91 Optimizing forage use in total mixed rations for lactating cows. R. Kowsar[1], G. R. Ghorbani[1], M. Alikhani[1], M. Khorvash[1], and A. Nikkhah*[2,3], [1]*Isfahan University of Technology*, *Isfahan, Iran*, [2]*Zanjan University*, *Zanjan, Iran*, [3]*University of Illinois*, *Urbana*.

The principal objective was to determine the effects of partial replacement of short-length alfalfa hay (AH, peNDF>8 mm = 14%) with corn silage (CS, peNDF>8 mm = 45%) in yellow grease supplemented total mixed rations on feed intake, chewing activity, rumen fermentation, and productivity of lactating cows. Four multiparous (138 ± 3 days in milk) and four primiparous (115 ± 10 days in milk) Holstein cows were used in a replicated 4 × 4 Latin square design study with four 21-d periods. Each period had 14-d of adaptation. Treatments were diets (dry matter based) with 1) 40% alfalfa hay (ALF), 2) 24% alfalfa hay + 16% corn silage (CS40), 3) 20% alfalfa hay + 20% corn silage (CS50), and 4) 16% alfalfa hay + 24% corn silage (CS60). All diets contained 2% yellow grease. Cows had greater ($P < 0.05$) intakes of net energy, neutral detergent fiber, and physically effective fiber when CS replaced 40, 50, and 60% of short AH. Replacing short AH with CS lengthened daily eating and chewing times in all cows, and increased rumen pH at 4-h post-feeding in multiparous cows ($P < 0.05$) but did not affect it in primiparous cows. Apparent total tract digestibility coefficients for dry matter, organic matter and crude protein were not different among ALF, CS40 and CS50 fed cows but were lower ($P < 0.05$) in the CS60 fed cows (71, 72, 71%) than in the ALF group (75, 77, 76%). Energy corrected milk yield was greater ($P < 0.05$) in CS40 (33.8 kg) and CS60 (34.0 kg) groups than in the ALF group (31.9 kg). Milk protein yield was increased ($P < 0.05$) when CS replaced 40, 50, and 60% of AH. Milk lactose was higher only in the CS60 fed cows, but milk lactose yield was greater in CS50 and CS60 fed cows, compared to the ALF fed cows. Milk percent and yield of fat and total solids and changes in body condition score did not differ among treatments. Therefore, partial replacement of short-length AH with CS enhanced diet palatability, stimulated energy and physically effective fiber intakes, and increased milk protein yield.

Key Words: Alfalfa Hay, Corn Silage, Yellow Grease

92 Fenugreek as forage for dairy cows 1. Effect on productivity. A. W. Alemu* and L. Doepel, *University of Alberta*, *Edmonton, AB, Canada*.

Fenugreek (*Trigonella foenum-graecum L.*) is a novel forage crop to Canada that is being studied as an alternative forage to alfalfa for dairy cows. The objective of this study was to evaluate the effect of fenugreek haylage relative to alfalfa haylage on productivity of dairy cows. Six 2nd lactation Holstein cows (56 ± 8 DIM) fitted with ruminal cannula were used in a replicated 3x3 Latin square design with 18 d periods, the last 7 d being used for collection. A TMR consisting of 40% haylage, 10% barley silage and 50% concentrate on a DM basis was fed once daily. The haylage component constituted the dietary treatments: 1) AAFC F70 fenugreek (F70), 2) CDC Quatro fenugreek (QUAT) and 3) Alfalfa (ALF). Apparent total tract digestibility of the diets was determined by feeding chromic oxide at 21 g/d as an indigestible marker. Data were analyzed using orthogonal contrasts of alfalfa vs. fenugreek (FEN) and F70 vs. QUAT. DMI, milk yield, and milk protein and lactose yields were higher ($P < 0.05$) for cows fed ALF than FEN, whereas milk fat yield and percent were unaffected by treatment. Milk urea N (MUN) was lower in the ALF fed cows than the fenugreek fed cows ($P = 0.003$). Total-tract digestibility of DM (77.4%), CP (78.3%), NDF (63.5%) and ADF (59.5%) was unaffected by treatment. Our results suggest that although the digestibility of the fenugreek diets was equivalent to that of the alfalfa diet, fenugreek haylage has a lower feeding value than alfalfa for lactating dairy cows due in part to lower DMI, resulting in lower milk yield. As such, it may not be a suitable alternative to alfalfa haylage.

