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Full Length Article

Effect of *Prangos ferulacea* Replacement for Alfalfa on Growth Performance and Carcass Characteristics of Lori Lambs

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ABSTRACT

This study was conducted to determine the effect of replacement of alfalfa hay (*Medicago sativa*) with *Prangos ferulacea* hay on growth performance and carcass characteristics of fattening Lori lambs. Alfalfa hay was replaced with *P. ferulacea* hay at 0 (diet 1), 35 (diet 2), 60 (diet 3), and 100% (diet 4) levels on a dry matter basis, in the ration of fattening lambs. Each ration was fed to 10 three-month-old Lori lambs over a period of 84 days. Average dry matter intake (DMI; kg day^{-1}), average daily gain (ADG; g day^{-1}) and feed conversion (F/G) ratios of lambs fed diets 1, 2, 3 and 4 were 1.23, 1.27, 1.25 and 1.30; 230.1, 215, 220 and 211; and 5.34, 5.90, 5.68 and 6.16, respectively. There was no difference ($P>0.05$) between four diets for the DMI, ADG and F/G. Replacement of alfalfa hay with *P. ferulacea* hay did not affect ($P>0.05$) the carcass meat and bone percentage. However, fat tail percentage differed ($P<0.01$) among various rations. At present costs, the inclusion of *P. ferulacea* in the ration of fattening lambs seems to be cost effective.

Key Words: *Prangos ferulacea*; Alfalfa hay; Fattening lambs; Growth performance; Carcass characteristics

INTRODUCTION

The provision of adequate quantities of cheap high quality forage is a major challenge in the development of livestock production systems throughout the Mediterranean and Middle-east. While the growing of fodder crops and sown pastures has been encouraged, there is a need to identify local plants that can offer high quality nutrition to grazing livestock (Gulsen & Inal, 1995). A native plant, *Prangos ferulacea* (family: Umbelliferae), is found in high mountain areas of South-east Iran. *P. ferulacea* is present in the Balkans, Italy, Sicily, Syria, Turkey and Caucasia. In Iran, it is found at 1000–2800 m as sea level in regions such as Kohgiloya and Bovirahmad, Fars, Azarbayejhan, Kordestan, Hamadan and Lorestan province. Local farmers cut and wilt the plant, known locally as Jashire, in the field prior to feeding it to sheep, as it is claimed that the fresh plant is not readily consumed. Furthermore, according to local farmers, 100 kg of the dried material can meet the requirement of sheep through the winter without supplementary feeding. It is perennial and grows to a height of 50–150 cm. A full description of *p. ferulacea* is given in Davis (1972). The purpose of this study was to investigate the effect of replacement of alfalfa (*Medicago sativa*) hay with *P. ferulacea* hay on performance and carcass characteristics of Lori lambs.

MATERIALS AND METHODS

This research was conducted using 40 Lori lambs of 3 months age with an average weight (initial body weight) of 20.8 ±1.1 kg during a period of 84 days. The lambs were divided at random in to four groups and kept indoor in four semi-opened pens. They were fed on four diets containing various levels of alfalfa (*Medicago sativa*) hay that was replaced with *P. ferulacea* hay at 0 (diet 1), 35 (diet 2), 60 (diet 3) and 100% (diet 4) on dry matter basis in the ration with equal nutrient level (Table I). Samples of *P. ferulacea* hay were collected at rang and for comparison a sample of alfalfa hay was also analysed (Table II). Metabolic Energy of the diets was calculated as DE × 0.82 (NRC, 1985). Nitrogen was determined by the Kjeldahl method (AOAC, 1999) and CP was calculated as N × 6.25. Neutral and acid detergent fiber (NDF, ADF) were determined by the method of Van Soest *et al.* (1991). NDF was analyzed with the addition of α amylase (EC 232. 560.9 Sigma) but without sodium sulfite. The diets were formulated according to NRC (1985) for daily gain (250 g day^{-1}).

Lambs were adapted to diet 14 days before the experiment. The diets were provided for lambs two times a day (8 AM & 12 Noon). Feed consumption and refusal were daily collected, recorded and body weights recorded every 14 days. At the end of experiment, four groups of lambs were slaughtered after 24 h fasting period. Analysis of body was carried out on commercial way at Standard and Industrial Researches Institute of Iran (Anonymous, 2005). Contents of the digestive tract were collected and weighed to obtain the empty body weight. Carcass components and parts (lean, fat & bone, thigh etc.) were dissected and relative weight of each component was calculated as percentage of empty body weight. Design of experiment

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was completely randomized with four treatments. Data were analyzed by analysis of variance using proc ANOVA (SAS, 1996). Duncan multiple range test (DMRT) was used to test the significant difference between the means.

