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RESEARCH ARTICLE

Determination of the Feed Values of Çaşir *(Prangos ferulacea)* and Goat's Thorn *(Astragalus gummifera)* Located in Natural Plant Flora of the Southeastern Anatolia Region

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Summary

The aim of this study was to determine the nutritive value of some alternative forage in Turkey by using chemical composition and *in vitro* gas production kinetics. In this study, casir *(Prangos ferulacea)* leaves, branch, corpus and goat's thorn *(Astragalus gummifera)* spines, branch and corpus were used. The values of these forages were compared with alfalfa hay (AH=*Medicago sativa*). The crude protein content of AH was significantly higher than those of *P. ferulacea* leaves (P1), *P. ferulacea* branch (P2), *P. ferulacea* corpus (P3), *A. gummifera* spines (A1), *A. gummifera* branch (A2), *A. gummifera* corpus (A3) (P<0.01). The neutral detergent fiber (NDF) content of *P. ferulacea* leaves was significantly higher than those of other forages (P2, P3, A1, A2, A3) (P<0.01). There were significant differences among *P. ferulacea, A. gummifera* and AH in terms of *in vitro* gas production kinetics as well as estimated parameters such as metabolizable energy (ME), net energy lactation (NEL) and organic matter digestibility (OMD). ME, NEL and OMD values of *Prangos* leaves were significantly higher than those of AH. The RFV of AH were significantly higher than those of P1, P2, P3 and A1, A2, A3 (P<0.001). Current results show that the feed value of *P. ferulacea* is higher compared to *A. gummifera* but lower than feed value of alfalfa hay.

Keywords: *In vitro gas production, Alternative forages, Relative feed value*

Güneydoğu Anadolu Bölgesi Doğal Bitki Florasında Bulunan Çaşir *(Prangos ferulacea)* ve Keçi Dikeni *(Astragalus gummifera)* Bitkilerinin Yem Değerlerinin Belirlenmesi

Özet

Bu çalışmada in vitro gaz üretim tekniği kullanılarak ve kimyasal içeriğine gore Türkiye'deki bazı alternatif yem kaynaklarının besin değerlerinin incelenmesi amaçlanmıştır. Çalışmada Çaşir (Prangos ferulacea) ve keçi dikeni (Astragalus gummifera) bitkilerinin yaprak, dal ve ana gövde kısımları kullanılmıştır. Elde edilen değerler yonca otu (Medicago sativa) ile kıyaslanmıştır. Yonca kuru otunun (YKO) protein değeri Prangos ferulacea yaprak (P1), dal (P2) ve gövde (P3) ile Astragalus gummifera yaprak (A1), dal (A2) ve gövde (A3) kısımlarından daha yüksek olmuştur (P<0.01). P1'in NDF içeriği diğer bitkilerden (P2, P3, A1, A2 ve A3) önemli düzeyde daha yüksek bulunmuştur (P<0.01). In vitro gaz üretim değerleri ve hesaplanan metabolik enerji (ME), net enerji laktasyon (NEL) ve organik madde sindirilebilirliği (OMD) bitkiler arasında önemli farklılıklar göstermiştir. Prangos yapraklarının ME, NEL ve OMS değerlerinin yoncaya gore daha yüksek olduğu belirlenmiştir (P<0.001). Elde edilen sonuçlara gore Prangos ferulacea'nın yem değerinin Astragalus gummifera bitkisine göre daha iyi; yonca otuna kıyasla daha düşük olduğu tespit edilmiştir.

Anahtar sözcükler: *In vitro gaz üretimi, Alternatif kaba yemler, Nispi yem değeri*

INTRODUCTION

Extensively livestock production based on pasture grazing is mainly located in the South-East Region of Turkey. However, forage production is not enough to meet total forage requirement of ruminant animals in this region of Turkey. Much of the pastures found in these regions cannot completely meet the nutrient requirements of