Table 1.

	Treatment				Contrasts	
	F70	QUAT	ALF	SEM	ALF vs. FEN	F70 vs. QUAT
DMI, kg/d	16.8	18.7	22.9	0.7	<0.001	0.10
Milk yield, kg/d	31.8	32.4	39.1	1.9	<0.001	0.63
Milk fat, %	2.64	2.66	2.43	0.2	0.11	0.85
Milk fat, g/d	837	862	943	70.5	0.17	0.73
Milk protein, %	2.83	2.85	3.04	0.1	<0.001	0.48
Milk protein, g/d	908	923	1188	46.5	<0.001	0.75
Milk lactose, %	4.58	4.59	4.66	0.04	0.02	0.52
Milk lactose, g/d	1473	1490	1827	83.9	<0.001	0.80
MUN, mg/dl	16.3	15.9	13.9	0.8	0.003	0.52
Total tract digestibility						
DM	77.6	76.0	78.6	1.9	0.40	0.53
CP	78.0	77.7	79.1	1.8	0.49	0.87
NDF	67.3	62.1	61.2	3.2	0.27	0.18

Key Words: Fenugreek, Milk Production, Apparent Digestibility

93 Brown midrib corn silage fed during the transition period can result in a persistent increase in production. W. C. Stone*[1], L. E. Chase[1], T. R. Overton[1], J. L. Lukas[1], and K. E. Nestor[2], [1]*Cornell University*, *Ithaca, NY*, [2]*Mycogen Seeds*, *Wooster, OH*.

Holstein cows (n = 66) entering second or greater lactation were used to determine whether feeding Brown Midrib (BMR; Mycogen F2F444) or conventional (a mixture of varieties) corn silage (CS) would improve performance and metabolism. Cows were fed diets that differed in source of CS from 3 wk precalving until 3 wk postcalving. Diets were formulated to keep all parameters the same with the exception of NDF digestibility. The NDF-d (30 h) for conventional and BMR silages averaged 56.8 and 73.8%, respectively. Prepartum rations contained about 47% CS, 18% wheat straw, 7% alfalfa haylage (AH), and 28% concentrate (DM basis). Postpartum rations contained about 40% CS, 15% AH, 1% straw, and 44% concentrate. All cows were fed a separate ration containing only conventional CS as the CS source from wk 4 to 15. Cows were housed in tiestalls and had milk weights (3X/d) and DMI recorded daily and milk composition measured weekly. Blood samples collected weekly during the transition period were analyzed for NEFA and BHBA. Cows fed BMR had higher DMI during the 2 wk period before calving and 3 wk period postcalving. Yields of milk, fat-corrected milk (FCM), and solids were increased for the first 15 wk of

lactation period for cows fed rations containing BMR. Concentrations of peripartal NEFA and postpartum BHBA were not affected by treatment. Feeding BMR CS during the transition period resulted in increased milk and milk solids yield during the first 15 wk of lactation.

Table 1. Effects of BMR or conventional corn silage on cow performance

	Control	BMR	SE	P value
Prepartum DMI, d -21 to -1, kg/d	13.8	14.6	0.38	0.14
Prepartum DMI, d -14 to -1, kg/d	13.2	14.3	0.35	0.03
Postpartum DMI, d 0 to 21, kg/d	18.2	20.2	0.41	0.001
Milk, kg/d	43.1	45.4	0.9	0.07
3.5% FCM, kg/d	45.1	48.1	1.1	0.07
Fat, %	3.85	3.90	0.07	0.66
True protein, %	3.06	3.01	0.11	0.72
Milk solids, kg/d	5.32	5.67	0.10	0.02

All production results are averages for the first 15 wk of lactation.