RESULTS AND DISCUSSION

Nutritive value of *P. ferulacea.* The results of the chemical analyses of *P. ferulacea* hay are shown in Table I. The CP concentration in the whole plant was 114 (g kg^{-1}) DM. This value is broadly similar to those found in plants of the Graminae family (Ensminger *et al*., 1990). The DM degradability values of *P. ferulacea* were similar to those reported for maize (796 - 845 g kg^{-1}) DM (Flachowsky *et al*., 1993). The ME values for *P. ferulacea* compared very favorably with those of other forages. Givens *et al.* (1992) reported that the ME concentration of early season perennial ryegrass, containing 198 g kg^{-1} DM CP and 543 g kg^{-1} NDF, was 11.5 (MJ kg^{-1}) DM. Maize silage is commonly regarded as a very high-energy forage with a typical ME concentration of 11.7 MJ kg^{-1} DM (Moss *et al*., 1992). Thus it is suggested that *P. ferulacea* can be used not only as basic forage in the diet of ruminants, but also as a high-energy feed. The high-energy concentration suggests that *P. ferulacea* probably has a high concentration of soluble carbohydrate. *P. ferulacea* can be described as a high-energy feedstuff, based on estimates of DM and OM digestibilities and ME concentrations.

Growth performance. There was no difference ($p>0.05$) between groups for mean daily dry matter intake, average daily gain and feed conversion ratio (Table III). However, average daily gain of lambs fed on 100% alfalfa hay (230 ± 21.7 g day^{-1}) was slightly higher than lambs fed on 35, 60, and 100% levels of *P. ferulacea* hay. This showed that considering the higher biological value of alfalfa compared to *P. ferulacea*, this matter could not take important effect on weight gain of lambs fed on alfalfa. These results support the findings of Eilami and Noroozian (1995). Average dry matter intake (DMI) of lambs fed diets 1, 2, 3 and 4 were 1.23, 1.27, 1.25, 1.30 kg day^{-1}, respectively. Similar results were also reported by Eilami and Noroozian (1995) on Karakul lambs. Coskun *et al*. (1996) reported that dry-matter (DM) degradability and *in vitro* DM (IVDMD) and organic matter digestibility (IVOMD) of *P. ferulacea* hay was higher than alfalfa hay. Total average of dry matter intake in this experiment was 1.26 kg. Feed conversion in terms of kg DM per kg gain was better for the group fed 100% alfalfa. These results are in agreement with results obtained later (Eilami & Noroozian, 1995).

Carcass characteristics. There was no difference ($p>0.05$) among different groups about initial body weight, final body weight, dressing warm carcass weight, bone and meat percentage and thickness of fat on rib 12 (Table IV). Fat tail percentage, was much higher for lambs fed with 100% *P. ferulacea* ration. This is in agreement with the results obtained by Eilami and Noroozian (1995). Total average of dressing warm carcass weight in this experiment was 52.94% so it can be said that Lori sheep is ranged in heavy weight breed. There is non-significant difference between four groups in case of meat percentage, while the percentage of knife-separable fat was significantly higher ($p<0.05$) for lambs fed 100% *P. ferulacea* ration (33.1 ±2.81). In other words, the efficiency of changing alfalfa protein to meat was greater than *P. ferulacea* or lambs fed on alfalfa have better carcass quality than lambs fed on *P. ferulacea*. Generally, diet containing alfalfa is preferred than *P. ferulacea* for percent of valuable pieces of body such as fillet, thigh, etc.

Table I. Ingredient and chemical composition of experimental feeds

	Experimental diets			
Ingredient (g kg^{-1})	**1(0% P.F)**	**2(35%P.F)**	**3(60%P.F)**	**4(100%P.F)**
Barely	680	650	630	580
Alfalfa	200	130	80	--
P. ferulacea	--	73	126	215
Soybean meal	97	95	95	100
Bran	5	34	50	88
Oyster shell	3	2	2	1
Salt	3	4	5	5
Mineral premix [a]	5	5	5	5
Vitamin premix [b]	5	5	5	5
Limestone	2	2	2	1
DM (g kg^{-1})	870.1	873.3	874.8	880.8
CP (g kg^{-1})	160	160	160	160
ME (MJ kg^{-1})	11.91	11.99	12.02	12.12
NDF (g kg^{-1})	247.7	241.7	236.2	231.3
ADF (g kg^{-1})	125.3	119.7	115.4	110.8
Ca (g kg^{-1})	5.2	5.4	5.1	5.5
P (g kg^{-1})	3.5	4.2	4.3	4.3

P.F, *Prangos ferulacea*

[a]contained Salt, 90 ppm Se, 1.6% Zn, 8,000 ppm Mn 4,600 ppm Fe, 70 ppm I, 60 ppm

[b]contained 1,763,680 IU of vitamin A and 881,840 IU vitamin D per kilogaram.

