Simulated Grazing of Winter Canola

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Introduction

- Cattlemen who graze wheat for pasture are interested in using winter canola as a dual purpose forage and grain crop.
- Livestock often devour canola forage more rapidly after a hard, killing freeze.
- In the southern Great Plains, limited research has been conducted on the best time to graze and the effects of grazing on forage quality, winter survival, and yield.
- Genotypic differences may exist for forage production and quality, winter survival, and grain yield.
- Dual purpose winter canola varieties exhibiting minimal reduction in winter survival and grain yield following grazing are needed.

Objectives

- Evaluate the effect of harvest timing on forage production and quality, winter survival and grain yield.
- Evaluate commercial and experimental winter canola varieties for use in a dual purpose system.
- Identify winter canola varieties developed for use as a dual purpose crop.

Methods

- A simulated grazing study was grown near Manhattan, KS in 2008-2009 (hereafter 2009) and 2009-2010 (2010).
- Plots were arranged in a split-plot, randomized complete block design with four replications.
- Variety was the whole plot randomly assigned within a replication and harvest treatment was randomly assigned to subplots within whole plots.
- The plot size was 6.3 m^2 and the seeding rate was 5.6 kg/ha.
- Four varieties (KS4022, Kiowa, Sitro, and Wichita) were evaluated in 2009 and two varieties (KS4022 and Wichita) were evaluated in 2010.
- The split-plot treatments were PRE (prior to a killing freeze or -2.2°C), POST (after a killing freeze), SPRING (at bolting stage), and NONE. The SPRING treatment was not harvested for forage production or grain yield in 2009.
- Plots were harvested with a sickle bar mower roughly 5 cm above the crown.
- Statistical analysis was performed using SAS and PROC Mixed with $\alpha = 0.05$.

Results

- For winter survival, the PRE and POST treatments were not significantly different in 2009 and PRE was significantly higher than POST in 2010 (Figure 1).
- The POST treatment produced significantly more forage than PRE both years. In 2010, the SPRING treatment differed significantly from POST (Figure 2).
- Fall growth was excessive in 2010 resulting in more forage production.
- The NONE treatment had significantly higher grain yield than all other treatments and the PRE and POST treatments did not differ significantly. In 2010, the SPRING treatment was significantly less than all others (Figure 3).
- The SPRING treatment delayed 50% bloom initiation, increased grain moisture, and decreased test weight of the harvested grain. All treatments reduced final plant height (Table 1).
- In 2009, there was no significant difference for percent protein. The PRE treatment had significantly higher protein than POST and SPRING was significantly higher than PRE in 2010 (Table 2).
- The POST treatment had significantly lower Neutral Detergent Fiber (NDF) and Acid Detergent Fiber (ADF) than all other treatments in the study (Table 2).
- The POST treatment had significantly higher Net Energy Maintenance (NEM), Total Digestible Nutrients (TDN), and Relative Feed Value (RFV) than all other treatments. The PRE and the POST treatment RFV values differed by nearly 80 units both years (Table 2).
- Kiowa and Sitro showed significant reductions in winter survival and grain yield following simulated grazing (data not shown).
- KS4022 had significantly higher winter survival than Wichita (Figure 4). Comparing both varieties at the POST treatment, KS4022 had significantly higher winter survival each year (data not shown).
- No significant difference between KS4022 and Wichita was observed for forage production and grain yield (data not shown).
- There was no significant difference in protein content between KS4022 and Wichita (Table 3).
- KS4022 had significantly lower ADF and NDF and significantly higher NEM, TDN, and RFV than Wichita in 2009.
- There was no significant difference between KS4022 and Wichita for ADF, NDF, NEM, TDN, and RFV in 2010.