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grazing ruminants. Grazing livestock have altered heterogeneity, composition and productivity of vegetation for years. Permanence of animal production is dependent to proper usage of different natural resources in arid and semi-arid regions. In the South-East Anatolian, grazing has very important force shaping vegetation structure and livestock production in these regions is highly dependent to pasturage. During the wet season, the plains are grazed intensely by the livestock. At the end of the wet season, vegetation is exhausted and valuable plant flora is never left. The other plants remaining are not available for livestock throughout following dry period. These alterations have directed to special ability of grazing animal for selecting different parts of spinney plants such as *Astragalus sp.* and *Prangos ferulacea* when food availability is scarce in these regions. The genus *Astragalus sp.* is generally considered the largest genus of most arid field with an estimated 2500-3000 species [1]. *Astragalus gummifera* is one of the last remaining plants in the sticky Karacadag grassland of Sanliurfa *(Fig. 1)*. After thorns are crushed by local farmers, goat's thorn is given to sheep. Although *Astragalus* plants are grazed unavoidably by livestock or fed as fodder, these species deserve nutritional investigation. As an alternative forage source, *Prangos ferulacea* is found in high mountainous areas of South-East Anatolia such as Sirnak and Diyarbakır [2]. *Prangos ferulacea* and *Astragalus gummifera* may be an alternative forage source in these regions.

In this study, it was aimed to determine the metabolizable energy (ME) and net energy lactation (NE_L) contents, organic matter digestibility (OMD) and nutritive values of *Astragalus gummifera, Prangos ferulacea* vs. *Medicago sativa* by using *in vitro* gas production technique [3,4]. The second purpose of this study was to determine the possibilities of using some alternative forage in place of alfalfa hay.

MATERIAL and METHODS

Plant Collection

This study was conducted over the period from June 2007 to January 2009 in Sanliurfa Province of the Republic of Turkey. General images of dry plants have been shown in the *Fig. 1*.

Samples of *Astragalus gummifera* were collected at four different regions of Karacadag in Sanliurfa which lies on longitude 38°50′E, latitude 40°20′N and 650 m altitude of sea level. It has 481 mm^3 of annual rainfall and average temperature is 15.8°C. The samples of *Prangos ferulacea* were also collected from four different hills of Sırnak province which lies on longitude 42°28′E latitude, 37°31′N and 1400 m altitude of sea level and has 633 $mm^3$of annual rainfall. Average temperature is 10.1°C in this district. Both samples were harvested in early June by cutting at ground level and then were field-dried. Samples from whole plants were separated manually into leaf or spine, twig and stem or branch (*Prangos* leaves: P1, *Prangos* branch: P2, *Prangos* corpus: P3, *Astragalus* spines: A1, *Astragalus* branch: A2, *Astragalus* corpus: A3, Alfalfa hay: AH) and then were ground in laboratory mill to pass through a 1 mm screen for chemical analyses and for incubations by *in vitro* gas production assays. But alfalfa was analyzed in full track. Because plant structural differences were correlated to differing partition of plants, they had to been ground to pass through 1 mm screen according to *in vitro* gas production assays [4]. For comparison, a sample of alfalfa hay (*Medicago Sativa Cultivar 13R Supreme*) was also subjected to the same range of analyses in four replicates in the form of hay. Dry matter, crude protein (N x 6.25), ash and ether extract contents of feeds were analyzed according to AOAC [5] procedure. ADF and NDF analysis were based on the method of Van Soest et al.[6] using ANKOM fiber analyzer. All chemical analyses were carried out in triplicate for each replication of plants.

Estimating of Relative Feed Value, Digestible Dry Matter and Dry Matter Intake

Relative Feed Value (RFV) index estimates digestible dry matter (DDM) of the samples from ADF, and calculates the DM intake potential (as a percent of body weight, BW) from NDF. The index is then calculated as DDM multiplied by dry matter intake (DMI as a % of BW) and divided by 1.29 [7].

DDM = Digestible Dry Matter = 88.9 - (0.779 x %ADF)
DMI = Dry Matter Intake (%of BW) = 120 / (%NDF)
RFV = (DDM x DMI)/1.29

In vitro Gas Production Technique

Three infertile Holstein cows aged 5 years with ruminal

Fig 1. The general appearance of *Prangos ferulacea* (the figures on the left) and *Astragalus gummifera* plants (the figures on the right)

Şekil 1. *Prangos ferulacea* (soldaki resimler) ve *Astragalus gummifera* bitkilerinin (sağdaki resimler) genel görünümleri cannulas (average live weight 650 kg) were used in *in vitro* gas production technique. Rumen fluid was obtained from the fistulated cows fed twice daily (08.30-16.30) with a diet containing corn silage (60%) and concentrates (40%). Triplicates of each sample were used in two separate runs.