Experimental diets, 1, 2, 3 and 4 alfalfa hay was replaced with *P. ferulacea*

hay at 0, 35, 60, and 100% levels, respectively on a dry matter basis

Table II. Chemical composition of *Prangos ferulacea*

	P. ferulacea	**Alfalfa**
Dry matter (g kg^{-1})	950	910
Crude protein (g kg^{-1})	114	120
Metabolic energy (MJ kg^{-1})	10.57	8.44
Ether extract (g kg^{-1})	34.7	14.2
NDF (g kg^{-1})	240	416
ADF (g kg^{-1})	210	328
Nitrogen free extract (g kg^{-1})	568	467

CONCLUSION

There was little numerical difference in average daily gain or feed conversion between lambs fed the diets with 35 or 60% *P. ferulacea*. This suggested that alfalfa hay can be replaced by P. ferulacea in rations for finishing lambs in levels from 35 to 60% ; higher levels increased fat in carcass and tail of lambs. ME concentrations of the whole

Table III. Growth performance of lambs in experimental groups

Item	Experimental diets			
	1(0% P.F)	**2(35%P.F)**	**3(60%P.F)**	**4(100%P.F)**
Initial body weight ±SD (kg)	20.81 ±0.88	21.04 ± 0.67	20.86 ±1.2	21.95 ±1.3
Mean daily DM intake (kg)	1.23	1.27	1.25	1.30
Average daily gain ± SD (g)	230 ± 21.7	215 ± 10.8	220 ±23.3	211 ±10.7
Feed conversion ±SD (kg kg^{-1} gain)	5.34 ± 0.75	5.90 ± 0.26	5.68 ± 0.4	6.16 ± 0.66

Experimental diets, 1, 2, 3 and 4 alfalfa hay was replaced with *P. ferulacea* hay at 0, 35, 60, and 100% levels, respectively on a dry matter basis

Table IV. Carcass characteristics of finally slaughtered lambs in experimental groups

Item	Experimental diets			
	1(0% P.F)	**2(35%P.F)**	**3(60%P.F)**	**4(100%P.F)**
No. of slaughtered animals	10	10	10	10
Final body weight (kg)	40.14 ± 2.1	39.15 ± 0.89	39.34 ± 1.5	39.67 ± 2.2
Warm carcass weight (kg)	20.82	20.69	20.65	21.62
Dressing of WCW (%)	51.86 ± 1.85	52.84 ± 1.33	52.57 ± 1.32	54.52 ± 1.85
Eye muscle area (cm^2)	17.5 ± 2.23	15.06 ± 1.47	15.02 ± 2.33	13.17 ± 1.55
Thickness of fat on rib 12 (mm)	9.87 ± 2.25	10.03 ± 2.45	10.77 ± 2.25	11.06 ± 2.45
Percent of carcass fat	27.3 ± 1.66[a]	30 ± 0.5[ab]	30.4 ± 1.66[ab]	33.1 ± 2.81[b]
Percent of carcass bone	21.2 ± 1.20	20.3 ± 1.1	20.3 ± 1.21	18.7 ± 1.3
Percent of carcass meat	51.5 ± 1.2	50.2 ± 1.1	49.3 ± 1.02	48.2 ± 1.03
Fillet (%)	15.6 ± 2.03	14.4 ± 0.33	14.2 ± 2.02	13.6 ± 0.31
Neck (%)	8.04 ± 0.2	7.8 ± 0.2	7.27 ± 0.3	7.4 ± 0.1
Thigh (%)	25.2 ± 0.55	24.9 ± 1.03	24 ± 0.65	23 ± 1.01
Hand (%)	15.8 ± 0.5	15.3 ± 0.73	15 ± 0.6	14.7 ± 0.73
Ribs (%)	9 ± 1.2	8.4 ± 0.62	9.5 ± 1.3	8.5 ± 0.62
Fat tail (%)	14.1 ± 2.25 [a]	17.5 ± 1.49[ab]	18.4 ± 2.35 [b]	20.5 ± 1.58 [b]

a, b means with a different letter within a row are different ($p<0.05$).(±SD)

WCW, warm carcass weight

Experimental diets, 1, 2, 3 and 4 alfalfa hay was replaced with *P. ferulacea* hay at 0, 35, 60, and 100% levels, respectively on a dry matter basis

plant *P. ferulacea*, was compared favourably with high quality forages commonly used in ruminant feeding. Due to high production potential and of this range plant, it could be introduced in the ration for lamb fattening without any adverse effect on animal performance.

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