spring prior to development of the first hollow stem. Forage yield was based upon the combined dry matter yield of the two clippings. All plots were fertilized to ensure that soil fertility would not be the first-limiting yield factor. A total of 608 observations were available. All data observations were used to determine the grain and forage yield response graphs shown in Figure 4.

Based upon the results from 6 yr of Lahoma small plot trials a 3-wk delay in planting from September 1 to September 21 is associated with an expected 44% increase in grain yield (from 26 to 38 bushels per acre). However, the same 3-wk delay will result in a fall-winter forage yield of only 32% as much as September 1 planting (1,935 lb on September 1 to 614 lb on September 21).

In general, the 1997-98 grazing data for cattle gain/acre and grain yield from early- and late-planted wheat fit the trade-off pattern of the Lahoma trials. Our studies at the Marshall Wheat Pasture Research Unit will provide actual cattle production and grain yield data from grazed wheat to further develop these relationships, and to identify *"economic optimum"* planting dates for different cattle price structures and grain price scenarios. Selection of wheat planting date is clearly an important management decision for dual-purpose wheat production.

IES versus SL. Season-long cattle grazed early-planted wheat from October 25 to February 20 (118 d) when cattle were removed at the first hollow stem stage of wheat maturity. The IES cattle were removed from early-planted wheat on January 23; thus, they grazed wheat for 90 d. Gain/acre from the IES cattle was 196 lb or about 84% of that of SL cattle (232 lb) at the highest stocking density. These relative gains are important in considering the potential and economic tradeoffs of an IES grazing program for dual-purpose wheat.

Grazing periods on late-planted wheat were from December 5 to February 20 (77 d) for SL cattle and from December 5 to February 6 (63 d) for IES cattle. While gain/acre did not continue to increase in a linear manner with increasing stocking rate as it did on early-planted wheat, gain/acre from IES cattle was about 80% of that predicted for SL cattle at the highest stocking rate.

Because grain yield did not decrease with increasing stocking rate, the data do not provide any information relative to our second objective. Grain yield of late-planted *versus* early-planted IES pastures was increased about 10.5 bushels.

In the summary, "trade-offs" between early- and late-planted wheat, **averaged across stocking rates**, for **season-long** grazing were as follows for the 1997/98 wheat pasture year.

Weight gain, lb/steer: 138 lb greater for <u>early-planted</u> wheat.

Steer gain, lb/acre: 94 lb greater for <u>early-planted</u> wheat.

Grain, bushels/acre: 12 bushels more for <u>late-planted</u> wheat.

Weight gain/acre for IES cattle was about 80 to 85% of that for SL cattle when compared within planting date. Because grain yield did not decrease with increasing stocking rate during this year's study, we did not obtain data regarding the potential of an "IES" grazing program to increase income from the grain component of a dual-purpose hard red winter wheat enterprise.

Table 1. Characteristics of the 1997-98 Marshall wheat pasture study.

	Early-Planted		Late-Planted	
Planting date	August 28, 1997		October 2, 1997	
Soil temperatures[a] @ planting, °F	83.6, 98, 71.6		78.2, 91.4, 68	
Date cattle placed on pastures	October 25		December 5	
Initial wt of steers @ turnout, lb	556		649	
Date cattle removed from pastures				
IES	January 23, 1998		February 6, 1998	
SL	February 20		February 20	
Grazing days				
IES	90		63	
SL	118		77	
Wheat forage standing crop @ turnout, lb DM/acre	1477		960	
- -				
Initial stocking rate,	**SL**	**IES**	**SL[bc]**	**IES[bd]**
Acres/steer	3.00		4.00	
	2.40		3.43	
	1.80		1.80	
	1.20	1.13	1.80	1.88

[a]Mean, maximum, and minimum "bare" soil temperatures at 2-in depth.

[b]Stocking rates, expressed as acres/steer, were adjusted to achieve the same range of grazin pressures (expressed as lb forage DM/100 lb of initial steer body weight) as those of early-planted wheat.

[c]Season-long.

[d]Intensive early stocking.

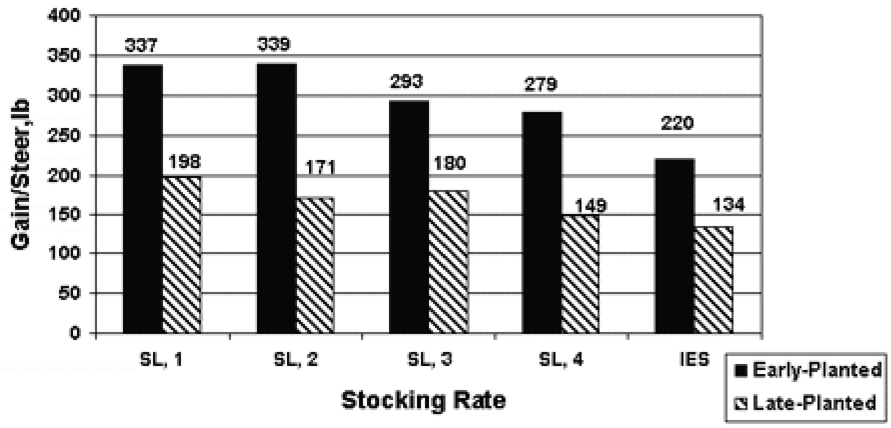

Figure 1. **Effect of grazing management (season-long grazing versus intensive early stocking) and stocking rate on steer weight gain.**