Approximately 200 mg dry weights of samples were weighed in triplicate into 100 ml calibrated glass syringes following the procedures of Menke and Steingass [3]. The syringes were pre-warmed at 39ºC and then the injection of 30 ml rumen fluid-buffer mixture (1:2) into each syringe and incubated in a water bath at 39ºC. Gas volume values were read at 0, 3, 6, 9, 12, 24, 48, 72 and 96 h of incubation from indicator on syringe. Cumulative gas production data were fitted to the model of Ørskov and McDonald [8] by NEWAY computer package program.

$y = a+b(1-e^{-ct})$, where; a: the gas production from the immediately soluble fraction (ml), b: the gas production from the insoluble fraction (ml), c: the gas production rate constant for the insoluble fraction (ml/h), a+b: potential gas production (ml), t: incubation time (h), y: gas produced at time "t".

OMD [9], ME [9] and NE_L [3] contents of forages were estimated using equations given below:

OMD, % = 14.88+0.889 GP+0.45 CP+0.651 A;
ME, (MJ/kg DM) = 2.20+0.136 GP+0.0574 CP;
NE_L, (MJ/kg DM) = 0.101 GP+0.051CP+0.112 EE; where; GP: 24 h net gas production (ml/200 mg DM), CP: Crude protein (%), A: Ash content (%), EE: Ether extracts (%).

Statistical Analysis

Completely Randomised Design was used to compare gas production, gas production parameters, energy values, DDM and OMD values using General Linear Model (GLM) of SPSS [10] package program. Significance between individual means was identified using the Duncan's multiple comparative tests. The data of plants brought from different areas were averaged.

$Y_{ij} = \mu + \alpha_i + e_i$
Y_{ij} : observed value on i^{th} treatment
μ : Population mean
α_i : Effect of i^{th} treatment
e_i: Error term

RESULTS

Chemical compositions of all forages were presented in *Table 1*. CP contents of different part of *P. ferulacea* and *A. gummifera* ranged from 39.2 to 101 g/kg DM and from 63.8 to 96.6 g/kg DM, respectively, and 212 g/kg DM for *Alfalfa hay (Table 1)*. The CP contents of A2 and A3 were higher than that of spine of this plant (P<0.01).

There were no significant differences among diverse parts of *P. ferulacea* in terms of dry matter content. When compared with alfalfa hay, P1 and P2 had lower dry matter content but there were no significant differences between P3, A1, A2, A3 and AH (P>0.05). There was difference in ash contents in forages and P1, P2, AH had higher values than other samples (P<0.01). While the NDF contents of P3 and AH was found lowest in forages, ADF contents of P1, P2 and AH were lower than those of other forages. The NDF content of all parts of *A. gummifera* were higher than those of P2, P3 and AH and the ADF content of all parts *A. gummifera* were higher than those P1 and AH (P<0.01). The ether extract contents of different parts of *Prangos* and *Astragalus* were similar and the A3 had a lower ether extract content than alfalfa hay (P<0.01).

RFVs, dry matter intakes (DMI) and digestible dry matter (DDM) contents were presented in *Table 2*.

The DDM values of P1 and AH were higher than those of other parts of plants and the highest values of DMI were found for AH and P3 (P<0.01). There were no significant differences among different parts of *P. ferulacea* but it had higher DDM content compared with other forages (P<0.01). RFV, DDM and DMI were not different among

Table 1. *Chemical compositions of Prangos ferulacea, Astragalus gummifera and alfalfa hay, (g/kg DM)*

Tablo 1. *Prangos ferulacea, Astragalus gummifera ve yonca kuru otunun kimyasal kompozisyonları (g/kg kuru madde)*