Key Words: Brown Midrib, Corn Silage, Transition Period

94 Production response of lactating cows to combinations of BMR corn silage and Tifton 85 bermudagrass hay. J. J. Castro*, N. A. Mullis, and J. K. Bernard, *University of Georgia*, *Athens*.

The effect of feeding combinations of forages with improved NDF digestibility on performance was evaluated in an 8-wk randomized design trial. Treatments were arranged as a 2 x 2 factorial to include silage from either normal (NCS) or brown midrib silage (BMR) with or without Tifton 85 (T85) bermudagrass hay. Experimental diets contained 50% forage with 3 to 5 % of DM provided by ryegrass silage. Treatments were 1) NCS; 2) BMR; 3) NCS plus T85; and 4) BMR plus T85. Diets were formulated to be isocaloric and isonitrogenous but differed in NDF concentrations: 30, 31, 34, and 34% of DM for treatments 1 through 4, respectively. Forty Holstein cows averaging 82 ± 19 DIM, 41.6 ± 8.9 kg/d milk, and 3.2 ± 0.2 % fat were assigned randomly to treatments at the end of 2 wk standardization period. Mean DMI, milk yield, fat and protein percentage and ECM yield during the trial were 24.7, 40.6, 3.12, 2.94, and 38.8; 26.4, 41.0, 3.31, 2.86, and 40.0; 24.7, 38.1, 3.65, 2.87, and 38.8; and 25.6 kg/d, 39.8 kg/d, 3.35 %, 2.85 %, and 39.0 kg/d for treatments 1, 2, 3, and 4, respectively. Cows fed diets with BMR had higher ($P < 0.01$) DMI than those fed NCS. Milk yield was lower ($P < 0.05$) but fat percentage was higher ($P < 0.05$) when cows were fed diets with T85 hay compared with those that did not receive T85. No differences were observed in milk protein concentrations or yield of fat, protein, or ECM among treatments. Blood glucose was higher ($P < 0.05$) in cows consuming diets with BMR than with NCS and averaged 64.2, 69.7, 67.2, and 68.7 mg/dl for treatments 1, 2, 3, and 4, respectively. An interaction ($P < 0.05$) between corn silage type and T85 was observed for plasma urea concentrations because of higher concentrations with BMR than NCS diet when T85 was added; (15.7, 13.7, 16.3, and 18.0 mg/100 ml for treatments 1, 2, 3, and 4, respectively). The results of this trial indicate that including T85 at 10 % of DM in diets based on normal or BMR plus ryegrass silage can maintain acceptable DMI and overall performance.

Key Words: Forage Evaluation, NDF, Tifton 85

95 Effect of wheat forage maturity and preservation method on dietary passage kinetics and DM digestibility of mixed diets fed to growing beef calves. P. Beck*, F. Nacer, B. Stewart, D. Shockey, M. Morgan, and S. Gunter, *University of Arkansas Division of Agriculture*, *Hope*.

Wheat (*Triticum aestivum* L.) forage was harvested at the boot or hard dough stage of maturity, preserved as hay or silage, and fed in total mixed diets (80:20 concentrate:forage ratio, DM basis) in order to measure the effect of maturity at harvest and preservation method on particulate passage rate and apparent DM digestibility. Six 1.2-ha wheat fields were harvested at either boot or dough stage of maturity and either ensiled or stored as hay. Hay or silage was incorporated into 14.5% CP diets using soybean hulls, corn, and cottonseed meal as primary concentrate sources. Beef calves (n=16, BW=187 ± 9.4 kg) were individually fed 2.0% of BW diets for 15 d in a completely randomized design with a 2 x 2 factorial arrangement of treatments. Calves received a pulse dose of 2.5 g $YbCl_3$ and fecal samples were collected at 6, 12, 24, 36, 48, 60, 72, and 96-h post dosing. Extraction of Yb was completed using an EDTA procedure and analyzed with Inductively Coupled Plasma spectrometry. Fecal Yb excretion curves were analyzed by nonlinear regression procedures of SAS using a one-compartment model (Marquardt method). Ruminal particulate passage rate (**PPR**) was determined by rate of ruminal mixing x 0.59635, mean ruminal retention time was calculated by 1/PPR, and fecal output was determined by Yb dose/K0. Acid detergent insoluble ash (**ADIA**) was used as an internal marker to determine diet DM digestibility. Data were analyzed using the GLM procedure of SAS using animal as the experimental unit. Ruminal PPR, RRT, fecal output, and diet DM digestibility averaged 4.6%/h, 22.7 h, 3.7g/kg BW, and 81.6%, respectively and were not affected ($P \geq 0.15$) by forage maturity, preservation method, or the interaction. This study indicates that maturity of wheat forage at harvest and preservation method has no affect on kinetics of dietary passage or digestibility when fed as 20% of a total mixed diet.

