COMPARISON OF COMPOSITION AND DEGRADATION CHARACTERISTICS OF EARLY BLOOM ALFALFA WITH FENUGREEK (*TRIGONELLA FOENUM-GRAECUM)* FORAGES HARVESTED AT DIFFERENT STAGES OF MATURITY

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ABSTRACT
The objective of this study was to compare the composition and degradation characteristics of early bloom alfalfa and fenugreek harvested after 9, 15 and 17 wk of growth. Crude protein (CP) content of fenugreek cut at 9, 15 and 17 wk was lower (P<0.05) than that of alfalfa. Neutral detergent fibre (NDF) and lignin content of fenugreek harvested after 15 and 17 wk were higher (P<0.05) than that of alfalfa. Ash content was lower (P<0.05) in fenugreek than for alfalfa. *In vitro* dry matter disappearance (IVDMD) of fenugreek cut at 15 and 17 wk was similar to that of alfalfa. Total *in vitro* gas production of fenugreek cut at the three stages of growth was not significantly different from those observed for alfalfa. Results indicate that chemical composition and IVDMD of fenugreek at all stages of maturity were comparable to that of early bloom alfalfa.

KEYWORDS
Alfalfa, fenugreek, digestibility, gas production, forage quality

INTRODUCTION
Fenugreek (*Trigonella foenum-graecum*) is an annual legume cultivated in the tropics and Middle East for human consumption. Dua et al. (1973) and Mir et al. (1993, 1997) have described potential merits of this crop as an annual forage legume for ruminants. The estimated dry matter (DM) yield of fenugreek from the plots at Lethbridge Research centre 19 wk post seeding was approximatelt 10.4 t ha^{-1} (Mir et al., 1997) compared with 12.5 t ha^{-1} DM at 20 to 22 wk of growth in the United Kingdom (Stapleton, 1982). Compared to other annual legumes, very little research has been conducted on hay prepared from fenugreek. Therefore, the objective of this study was to compare nutrient composition and degradation of fenugreek hay harvested after 9, 15 and 17 wk of growth with alfalfa harvested at early bloom.

MATERIALS AND METHODS
A 3.2 ha field was seeded with inoculated AC amber fenugreek seed at the Lethbridge Research Centre on May 18, 1995. Fenugreek consisting of whole plants clipped manually 5 cm above ground level in quadruplicate at 9, 15 and 17 wk after seeding. Alfalfa was harvested at early bloom from the adjacent field. At each collection, samples were chopped, mixed and oven-dried at 60°C to constant weight. Dried samples were ground and analyzed for CP, NDF, acid detergent fibre (ADF), lignin, ash, calcium and phosphorus. In vitro DM disappearance (IVDMD) was determined after incubation with rumen fluid for 48 h using the first stage of the Tilley and Terry (1963) technique. *In vitro* gas production was determined as described by Menke et al. (1979) in triplicates. Gas production data were fitted using nonlinear regression to the equation $P=a+b\ (1-e^{-c(t-Lt)})$ (Dhanoa, 1988). Data were analyzed using General Linear Models procedure as a completely randomized block design experiment. Means were compared using the Student-Newman-Keul's test.

RESULTS AND DISCUSSION
Crude protein content of forages from fenugreek cut at 9 wk was higher (P<0.05) than fenugreek cut at 15 or 17 wk (Table 1). The CP of fenugreek forage in the present study was greater than reported values of 12.7% after 20-22 wk of growth (Stapleton, 1982) and 13.9 to 14.4% on a DM basis at the dough stage (Dua et al., 1973) but lower than those reported by Mir et al. (1997) at 9, 15 and 19 wk of growth. The differences between reported values and those determined in the present study may be due either to differences in plant maturity or growing conditions or seasonal variation. Total cell wall as indicated by NDF content was lower (P<0.05) for fenugreek cut at 9 wk than alfalfa, however, it was higher for fenugreek cut at 15 or 17 wk. Acid detergent fibre content of all fenugreek samples was similar to that of early bloom alfalfa. Lignin content of fenugreek cut at 9 wk and 17 wk were similar to that of early bloom alfalfa. These values for ADF and lignin were similar to earlier values reported by Mir et al. (1997) at 9, 15 and 19 wk of growth. Ash content of the fenugreek cut at 9 wk after seeding was higher (P<0.05) than fenugreek cut at 15 or 17 wk and early bloom alfalfa. The calcium/phosphorus ratio in fenugreek at all stages of growth (5.7-6.1%) was lower than in early bloom alfalfa (9.2%). The IVDMD of the forages from fenugreek cut at 9 wk was not significantly different of early bloom alfalfa but was lower (P<0.05) than that of fenugreek cut at 15 and 17 wk . These IVDMD values were lower than those reported by Mir et al. (1997) at 9, 15 and 19 wk of growth but greater than those reported by Dua et al. (1973). The potential for gas production was similar for fenugreek cut at the three stages of growth and early bloom alfalfa (Table 2) and are comparable to values reported by Mir et al. (1997). A decline in lag time prior to initiation of gas production with advancing age of fenugreek was also noted. These results indicate that the quality of fenugreek grown under irrigated prairie conditions, is comparable to that of early bloom alfalfa and has the potential to be used as a forage crop for ruminants.

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Table 1
Chemical composition and *in vitro* dry matter disappearance (IVDMD) of alfalfa and fenugreek forages harvested at different stages of growth

	Fenugreek age of plants (wk)			Alfalfa	
% DM	9	15	17	early bloom	SEM[z]
CP	19.7[b]	15.1[c]	15.5[c]	24.6[a]	0.26
NDF	29.0[c]	38.9[a]	40.4[a]	34.7[b]	0.44
ADF	27.0	32.0	33.5	27.6	2.80
Lignin	5.0[c]	7.0[a]	6.3[ab]	5.6[bc]	0.20
Ash	12.9[a]	9.5[c]	8.7[d]	10.6[b]	0.07
Ca	2.0[b]	1.6[c]	1.5[d]	2.2[a]	0.02
P	0.33[a]	0.28[b]	0.27[b]	0.24[c]	0.004
IVDMD	59.8[a]	54.6[b]	54.2[b]	58.0[ab]	0.99

[z] Standard error of the mean.
[a-c], Means in the same row with different superscripts are different (P<0.05).

Table 2
Kinetics of *in vitro* gas production of 9, 15 and 17-wk-old fenugreek and early bloom alfalfa

	Fenugreek age of plants (wk)			Alfalfa	
	9	15	17	early bloom	SEM[z]
$(a + b)y$	23.2	23.5	22.3	25.5	0.94
c^y	20.1	14.4	14.8	16.5	0.01
lag^y	0.67	0.27	0.28	0.75	0.17

[z] Standard error of the mean.
[y] (a+b) is potential gas production (mL 100 mg^{-1} DM), c is rate constant of gas production (% h^{-1}), lag is lag time (h) prior to initiation of gas production in the model $P = a + b\ (1- e^{-c(t-Lt)})$ (Dhanoa, 1988).