Analyzed Composition g/kgDM	Samples								
	P1	*P2*	*P3*	*A1*	*A2*	*A3*	*AH*	*SEM*	*Sig.*
DM	923.4^{c}	920.0^{c}	933.9^{bc}	931.5^{bc}	951.7^{a}	942.9^{ab}	944.7^{ab}	0.23	**
CP	101.0^{b}	39.2^{d}	41.3^{d}	63.8^{cd}	96.6^{b}	93.3^{bc}	212.0^{a}	1.52	**
EE	14.2^{ab}	5.5^{ab}	11.1^{ab}	6.6^{ab}	11.0^{ab}	2.8^{b}	26.3^{a}	0.25	*
Ash	146.2^{a}	82.8^{abc}	70.6^{bc}	40.7^{c}	28.4^{c}	24.2^{c}	122.1^{ab}	1.03	**
NDF	562.4^{b}	462.5^{c}	447.8^{cd}	722.6^{a}	649.6^{ab}	648.5^{ab}	365.4^{d}	2.80	**
ADF	245.5^{c}	422.7^{b}	424.4^{b}	582.5^{a}	529.8^{ab}	514.9^{ab}	279.3^{c}	2.62	**

*A1-A. gummifera spines; A2-A.gummifera branch; A3-A. gummifera corpus; AH-Alfalfa hay; P1-P. ferulacea leaves; P2- P. ferulacea branch; P3- P. ferulacea corpus, DM: Dry matter, CP: Crude protein, EE: Ether extracts, NDF: Neutral detergent fiber, ADF: Acid detergent fiber, SEM: Standard error of means, ^{a,b} there are important differences between the groups in the same row,**P<0.01, *P<0.05* different partitions of *A. gummifera* (P>0.05). Ruminal gas production has been highly affected by VFA contents, acetate: propionate ratio and pH. The gas production level of AH was between that of *P. ferulacea* and *A. gummifera (Table 3* and *Fig. 2)*. There was no relationship among forages in terms of the gas production from the immediately soluble fraction (a) (P>0.05), but P2 differed from its other partitions (P<0.01). The value of a parameter was not different between *A. gummifera* and AH, but *P. ferulacea* (P1, P2 ve P3) had lower value than *A. gummifera* (P<0.01). There was no significant difference between *A. gummifera* and AH with regard to the gas production from the insoluble fraction (b), but *P. ferulacea* (P1, P2 ve P3) had higher value than AH and *A. gummifera* (P<0.01).

DISCUSSION

Alfalfa hay which has higher protein content compared to the other forages used in this study showed higher gas production value than *A. gummifera* but it had lower gas

Table 2. *RFV, DDM and DMI values of Prangos ferulacea, Astragalus gummifera and alfalfa hay*

Tablo 2. *Prangos ferulacea, Astragalus gummifera ve yonca kuru otunun nisbi yem değeri (RFV), sindirilebilir kuru madde (DDM) ve kuru madde tüketim (DMI) değerleri*

Parameters of Feed Evaluation	Samples								
	P1	P2	P3	A1	A2	A3	AH	**SEM**	**Sig.**
RFV	115.4^{b}	112.57^{b}	115.98^{b}	56.03^{c}	68.19^{bc}	69.99^{bc}	174.59^{a}	10.59	**
DDM, %	66.77^{a}	55.96^{b}	55.83^{b}	43.51^{c}	47.62^{bc}	48.78^{bc}	67.13^{a}	2.04	**
DMI, % BW	2.13^{bc}	2.59^{b}	2.67b^{a}	1.66^{c}	1.84^{c}	1.85^{c}	3.33^{a}	0.15	**

*A1-A. gummifera spines; A2-A.gummifera branch; A3-A. gummifera corpus; AH-Alfalfa hay; P1-P. ferulacea leaves; P2- P. ferulacea branch; P3- P. ferulacea corpus, RFV: Relative feed value, DDM: Digestible dry matter (%of body weight), DMI: Dry matter intake (%of body weight), SEM: Standard error of means, ^{a,b} there are important differences between the groups in the same row, **P<0.01*

Table 3. *In vitro gas productions (ml) parameters and ME, NE$_L$ and OMD values of Prangos ferulacea, Astragalus gummifera and alfalfa hay*
Tablo 3. *Prangos ferulacea, Astragalus gummifera ve yonca kuru otunun ME, NE$_L$ ve OMS değerleri ile in vitro gaz üretim parametreleri*