Key Words: Digestibility, Passage Rate, *Triticum aestivum* L.

96 Effect of maturity and preservation method of wheat forage on the performance of growing beef calves fed mixed diets. M. Morgan*, P. Beck, F. Nacer, B. Stewart, D. Shockey, and S. Gunter, *University of Arkansas, Division of Agriculture*, *Hope*.

Wheat (*Triticum aestivum* L.) forage was harvested at the boot or hard dough stage of maturity, preserved as hay or round-bale silage, and fed to growing calves in total mixed diets to determine the effects of maturity at harvest and preservation method on animal performance. Six 1.2-ha wheat fields were cut using a disc mower at either the boot or dough stage of maturity. One-half of each field was either round baled within 24 h and ensiled or baled as hay. Fresh cut forage contained 24 and 57% DM, 15 and 8% CP, and 19 and 23% NFC, for boot and dough harvest, respectively. After 3 months of storage, boot cut silage contained 22, 17, and 18% DM, CP, and NFC, respectively; while hay contained 91, 15, 5.5% DM, CP, and NFC. Dough cut silage contained 47, 10, and 18% DM, CP, and NFC, respectively; while hay contained 91, 9, 22% DM, CP, and NFC. The hays or silages were incorporated into 14.5% CP diets at 20% (DM basis) using soybean hulls, corn, and cottonseed meal as the concentrate sources. Growing beef calves (n=84, BW=229 ±

6.0 kg) were randomly assigned to the 4 diets and fed at 3% (DM basis) of BW for 63 d in a 2 x 2 factorial arrangement with 3 pens/treatment. Animal performance data were analyzed as a completely randomized design using the mixed procedure of SAS. Forage yield, feed intake and G:F was analyzed using the GLM procedure of SAS. Forage yield at the dough harvest was greater ($P < 0.01$) than at boot harvest (2,781 vs. 6,259 ± 246 kg/ha, respectively). Average daily gain (1.20 ± 0.05 kg), DMI (7.4 ± 0.15 kg), and feed efficiency (0.16 ± 0.01) were unaffected ($P \geq 0.55$) by maturity at harvest, preservation method, or their interaction. The results indicate that forage maturity at harvest and preservation method has no affect on animal performance of growing beef steers when fed at 20% of mixed diets.

Key Words: Cattle, Hay, Silage

97 Comparison of grazing stockpiled tall fescue versus feeding hay or hay plus supplement to beef cows in late gestation and early lactation. A. M. Meyer*, R. L. Kallenbach, and M. S. Kerley, *University of Missouri*, *Columbia*.

