Nutrient Content of Summer-Planted Oats after Corn Harvest and Grazing Performance

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Summary with Implications

Annual forages provide producers with an alternative grazing source in the fall. A cover crop grazing study was conducted following corn harvest to evaluate the steer ADG and yield of summer sown oats and turnips planted after either high moisture corn or corn silage production. The gain of steers grazing oats after silage was 1.29 lb/day, while the gain of steers grazing corn residue and oats after high moisture corn was 0.72 lb/day. Average oat forage production after silage harvest was 2857 lb/acre, while oat production following corn harvest was 523 lb/acre. Fall forage production of oats following corn silage harvest provided 133 lb of steer gain per acre, while corn residue plus oats following corn harvest provided 57 lb of steer gain per acre. Utilizing oats following silage harvest provides an opportunity for greater forage production and grazing as compared to following corn grain harvest.

Introduction

Planting annual forages in September following corn silage or grain harvest may provide producers with an alternative grazing source for backgrounding spring born calves in the winter. Oats and turnips are cool season species that can be planted in late-summer to produce fall forage. Utilizing oats alone or an oat and turnip mix after corn harvest may enable producers to have additional ground cover and produce grazeable forage. The timing of corn harvest can affect the amount of fall forage produced. Early harvested, corn silage (end of August to early-September) results in more growing degree days available for fall forage growth when compared to high moisture corn grain harvest (mid to late September). The objectives of this study were to: determine forage production and forage quality of late summer planted oats-turnip mix or oat monoculture planted after corn silage or high moisture corn harvest and evaluate performance of steers grazing oats produced after corn silage harvest or oats with corn residue produced in a high moisture corn system from November to January.

Procedure

Field and planting details

Pivot irrigated fields at the Eastern Nebraska Research and Extension Center (ENREC) near Mead, NE were drilled with 60 lb / ac of Horsepower oat and 5 lb / acre purple top turnip in a 7.5 inch row spacing on September 9, 2014 after corn silage (CS) harvest. On September 18, 2014 after high moisture corn (HMC) harvest, Horsepower oat and purple top turnip were drilled into the corn residue at 70 lb /ac and 5 lb / ac, respectively. Restrictions related to the herbicides used on the corn precluded grazing of the turnips, therefore no grazing occurred in year 1. In year 2, 90 lb / ac of Horsepower oat were drilled with a 7.5 inch row spacing on September 3, 2015 and September 17, 2015 following CS and HMC harvest, respectively. The 104-acre field was split in half (east and west) with half being planted to corn and half to soybeans and crops were alternated yearly. The 52 acres of corn were further split into two 13 acre replications of the two corn harvest treatments (HMC vs. CS). Three acres of each rep were not grazed, half having a fall crop planted and half not. Fertilizer was applied at 45 and 40 lb nitrogen per acre to all treatments in years 1 and 2, respectively.

Forage production measures

Initial forage mass was measured the last week of October. To measure biomass, three randomly selected 36 inch x 22.5 inch areas in each paddock were sampled. All above ground biomass was harvested at ground level, dried at 60°C, and weighed. The growing degree days (GDD) that accumulated between time of planting and yield measurement calculated by subtracting 32 from the average daily temperature for each day from planting date to date of biomass measurements and summing the resulting degrees. The resulting number (GDD) indicates the amount of heat that was available for plant growth.

A quality sample was collected in late October by randomly clipping forage at ground level at three locations within the paddocks. All quality samples were freeze dried and analyzed for DM in 105°C oven, crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and organic matter (OM).

In March, ground cover was measured by marking points of ground cover over a 100-foot length.

Stocking rate and grazing

In year 1, there was no grazing of the oats-turnip mixture due to restrictions of herbicides use on the corn and the carryover effects on the cover crop. In year 2, steers grazed treatment paddocks beginning in November. Steers grazing oats after CS were stocked at 1.7 steers per acre, while steers grazing oats and corn residue after HMC were stocked at 1.3 steers per acre. Steers grazing after corn silage were allocated 1751 lb oat forage DM / steer based on the initial forage mass measurements. Steers grazing after HMC were allocated 399 lb oat forage DM and 2707 lb corn husk and leaf DM / steer (assuming 16 lb of leaf and husk material produced per bushel of corn with 220 bushel per acre corn yield).

Prior to grazing, all steers (initial BW= 468 ± 14 lb) were limit fed a 50:50 diet of alfalfa hay and Sweet Bran for five days, and then weighed three consecutive days prior to grazing to adjust for rumen fill. On day two of weighing, steers were assigned to

Table 1. Nutrient analysis of fall forage planted after corn silage or high moisture corn for both years[1]

	Treatment[2]			
	CS	HMC	SEM	*P*-value
Year 1[3]				
OM, %	84.8	86.5	0.26	0.05
CP, %	22.5	18.7	2.25	0.35
NDF, %	43.7	45.1	0.58	0.23
ADF, %[4]	24.8	21.6	0.66	0.08
IVOMD, %[5]	82.1	82.2	0.61	0.87
Year 2				
OM, %	83.8	84.4	0.39	0.36
CP, %	18.0	23.2	2.15	0.23
NDF, %	43.7	37.5	2.18	0.18
ADF, %	25.6	22.1	0.74	0.08
IVOMD, %	78.9	84.6	0.66	0.03