Incubation Times	**Samples**							**SEM**	**P**
	P1	**P2**	**P3**	**A1**	**A2**	**A3**	**AH**		
3h	9.34^{c}	2.62^{b}	6.10^{ab}	3.74^{b}	3.16^{b}	1.83^{b}	6.5^{ab}	0.60	*
6h	26.6^{a}	16.12^{b}	18.12^{b}	7.16^{cd}	7.69^{cd}	5.14^{d}	14.29^{bc}	1.22	**
9h	34.24^{a}	25.95^{ab}	26.78^{ab}	10.45^{c}	12.98^{c}	8.44^{c}	20.95^{b}	1.49	**
12h	39.41^{a}	31.90^{ab}	31.07^{ab}	13.99^{c}	15.63^{c}	10.97^{c}	25.59^{b}	1.63	**
24h	48.62^{a}	43.34^{a}	41.30^{a}	24.43^{c}	24.12^{c}	18.42^{c}	33.75^{b}	1.64	**
48h	53.99^{a}	48.77^{a}	46.36^{ab}	33.08^{cd}	33.11^{cd}	22.79^{d}	38.98^{bc}	1.47	**
72h	55.53^{a}	49.73^{ab}	47.50^{b}	35.02^{c}	37.29^{c}	32.56^{c}	38.58^{c}	1.89	**
96h	57.28^{a}	50.60^{ab}	48.34^{b}	36.75^{c}	38.83^{c}	35.21^{c}	39.48^{c}	1.88	**
pH	5.78^{c}	6.89^{a}	6.80^{a}	5.87^{bc}	6.89^{a}	6.90^{a}	6.55^{ab}	0.09	*
Estimated Parameters									
a	-8.51^{b}	-14.81^{c}	-8.15^{b}	-1.81^{a}	-0.93^{a}	-1.03^{a}	-4.81^{ab}	0.82	**
b	63.52^{ab}	64.41^{a}	55.42^{b}	38.99^{c}	40.01^{c}	38.10^{c}	44.91^{c}	1.77	**
c	0.12^{a}	0.11^{a}	0.10^{a}	0.05^{b}	0.04^{b}	0.03^{b}	0.09^{a}	0.006	**
a+b	55.0^{a}	49.59^{a}	47.27^{ab}	37.18^{c}	39.07^{bc}	37.06^{c}	40.09^{bc}	1.29	**
OMD,%	73.34^{a}	61.19^{b}	58.52^{b}	42.52^{c}	42.84^{c}	37.39^{c}	63.41^{b}	2.05	**
ME, MJ/kg DM	9.44^{a}	8.34^{b}	8.07^{b}	5.91^{c}	6.06^{c}	5.27^{c}	8.07^{b}	0.23	**
NE$_L$ MJ/kg DM	5.64^{a}	4.66^{b}	4.56^{b}	2.95^{c}	3.08^{c}	2.41^{c}	4.78^{b}	0.18	**

*A1-A. gummifera spines; A2-A.gummifera branch; A3-A. gummifera corpus; AH-Alfalfa hay; P1-P. ferulacea leaves; P2- P. ferulacea branch; P3- P. ferulacea corpus, h: incubation time (hour), a: the gas production from the immediately soluble fraction (ml), b: the gas production from the insoluble fraction (ml), c: the gas production rate constant for the insoluble fraction (ml/h), a+b: potential gas production (ml). OMD: organic matter degradability, ME: metabolizable energy, NE$_L$:net energy lactation, SEM: Standard error of means, ^{a,b} there are important differences between the groups in the same row,**P<0.01, *P<0.05*