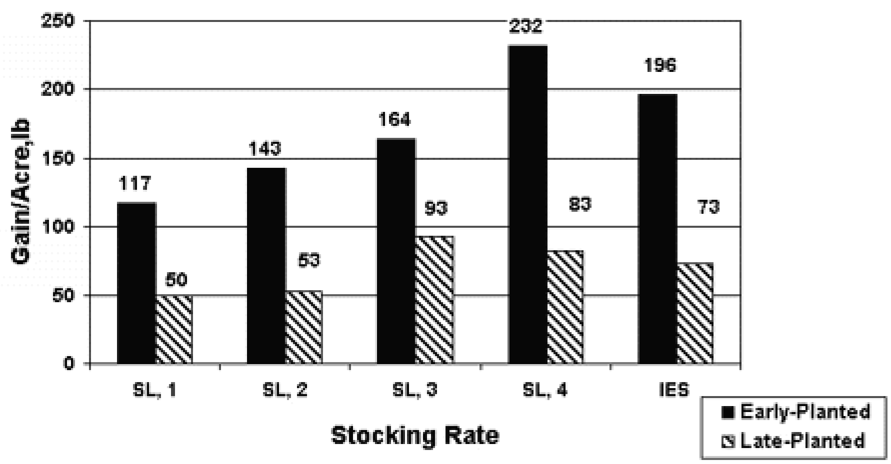

Figure 2. **Effect of grazing management (season-long grazing versus intensive early stocking) and stocking rate on steer gain/acre.**

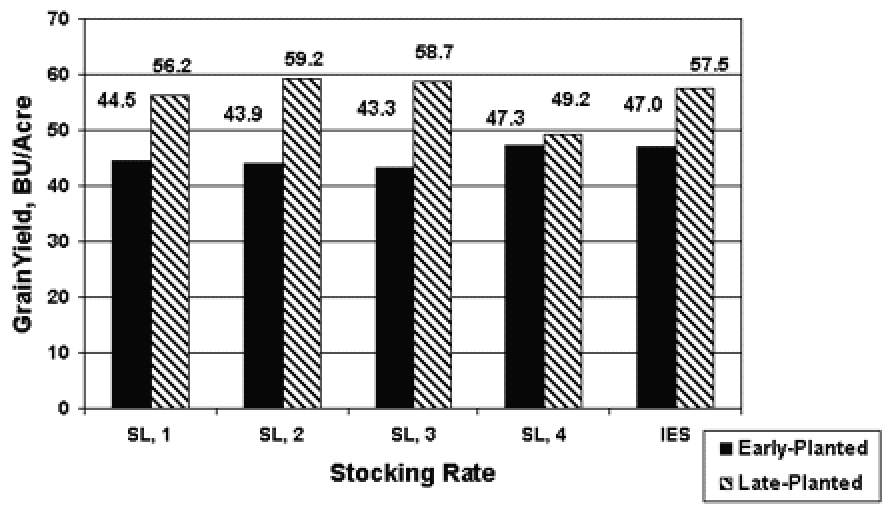

Figure 3. **Effect of grazing management (season-long grazing versus intensive early stocking) and stocking rate on grain yield.**

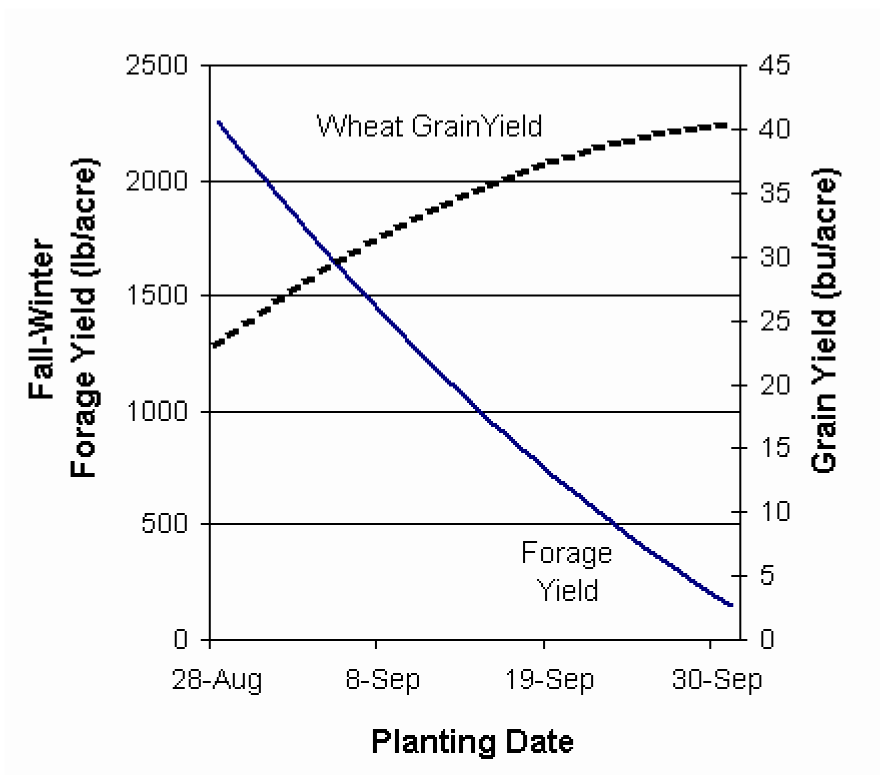

Figure 4. **Predicted dual-purpose winter wheat fall-winter forage yield and grain yield by planting date, from data obtained at Lahoma, OK from 1991-92**

through 1996-97.

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