Effect of chickling vetch (*Lathyrus sativus* L.) or alfalfa (*Medicago sativa*) hay in gestating ewe diets

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Interpretive Summary

Chickling vetch (var. AC-Greenfix) hay did not reduce performance nor result in health-related complications when fed to gestating ewes. Chickling vetch hay was comparable to alfalfa hay when included in gestating ewe diets.

Introduction

Lathyrus sativus (grasspea or chickling vetch, guaya in Ethiopia, khesari in India; IPBO, 2003) is a common food legume widely grown and eaten throughout many parts of the world (Jaby El-Haramein et al., 1998; Small, 1999; IPBO, 2003). The nutritional composition of *L. Sativus* and *L. cicera* (two closely related species) is similar to that of other feed grain legumes (e.g. field pea [*Pisum sativum*], faba bean [*Vicia faba*], lupine [*Lupinus angustifolius*]; Hanbury et al., 2000; White et al., 2001). However, *Lathyrus* spp. can contain a large number of antinutritional substances that can reduce their potential as a raw, unprocessed feedstuffs (Foster et al. 1996; Grela et al., 2001). Most notable is a neurotoxin, 3-N-oxalyl-L-2,3-diaminopropionic acid (acronymns: β-oxalyl-diamino-propionic acid or ODAP and β-oxalyl-amino-alanine or BOAA), which can cause a paralysis of the lower limbs known as Alathyrism@ (Hanbury et. al., 2000; Grela et al., 2001).

In Canada, grass pea and chickling vetch are annual creeping vines that have been used primarily as green manure alternatives to summer fallow in small grain production systems to reduce wind and water erosion and increase soil nitrogen concentrations (Small, 1999). Grass pea and chickling vetch are both *Lathyrus sativus* differing in their inherent neurotoxin concentration (i.e. ODAP; Miller et al., 2003). Varieties that have been bred for reduced ODAP are generally referred to as grass pea, while varieties with normal ODAP concentrations are generally called chickling vetch. AC-Greenfix is a variety of chickling vetch developed at the Semiarid Prairie Agricultural Research Centre (SPARC) in Swift Current, Saskatchewan (DFS, 2003). It is marketed in the US by Dakota Frontier Seeds (Flasher, ND).

The objective of this preliminary study was to test the forage quality and general safety of chickling vetch hay compared to alfalfa (*Medicago sativa)* hay in gestating ewes.

Materials and Methods

Twenty pregnant, whitefaced ewes (BW = 170.6 ± 13.4 lb; condition score = 3.0 ± .33) were randomly allotted into one of four groups (5 ewes/group). Groups were then assigned to one of two dietary treatments. Treatments were ad libitum access to either alfalfa (ALFA) or chickling vetch (var. AC-Greenfix provided by Dakota Frontier Seeds, Flasher, ND; ACGF) hay. Standard supplementation (e.g. grain, minerals, vitamins) practices for gestating ewes at HREC were also provided uniformly to each group. Ewes were fed hays for 56 d prior to lambing. Ewes were weighed and condition scored (1 = very thin and 5 = obese) on days 0, 28 and 56. Ewes were shorn during the first 28 d on feed. Individual fleece weight averaged 12.0 lb. Liveweights during the study were not adjusted for fleece removal. Feed deliveries and refusals were recorded daily and weekly, respectively. Feed disappearance was the differences between hay delivery and refusal. Feed efficiency was calculated as liveweight gain divided by feed disappearance. One ewe on the alfalfa treatment lambed on day 18 of the treatment phase. This ewe and lambs were

maintained in their respective pen for the remainder of the phase to allow for calculation of feed disappearance. Gain data from this ewe was excluded from the data set and feed parameters adjusted to a per head basis for comparison purposes. Four ewes (two from each treatment) had not lambed by spring turnout. Calculations of lambs born and weaned reflect only those ewes that lambed after the treatment phase and before spring turnout to pasture. Data were analyzed as a completely random design using pen as the experimental unit for feed and efficiency data and animal as the experimental unit for liveweight and condition score data.