[1]All nutrients on a dry matter basis
[2]CS: Forage grazed after corn silage harvest; HMC: forage grazed after high moisture corn harvest.
[3]Year 1 mix composed of 60 lbs oats and 5 lbs turnips after corn silage and 70 lbs oats and 5 lbs turnips in HMC treatment. Year 2 composed of 90 lbs oats planted after corn silage and HMC.
[4]ADF (Acid Detergent Fiber): measure of less or indigestible fiber which is negatively correlated to energy of diet
[5]IVOMD (in vitro organic matter digestibility): measure of the digestibility of the organic matter in the diet

Table 2. Performance of steers grazing oats after corn harvest in 2015

	Treatment[1]			
	CS	HMC	SEM	*P*-value
Initial BW, lb	468	469	0.50	0.29
Ending BW, lb	548	513	16.8	0.27
ADG, lb	1.29	0.72	0.27	0.27
Gain, lb/acre	133	57	23.5	0.15

[1]CS: Forage grazed after corn silage harvest; HMC: forage grazed after high moisture corn harvest.

paddocks based on weight blocks. On day three of weighing, steers were implanted with Ralgro®. Grazing was initiated on November 13, and steers were removed from paddocks on January 4 after 62 days when oats and corn residue were fully utilized, meaning little to no leaf or husk and only oat stubble were present. At termination of grazing, steers were returned to the feedlot and were limit fed a 50:50 alfalfa and Sweet Bran diet for eight days followed by weighing three consecutive days to determine ending BW.

Data were analyzed with the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.) with paddock as the experimental unit for forage analysis and steer performance.

Results

Forage production

In year 1, oats-turnip forage production of CS was 941 lb DM / ac (SEM = 104) and 343 lb DM / ac (SEM = 58) for HMC in late October. Growing degree days (GDD) were calculated to be 1358 for the oats-turnip planted after CS and 1142 after HMC.

In year 2, oats forage production was 2857 lb DM / ac (SEM = 93) for CS and 523 lb DM / ac (SEM = 95) for HMC. Greater oats production on CS paddocks as compared to the HMC paddocks was likely due to the earlier planting and thus the greater accumulation of GDD for fall growth (1714 vs. 1162 GDD, after CS and HMC, respectively).

Post-graze ground cover measurements showed that there was 63.2% ground cover by oat stubble after grazing on the CS paddocks, while there was 81.9% ground cover due to corn residue and minimal oat stubble after grazing HMC treatment. The HMC treatment had significantly more ground cover ($P < 0.01$; SEM = 2.68) than CS. These data show that after 62 days of grazing, there was a significant amount of ground cover to prevent erosion.

Forage quality

The nutrient content of samples collected in October of the oats-turnip mix in year 1 and oats in year 2 are reported in Table 1. In year 1, the oat turnip mix produced in the HMC (86.5%) treatment had a greater percentage of OM as compared to CS (84.8%), as well as, tended ($P = 0.08$) to have a lower ADF compared to CS (21.6% vs. 24.8% for HMC vs. CS, respectively). However, there was no difference in the IVOMD of oat-turnip mix planted after CS vs. HMC, 82.1 and 82.2%, respectively. In year 2, the OM content of the late summer planted oats did not differ between HMC and CS. Whereas, ADF tended ($P = 0.08$) to be lower for HMC (22.1%) than CS (25.6) and IVOMD was greater for HMC (84.6%) than CS (78.9%). Although, there were some differences in nutrient content in the fall forage produced due to planting date (CS vs. HMC), the quality of the forage was extremely high at either planting date. The nutrient analysis shows that late summer planted oats, with or without turnips, are high in protein, ranging from 18 to 23% CP and high in energy with IVOMD ranging from 78.9 to 84.6%.

Cattle performance

In year 2, the ADG of steers grazing oats planted after CS was 1.29 lb / d and 0.72 lb / d for steers grazing the oats plus corn residue in HMC paddocks (Table 2). However, given the low number of replicates (n = 2) ADG did not statistically differ among

treatments ($P = 0.27$; Table 2). Likewise, gain per acre was numerically greater but not statistically significant ($P = 0.15$) for steer grazing oats planted after CS (133 lb / ac) than for steers grazing HMC residue and oats (57 lb / ac).

In a previous experiment, (2016 Nebraska Beef Report, pp. 31-32) calves grazing corn residue with no supplement lost 0.18 lb of ADG. This suggests that the low amount of oats produced in the HMC system increased gains over grazing residue alone. With the stocking rate used in the present study, the seed plus seeding would have cost $23 / steer in the HMC system. Distillers supplementation of 0.5 lb DM / d (31 lb / steer for the entire period) would have resulted in the same gain but cost roughly $2.60 / steer at $150 / ton of DDGS. Steers grazing oats after CS gained 1.29 lb /d, and at the stocking rate used in this study, the cost of seed plus seeding cost $18 / steer. If calves would have been grazed on corn residue and supplemented with distillers to achieve a rate of gain of 1.29 lb / d, they would have needed to be supplemented at 3.0 lb DM / d (186 lb / steer for entire period), resulting in a cost of $14 / steer. Suggesting that from an economic standpoint, supplementing distillers on cornstalks provides a cheaper gain for producers. However, unlike corn harvested for grain where corn residue provides significant amounts of ground cover, there is a need to plant something in the fall to provide ground cover in corn silage systems. These data suggest that in early harvested fields, oats can be used to produce ground cover and provide a relatively low cost source of gains for calves.

Conclusions

These data suggest that there is an opportunity for fall forage production after corn silage harvest, but minimal fall production after HMC harvest. Moderate gains (1 to 1.5 lb / d) are possible for growing calves grazing summer planted oats in the late fall/early winter.

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