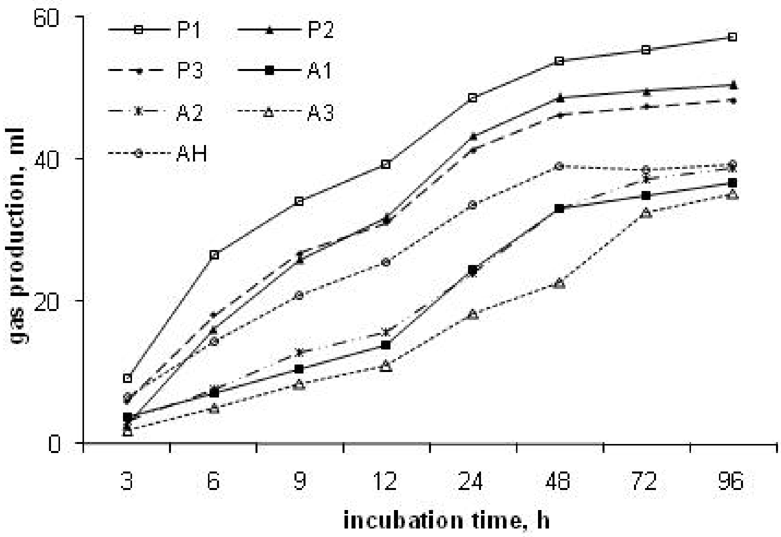

Fig. 2. Comparison of *in vitro* gas productions of samples with those of alfalfa hay. A1-*A. gummifera* spines; A2-*A. gummifera* branch; A3-*A. gummifera* corpus; AH-Alfalfa hay; P1-*P. ferulacea* leaves; P2- *P. ferulacea* branch; P3- *P. ferulacea* corpus

Şekil 2. Yonca kuru otu ile diğer bitkilerin gaz üretimlerinin kıyaslanması A1-*A. gummifera* dikenleri; A2-*A.gummifera* yan dalcıklar; A3-*A. gummifera* ana gövde AH-yonca kuru otu; P1-*P. ferulacea* yaprakları; P2- *P. ferulacea* yan dalcıklar; P3- *P. ferulacea* ana gövde

production value than *P. ferulacea* which has lower protein content than alfalfa hay. It is suggested that increase in protein and fat contents of feeds leads to decrease in their gas production values [3]. It is known that feeds must contain minimum 10% crude protein for the optimal activity of microbial flora [11]. When the amount of crude protein is lower than this level, the gas production levels of feeds decreases significantly. In this regard, it could be considered that P2, P3 and A1 with CP contents below 10% might have lead to decrease in microbial activity.

It is well documented that the fat content of feeds affects their potential gas productions and amount of gas produced tends to decrease with increasing fat content of feeds [12]. These results have also explained why the high levels of gas production were not seen in AH having high content of ether extract in comparison with other forages used in current study. It was also suggested that there was a negative correlation between *in vitro* gas production and the NDF content of feeds [13,14]. There is also a negative relationship between cell wall content of feeds (ADF and NDF) and their capability of gas production due to declining microbial activity [15]. However, it cannot be said that gas production arises every time with decreasing NDF content of feeds [16]. Because, while *A. gummifera* which has high NDF content showed lesser gas production compared to other forages used in this study but AH having lesser NDF than *P. ferulacea* showed lower value of gas production *(Fig. 2)*. These findings are not in consistent with Coskun et al.[2] who found higher gas production levels for different parts of *Prangos ferulacea* such as leaves and stem.

RFV is used generally to compare similar forages for two important qualities; "how well it will be consumed and how well it will be digested". RFV has no units; instead, it is used to rank similar forages for potential dry matter intake [17]. RFVs, dry matter intakes (DMI) and digestible dry matter (DDM) contents were presented in *Table 3*. The Hay Marketing Task Force of the American Forage and Grassland Council (AFGC) endorses the use of RFV as a measure of forage quality [18]. According to the Quality Grading Standard assigned by the Hay Market Task Force of AFGC, the RFV values were found as "Prime" for AH; 2 or "good" for P1, P2, P3 and 5 or "reject" for A1, A2, A3. The higher DDM value of *P. ferulacea's* leaf can also be attributed to its lower ADF content, because it is well known that DDM value is affected from ADF content of feeds [19].

Table 3 shows the results of the gas production measurement and estimated OMD, ME and NE_L values. *A. gummifera* had also high contents of ash, ADF and NDF compared with other plants probably due to its spinous structure. These results also showed that different parts of *A. gummifera* had lower energy contents. Surprisingly, OMD, ME and NE_L values of the P1 were higher than those of the *A. gummifera* and AH. This may be explained by high EE contents and lower ADF content of P1 compared with the P2 and P3. The high energy concentration suggests that *P. ferulacea* probably has a high concentration of soluble carbohydrate [20]. *P. ferulacea* can be described as a high energy feedstuff, due to its DM, OMD and ME concentrations. Thus, it is suggested that *P. ferulacea* can be used not only as a basic forage in the diet of ruminant but also as a high energy feed, because Coskun et al.[2], suggested that *Prangos ferulacea* had a high energy content in their study.

