

Effect of time on dry matter yield and forage quality of swathed oat and unharvested corn forages

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Increasing the grazing season of beef cows into the fall and early winter has the potential to reduce the expenses associated with traditional forage feeding practices. The potential to extend the grazing season depends on retention of dry matter (DM) yield and forage quality. The objectives of this experiment were to compare changes in DM yield and forage quality of unharvested corn (*Zea mays*; CO) and swathed oat (*Avena sativa*; SW) to oat harvested as hay (HY). Average DM yield ($P < .01$) and IVDMD ($P < .01$) was greatest in CO. Average DM yield ($P = .1$; 3098, 2397 and 1922, kg/ha for CO, HY and SW, respectively) and IVDMD concentration ($P < .01$; 66.0, 61.2 and 48.8%, respectively) was greater in HY compared to SW. Daily rate of DM disappearance ($P = .13$; -14.4, -.8 and -6.9 kg/ha) and the daily loss of IVDMD concentration ($P < .01$; -.098, -.025 and -.062%) was greatest in CO, least in HY and intermediate in SW. Average CP concentration ($P < .01$) was greatest in HY, least in SW and intermediate in CO (14.6, 17.0 and 11.9%). Daily loss of CP concentration (-.013%, $P < .05$) was similar across treatments ($P = .42$). Average fiber concentrations ($P < .01$) were greatest in SW, least in HY and intermediate in CO. Daily increase in fiber concentrations were greatest in CO, least in HY and intermediate in SW. Ash concentration was not affected by forage type or sampling date. Daily changes in DM yield ($P > .8$) and concentrations of IVDMD ($P > .2$), ADF ($P > .7$) and NDF ($P > .5$) of HY did not differ from 0. With the exception of CP concentration, DM and forage quality of oat hay was relatively stable in the fall and early winter of the year of harvest. Unharvested corn had greater average and daily loss DM yield and digestibility compared to swathed oat. However despite changes in DM yield and forage quality in these forages, both unharvested corn and swathed oat appear to offer alternative forage options for beef cows in the fall and early winter.

Key Words: Forages, Unharvested corn, Oat swaths

Justification

Agricultural (arable and grazable) land dominates the landscape in the Northern Plains. Appropriate integration of crop and livestock systems within this landscape can be a valuable tool in increasing rural economic development. Inclusion of feed and forage production in cropping rotations would provide flexibility in developing cropping systems to help enhance the general sustainability of the underlying ecosystem. Coupling this feed and forage production with resident and value-added ruminant livestock production offers a tremendous spring board for capturing the real value of agricultural production and stimulating additional economic development in the region in an environmentally friendly fashion.

Annual forage production is increasing in importance in the agricultural economy of the Northern Plains. Innovative farmers are seeking ways to enhance crop diversity, control pests and increase crop water use efficiency without assuming the risks often associated with continuous cropping. However, a viable market for annual forage production is often critical for enhancing its impact on regional economies.

Ruminant livestock constitutes a primary economic engine in this region with cow/calf production a major component. The winter management program of traditional cow/calf production accounts for up to 60% of annual production expenses in these operations. Two-thirds of this expense is for harvested and stored feeds typically fed in total or semi confinement feeding facilities. Increasing the grazing season of beef cows into the fall and early winter has the potential to reduce the expenses associated with traditional forage feeding practices. However, the potential to extend the grazing season depends on retention of dry matter (DM) yield and forage quality. Appropriate integration of crop and livestock systems within the region could conceivably use cattle to create a ready market for annual forage production while

simultaneously reducing the overall environmental and economic costs associated with traditional winter management programs.

Objective

Compare changes in DM yield and forage quality of unharvested corn (*Zea mays*; CO) and swathed oat (*Avena sativa*; SW) to oat harvested as hay (HY).

Procedures

Three forage treatments:

- Oat hay (HY; seeded in mid April, swathed in late July and baled in early August)
- Oat swaths (SW; seeded in mid April and swathed in late July and left in field)
- Standing corn (CO; seeded in early May and left standing in field)

Forage sampling began in early August (early September for CO) and continued into mid December.

DM yield was calculated and concentrations of invitro DM digestibility (IVDMD), crude protein (CP), acid (ADF) and neutral (NDF) detergent fibers and ash were determined.

Data were analyzed as a randomized complete block design sampled across time. Linear regression was used to estimate and compare daily change in yield and forage quality. Treatment parameters were compared using a protected t-test.

Conclusions

- ✓ Average DM yield and IVDMD concentration was greatest in CO, intermediate in HY and lowest in SW. Daily loss of DM mass and IVDMD concentration was greatest in CO, intermediate in SW and lowest in HY.
- ✓ Average CP concentration was greatest in HY, least in SW and intermediate in CO. Daily loss in CP concentration was not different across treatment and averaged .013%.

- ✓ Average fiber concentrations were greatest in SW, least in HY and intermediate in CO. Daily increase in fiber concentration was greatest in CO, least in HY and intermediate in SW.
- ✓ Ash concentration was not affected by either treatment or sampling date.
- ✓ Daily changes in DM yield and concentrations of IVDMD and fibers of HY did not differ from 0 ($P > .05$).

Summary

With the exception of CP concentration, DM and forage quality of oat hay was relatively stable in the fall and early winter of the year of harvest. Oat swaths and standing corn left in the field for subsequent grazing had greater losses in yield and forage quality compared to oat hay. Unharvested corn had greater daily loss DM yield and digestibility compared to swathed oat. In general, forage quality of all treatments was nutritionally adequate for dry, pregnant beef cows.

Implication

Despite losses in total DM and consistent declines in forage quality, both unharvested corn and swathed oat appear to be viable grazing forage options for dry, pregnant beef cows in the Northern Plains.

Effect of time on DM yield and forage quality.

Item	Average across time			Daily change			P-value
	HY [†]	SW	CO	HY	SW	CO	
DM yield (kg/ha)	2397 ^b	1922 ^a	3098 ^c	-0.82 ^{b*}	-6.90 ^{ab}	-14.47 ^a	.13
Concentration (%DM)							
Invitro DM Digestibility	61.2 ^b	48.8 ^a	66.0 ^c	-0.025 ^{b*}	-0.062 ^{ab}	-0.098 ^a	<.01
Crude Protein	17.0 ^c	11.9 ^a	14.6 ^b	-	-	-	.42
Acid Detergent Fiber	26.0 ^a	36.2 ^c	30.4 ^b	.007 ^{a*}	.060 ^b	.075 ^b	<.01
Neutral Detergent Fiber	47.6 ^a	64.5 ^c	61.3 ^b	.013 ^{a*}	.055 ^{ab}	.115 ^b	<.01
Ash	8.3	6.5	7.2	-	-	-	.8

[†] HY= oat hay, SW=swathed oat and CO=standing corn.

* Parameter does not differ from 0 (P>.05).

^{a,b,c} Means within the same row and parameter with differing superscripts differ (P<.05).