Results and Discussion

Nutritional composition of alfalfa and chickling vetch hay are reported in table 1. Dry matter and crude protein concentrations were similar between the two hay types. Chickling vetch tended to have more acid- and neutral-detergent fiber and lower calculated energy concentrations compared to alfalfa. Despite these differences, both hays were nutrient dense forage of high quality. One visible difference was the presence of a small amount of corn stover in the chickling vetch hay. Stover contamination was the result of corn being grown on the same field in the preceding year.

Body weight or gain and condition score or change were not affected ($P > .1$) by dietary treatment (Table 2). Ewes lost an average of 13.9 lb in the first 28 d. A majority of this loss was fleece weight. Ewes gained approximately 25.3 lb over the last 28 d. Ewes gained approximately 11.4 lb and 0.5 condition score units over the 56 d feeding period. Lambs born and weaned were also not affected by dietary treatment (Table 2). Ewes produced 1.4 lambs/ewe prior to spring turnout and weaned 1.3 lambs/ewe.

Hay delivery ($P < .01$), refusal ($P < .01$) and disappearance ($P = .02$) in the first 28 d was affected by dietary treatment (Table 3). ACGF had greater hay deliveries (.17 lb/d) and refusals (0.33 lb/d) and less disappearance (0.15 lb/d) compared to ALFA. Feed efficiency ($P = 1.0$) during the first 28 d was not affected by dietary treatment. During the second 28 d, feed delivery ($P = .08$) and refusals ($P < .01$) were increased 0.34 and 0.52 lb/d, respectively, by ACGF. Hay disappearance ($P = .35$) and feed efficiency ($P = .70$) were not affected by dietary treatment in the second 28 d. Overall hay delivery ($P = .04$) and refusal ($P < .01$) were increased 0.26 and 0.38 lb/d, respectively, by ACGF. Overall feed disappearance ($P = .19$) and efficiency ($P = .54$) were not affected by dietary treatment.

Chickling vetch produces a hay that is comparable to alfalfa hay in nutrient composition. No adverse affects were observed in gestating ewes fed chickling vetch hay compared to alfalfa hay. Observed increases in hay delivery and refusal of chickling vetch hay were probably related to the presence of corn stover in the hay bale that ewes tended to sort out and not consume. These preliminary data suggest no overt problems from feeding chickling vetch hay to sheep and that chickling vetch (var. AC-Greenfix) is comparable to alfalfa hay in gestating ewe diets.

Implications

Chickling vetch (var. AC-Greenfix) hay did not reduce performance nor result in health-related complications when fed to gestating ewes. Chickling vetch hay was comparable to alfalfa hay when included in gestating ewe diets.

Literature Cited

DFS. 2003. AC Greenfix. Dakota Frontier Seeds, Ltd. Flasher, ND. (http://acgreenfix.com/main.html).

Foster, J.G., K.E. Turner, C.L. Ernst and A.L. Ernst. 1996. Performance of feeder cattle offered a diet containing early-bloom stage flatpea silage. J. Prod. Agric. 9:415-418.

Grela, E.R., T. Studzinski and J. Matras. 2001. Antinutritional factors in seeds of *lathyrus sativus* cultivated in Poland. Lathyrus Lathyrism Newsletter. 2:101-104. (www.clima.uwa.edu.au/lathyrus/).

Hanbury, C.D., C.L. White, B.P. Mullan and K.H.M. Siddique. 2000. A review of the potential of *Lathyrus sativus* L. and *L. cicera* L. grain for use as animal feed. Lathyrus Lathyrism Newsletter. 1:34-35. (www.clima.uwa.edu.au/lathyrus/volume1/).

IPBO, 2003. IPBO Lathyrus Research. Plant Biotechnology Institute for Developing Countries. (www.ipbo.rug.ac.be/Ourresearch/Lathyrus.html)

Jaby El-Haramein, F., Abd-El Moneim, A. and Nakkoul, H. 1998. Prediction of the neuro-toxin beta-N-oxalyl-amino-L-alanine in Lathyrus species, using near infrared reflectance spectroscopy. J. Near Infrared Spectrosc. 6:93-96.

Miller. P., H. Cutforth, B. McConkey, D. Ulrich, B. Zentner and C. Campbell. 2003. Pulse crop production on the Canadian semi-arid prairies. Semiarid Prairie Agricultural Research Centre. Agriculture and Agri-Food Canada. (www.ipbo.rug.ac.be/Ourresearch/Lathyrus.html).