Ruminal gas production has been highly affected by VFA contents, acetate: propionate ratio and pH and it is well documented that gas production decreases at pH values below 6.2. Because, it was demonstrated that microbial activity due to the absence of buffer matter in medium had decreased at low pH in previous studies [21,22]. Observed pH values after the incubations of 96 h *(Table 3)* for rumen liquid using *in vitro* gas production technique were 6.82 (5.78-6.80), 6,38 (5.87-6.9) and 6.55 for *Prangos ferulacea, Astragalus gummifera* and alfalfa hay respectively. After the incubations of 96 h, pH decreased up to towards critical levels in P1 and A1 (5.78 and 5.87 resp.), consequently *in vitro* gas production of these forages could have been affected by low pH values in this study. Different gas production levels might be obtained for different parts in the same plant [15]. In our study, it was observed different gas production parameters in different partitions of *P ferulacea* ($P<0.01$), but not *A. gummifera* ($P>0.05$). In the present study, contrary to findings of Kamalak et al.[23] and Kilic [16], lower gas production level was obtained for AH probably due to its nutrient composition and harvesting time [24]. The amount of *in vitro* gas production according as time was reached to maximal point in P1 after incubation of 3 and 6 h. After all incubation times (6, 9, 12, 24, 48, 72 and 96 h), the amount of gas production of *P. ferulocea* was higher than that of *A gummifera*. This was attributed to its lower NDF and ADF contents and higher RFV compared to A1, A2 and A3.

The rate of gas production constant from the insoluble fraction (c) was not different between *P. ferulacea* and AH, but *A. gummifera* (A1, A2 and A3) had lower value than AH and *P. ferulacea* ($P<0.01$). This can be attributed to the higher gas production of *P. ferulacea*. There were no significant differences among parts of *P. ferulacea* and *A. gummifera* with respect to potential gas production (a+b) ($P>0.05$). OMD, ME and NE_L values of AH and *P. ferulacea* were also higher than that of *A. gummifera* ($P<0.01$) and the the highest value was measured in leaf of *P. ferulacea* ($P<0.01$). It is well known that the lower ether extract content of forages refers to decrease in digestibility of feeds [3]. In the current study, the lower OMD value was also measured in AH due to its lower ether extract content.

The organic matter digestibility of *P1* was too high compared to those of other plants. Similarly, Coskun et al.[2] reported that dry matter degradability, *in vitro* degradability and organic matter digestibility of *P. ferulacea* were higher than AH. The RFV and DMI values of the AHs were significantly higher than those of the *P. ferulacea* and *A. gummifera* ($P<0.001$). Ruminal OM digestibility of *Astragalus gummifera* was lowest among all forages *(Table 3)*. This may be explained by spinous structure of *A. gummifera* and also lacking of edible parts in *A. gummifera.* Because, Mould et al.[25] observed that there were positive relationships between gas production and plant maturity and so the lowest gas production was observed for plants in period of early vegetation. Due to lower NDF content of AH and A1 the ewes receiving these forages may achieve high dry matter intake, but lower ADF contents of AH and P1 might affect milk yield and milk fat content negatively. In conclusion, this study showed that these forages can be used as an alternative forage source in the diet. This may also lead to stabilize milk yield and milk fat concentration in ewes without any negative effect on performance. In the present study, it was seen that *A. gummifera* and *P. ferulacea* had highly low CP content compared with AH. At the same time, it is suggested that these forages (*Astragalus sp*. and *Prangos sp.*) must be ground due to the spinous structure of *A. gummifera*. So, they must be given with other forage sources such as alfalfa and silage etc. As for *P. ferulacea* due to high production potential and cheaper costs of this range plant in Sirnak province, it could be used in the fattening rations for small ruminants without any adverse effect on animal performance.

In conclusion, the present study shows that *Prangos ferulacea* can be used not only as basic forage in the ruminant diets but also as a high energy feed. This study shows that the feed quality of *P. ferulacea* is higher than that of *A. gummifera*, even if *P. ferulocea* has lower RFV content than alfalfa hay.

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