Figure 1. Grazing Treatment Effects on Winter Survival

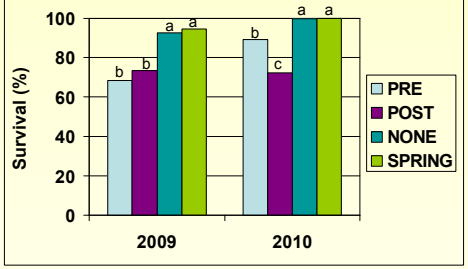

Figure 2. Grazing Treatment Effects on Forage Production

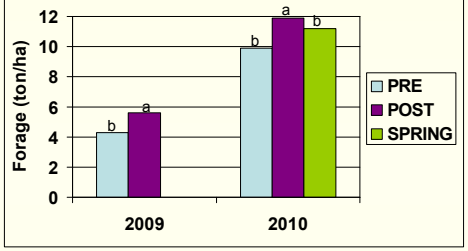

Figure 3. Grazing Treatment Effects on Grain Yield

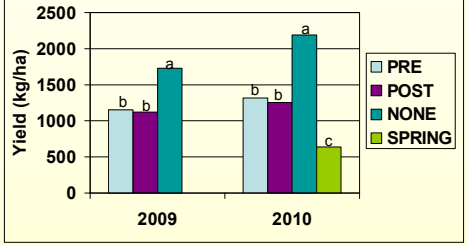

Table 1. Treatment effects on agronomic parameters in 2010.

Treatment	50% Bloom	Plant Height	Grain Moisture	Test Weight
	(day)	*(in)*	*(%)*	*(kg/bu)*
PRE	105.5	111	9.6	22.3
POST	105.9	111	9.3	22.2
SPRING	119.5	110	13.8	21.5
NONE	104.6	124	9.7	22.4
LSD (0.05)	1.6	5	1.1	0.5

Table 2. Forage quality measurements of winter canola following simulated grazing at different timings.

Treatment	Year	Protein (%)	ADF (%)	NDF (%)	NEM (Mcal/lb)	TDN (%)	RFV
PRE	2009	24.9	22.9	25.3	0.82	71.9	265.1
POST		25.6	18.6	20.5	0.88	76.9	343.3
LSD (0.05)		NS	1.6	1.3	0.03	1.9	20.6
PRE	2010	27.4	20.7	23.7	0.85	74.5	289.4
POST		24.4	17.0	19.5	0.91	78.8	361.3
SPRING		31.9	19.5	23.4	0.87	75.9	296.1
LSD (0.05)		1.3	1.7	1.7	0.03	1.9	27.2

Figure 4. Genotypic Differences in Winter Survival after Grazing

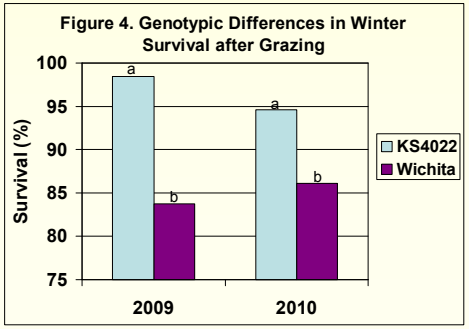

Table 3. Forage quality measurements of KS4022 and Wichita canola varieties following simulated grazing.

Treatment	Year	Protein (%)	ADF (%)	NDF (%)	NEM (Mcal/lb)	TDN (%)	RFV
KS4022	2009	26.5	19.0	21.3	0.88	76.5	332.1
Wichita		25.6	23.2	25.6	0.81	71.6	263.8
LSD (0.05)		2.5	2.2	1.8	0.04	2.6	29.2
KS4022	2010	28.4	19.5	22.6	0.87	75.9	309.5
Wichita		27.4	18.6	21.8	0.88	76.9	321.7
LSD (0.05)		NS	NS	NS	NS	NS	NS

Conclusions

- Removing forage after a killing freeze (POST) resulted in the greatest forage yields and the highest quality forage for livestock.
- Grazing either PRE or POST in the fall decreases winter survival by 10% to 30% and grain yield from 30% to 50%.
- Grazing canola in the spring provides a high-quality forage. However, spring grazing is not recommended if a producer wants to harvest grain because it delays flowering, increases seed moisture, and reduces test weight and yield.
- Livestock devour canola forage more rapidly following a killing freeze because the digestibility increases significantly.
- KS4022 has better winter survival following grazing treatments because its growing point is positioned closer to the soil surface.
- Pending another year's evaluation, KS4022 will be considered for release as a dual purpose winter canola variety.
- Greater winter survival following grazing improves yield potential by increasing plants per area, decreasing weed competition, and minimizing maturity differences at harvest. These factors are known to become problems following grazing.
- Future research will examine multiple fall nitrogen application rates and the effects on canola forage quality.

Acknowledgments

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