Small, E. 1999. New crops for Canadian agriculture. In: J. Janick (ed.), Perspectives on new crops and new uses. ASHS Press, Alexandria, VA. USA. pp.15-52.

White, C., C. Hanbury and K. Siddique. 2001. The nutritional value of *Lathyrus cicera* and *Lupinus angustifolius* grain for sheep. Lathyrus Lathyrism Newsletter 2:49-50. (www.clima.uwa.edu.au/lathyrus/volume2-1/index.htm)

Table 1. Nutrient composition of chickling vetch (var. AC-Greenfix; ACGF) and alfalfa (ALFA) hay fed to gestating ewes.

	Treatments	
Item	ACGF	ALFA
Dry matter (DM)	87.4	88.6
Crude Protein (CP), %DM	18.2	18.1
Acid Detergent Fiber (ADF), %DM	36.3	35.0
Neutral Detergent Fiber (NDF), %DM	48.6	44.6
Energies:		
Total Digestible Nutrients (TDN), %DM	60.6	61.7
Net Energy for Maintenance (NE_m), Mcal/lb DM	.60	.62
Net Energy for Gain (NE_g), Mcal/lb DM	.34	.36

Table 2. Effect of hay source on body weight and condition when fed to gestating ewes.

Item[b]	Treatments[a]		SE[c]	P-value[d]
	ACGF	ALFA		
Initial				
Weight	173.0	168.0	4.3	.43
Condition	2.9	3.1	.10	.17
Day 0 -28				
Weight	159.5	153.8	3.8	.31
Gain	-13.6	-14.2	1.5	.77
Daily gain	-.48	-.51	.055	.77
Day 28 - 56				
Weight	182.5	181.2	4.5	.85
Gain	23.1	27.4	2.2	.19
Daily gain	.82	.98	.080	.19
Day 0 - 56				
Gain	9.5	13.2	2.1	.25
Daily gain	.17	.24	.038	.25
Condition	3.3	3.7	.16	.12
- change	.40	.56	.16	.52
Number of lambs per ewe[e]				
Born	1.4	1.4	-	-
Weaned	1.4	1.2	-	-

[a] Treatments include ad libitum access to chickling vetch (var. AC-Greenfix; ACGF) and alfalfa (ALFA) hay for 56 d during gestation.
[b] Body weight and gain are expressed in lb and daily gain in lb/d. Body condition scored on a 5-point scale (1-very thin and 5-obese).
[c] Standard error.
[d] Probability of statistical significance.
[e] Two lambs in each treatment lambed after ewes and lambs went to pasture. Thus, lambs born and weaned for these ewes were unknown and recorded as 0. Also, one lamb in the alfalfa treatment lambed early during the gestation feeding period and lamb data from this ewe was removed from analysis.

Table 3. Effect of hay source on hay deliveries, refusal and disappearance and feed efficiency when fed to gestating ewes.

Item[b]	Treatments[a]		SE[c]	P-value[d]
	ACGF	ALFA		
Days 0 - 28				
Delivered	5.27	5.10	.0065	<.01
Refusal	-.49	-.16	.015	<.01
Disappearance	4.79	4.94	.015	.02
Efficiency	-10.1	-10.1	1.29	1.0
Days 28 - 56				
Delivered	5.73	5.39	.075	.08
Refusal	-.59	-.07	.033	<.01
Disappearance	5.14	5.32	.102	.35
Efficiency	16.0	18.1	3.39	.70
Days 0 - 56				
Delivered	5.51	5.25	.041	.04
Refusal	-.54	-.12	.020	<.01
Disappearance	4.97	5.13	.059	.19
Efficiency	3.41	4.47	1.03	.54

[a] Treatments include ad libitum access to chickling vetch (var. AC-Greenfix; ACGF) and alfalfa (ALFA) hay for 56 d during gestation.
[b] Hay delivery, refusal and disappearance are expressed as lb/d. Efficiency is body weight gain (table 1) expressed as a percentage of hay disappearance.
[c] Standard error.
[d] Probability of statistical significance.