Ninety-three beef cows (avg BW = 624.5 ± 11.7 kg, avg BCS = 5.0 ± 0.1) were allocated by BW, BCS, age, and calving date to 1 of 3 treatments (3 replicates each): grass hay fed to cows on dormant, previously grazed pastures (HAY), grass hay with supplementation (1.1 kg corn and 0.9 kg DDGS•cow^{-1}•d^{-1}) to meet predicted NRC requirements (HS), and strip-grazed non-endophyte infected stockpiled tall fescue pasture (STF). The trial was conducted from mid December to late March and split into 2 periods: from initiation to 1 wk precalving (P1, d 1 to 68) and from precalving until conclusion (P2, d 69 to 103). Average nutrient composition of STF was better than that of hay (11.8% vs. 8.0% CP, 67.2% vs. 74.2% NDF). Stockpiled pastures had an average yield of 2,691 kg DM/ha and average utilization rate of 60.6%. Hay offered did not differ ($P > 0.05$) between HAY and HS (12.4 vs. 11.8 kg•cow^{-1}•d^{-1}, respectively). During P1, HAY cows lost BW while HS and STF cows gained BW (-9.7 vs. 21.1 and 14.5 kg, respectively; $P < 0.05$), despite having similar BCS and ultrasonic back fat (BF) thickness. Although no differences were observed in BW or BF during P2, HAY cows lost more BCS ($P < 0.05$) than HS and STF cows (-0.6 vs. -0.2 and -0.1, respectively). Over the entire trial, HAY cows lost more ($P < 0.05$) BW, BCS, and BF than HS and STF cows (BW: -85.0 vs. -49.3 and -52.0 kg, BCS: -0.9 vs. -0.3 and -0.2, BF: -0.53 vs. -0.33 and -0.28 cm). No differences ($P > 0.05$) were observed for cow BW changes post-trial through weaning, pregnancy rates, or calf birth and weaning weights. Post-trial, HAY cows gained more ($P < 0.10$) BCS than HS (0.7 vs. 0.3), and HAY ($P < 0.05$), and HS ($P < 0.10$) gained BCS compared to a loss in STF cows (-0.1) through weaning. Results of this study indicate that grazing STF is a viable option for wintering spring-calving beef cows. Because typical grass hay used is often of lower quality than STF, cows fed hay require supplementation to achieve similar performance to that observed while grazing STF.

Key Words: Beef Cows, Stockpiled Tall Fescue, Supplementation

98 Associative effects of leguminous (C3; Lucern) and nonleguminous (C4; Corn & sorghum) fodders on In-situ digestion kinetics of fiber. M. Yaqoob*[1], J. I. Sultan[2], A. Jeved[2], and P. Akhtar[3], [1]*Department of Livestock Management, University of Agriculture*, *Faisalabad, Punjab, Pakistan*, [2]*Institute of Animal Nutrition and Feed Technology, University of Agriculture*, *Faisalabad, Punjab, Pakistan*, [3]*Department of Animal Breeding and Genetics, University of Agriculture*, *Faisalabad, Punjab, Pakistan*.

An in sacco Nylon Bag study was conducted to evaluate the associative effects of leguminous (C3; Lucerne) and nonleguminous (C4; corn & sorghum) fodders. Lucerne was replaced at the rate of 15, 30 and 45% with corn and sorghum fodders respectively. The respective fodder samples were filled in each Nylon bag (10g) and incubated in the rumen of fistulated buffalo calf at 0, 0.5, 1, 2, 4, 6, 10, 12, 24, 36, 48 and 72 hours respectively. The bags were suspended in reverse order so that all the bags were pulled out together. The data regarding lag time rate of disappearance and extent of digestion were analyzed using analysis of variance techniques. Lucerne substitution increased ($P<0.05$) the in sacco DM and NDF digestibility (48h) of corn and sorghum with maximum value at 30% replacement level. However, a declining trend was observed with the higher substitution level. A similar trend was noticed in rate of disappearance of DM and NDF of corn and sorghum. Lucerne substitution decreased the ($P<0.05$) the lag time for DM and NDF disappearance in sacco upto 30% replacement level for both nonleguminous fodders however, an increasing trend was observed at 45%, substitution level. The extent of in sacco DM and NDF digestion was unaffected ($P<0.05$) by Lucerne substitution. A positive associative effect was observed by replacing the Lucerne (C3) with corn and sorghum (C4) fodders, which was maximum at 30% Lucerne replacement.

Key Words: Lucerne, Sorghum, Lag Time