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Determination the nutritive value and in situ dry matter digestibility of peanut forage

zahra shoryabi

***Corresponding author*:** Zahra shoryabi

ABSTRACT: There is interest in growing peanut (Arachis hypogaea L.) for forage, but little is known about the nutritive value and forage quality. The objective of this study was to Determination chemical composition and in Situ degradation kinetics of peanut hay. Sample randomly collected and then shade-dried. Chemical composition were measured according to the standard procedure. Dry matter digestibility determination by in situ methods. chemical composition including dry matter (DM), Organic matter (OM), crude ash (CA), ether extract (EE), crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) were estimated: 94/48, 89/23, 10/76, 2/20, 7/79, 41/21 and 28/14 respectively. The In situ DMD values for time incubation 3, 6, 12, 24, 48, 72, 96 h were estimated: 29/76, 32/55, 39/64, 45/89, 54/9, 63/01 and 70/5 respectively. It is noteworthy The DM disappearance of the peanut hay in the rumen increased with increasing incubation time. The value of in situ ruminal degradation cofficients of DM (a, b, c, a+b) and effective degradability of DM at outflow rate 0.02, 0.05 and 0.08 h -1 were estimated 28/60, 53/32, 0/0152, 81/92, 51/62, 41/03, 37/11 respectively. According to this experiments findings, it can be concluded that peanut hay have high nutritive value and therefore they can be used as alternative forage in ruminant nutrition.

***Keywords*:** Nutritive value, peanut hay, In situ, digestibility.

INTRODUCTION

Increasing feed costs and the need for diets based on locally available feedstuffs has shifted animal nutrition studies to unconventional feedstuffs for ruminants (Lashkari , 2013). Considerable quantities of crop residues by uncommon agro-industrial are generated every year in most developing countries in the tropics and subtropics. Most of the mentioned crop residues are suitable for feeding livestock, however, because of lack of technical-know-how they are considered as waste and are disposed (Aregheore and Chimwano, 1991). Therefore, there is a growing interest in most countries to use the low cost alternative feedstuff sources for animals. One of such alternative feedstuffs is the peanuts hay. Peanuts (Arachis hypogaea) is a warm-season legume. peanut hay which is made from the residue after pod/seed harvest of the annual peanut (Arachis hypogaea). Legumes have a greater protein concentration and less structural fiber concentration than grasses. This and the reticulate venation of leaves allows legumes to be degraded more easily and rapidly by ruminal microbes (Dewhurst, 2003; Frame, 2005). Despite the nutritional benefits of legumes, warm-season legumes are not commonly used in the Iran. Most of the available cultivars are annuals which require seed purchase, land preparation, and planting each spring. One common summer legume crop is peanut (Arachis hypogaea L.), a crop grown on 3500 hectares in iran and 140000 kilograms of peanuts are produced annually (nameless, 2013). Hammond (1992) found that perennial peanut forage is a suitable protein and energy

supplement feed for wintering cattle, especially for those on low protein grass hay. Thus, for ruminant animals (cattle, sheep and goats) perennial peanut is very nutritious and well liked. The nutritional quality of perennial peanut appears to be as good as alfalfa.

In research studies conducted in Florida and Georgia, perennial peanut forage has been found to be highly nutritious for beef and dairy cattle, and goats (Gelaye , 1990; Williams , 2004). Gelaye (1990) reported that goats fed perennial peanut hay actually had slightly greater digestibility of dry matter, fiber, and protein than those fed the alfalfa hay control. The goats also voluntarily ate more perennial peanut hay than alfalfa hay. The objective of this study was to Determination chemical composition and in situ degradation kinetics of peanut hay.

MATERIALS AND METHODS

2.1.Chemical Composition and Analytical Technique

First, peanut hay was collected from zabol region of Iran, and then the collected samples were shade-dried and representative dry samples were taken to the laboratory and milled in a hammer mill through a 1 mm sieve for chemical analysis and *in situ* DMD. Dry matter (DM) was determined by drying the samples at 105 ˚C overnight and ash by igniting the samples in a muffle furnace at 525 ˚C for 8 h. Content of nitrogen (N) was measured by the Kheldal method (AOAC 1990). The CP was calculated as N X 6.25. Contents of neutral detergent fiber (NDF) and acid detergent fiber (ADF) were determined by the method of Van Soest et al (1991). Ether extract (EE) were determined by extracting the sample with ether.

2.2. In situ Measurements

The nylon-bag technique was used to measure the rumen DM degradability of the samples. Two Sistani steers with the average initial live weight of 350±10 kg fitted with the permanent ruminal fistula in individual pens were used. The steers were offered a diet containing 60:40 ratio forage to concentrate in 2 equal portions daily (07.00 and 19.00). Samples of about 3 g were weighed into polyester nylon bags with pore size of 44 µm and dimensions of 17x10 cm and incubated in the rumen for periods of 0, 2, 4, 8, 16, 24, 48, 72 and 96 h. After removal the bags were thoroughly washed under tap water and were dried to constant weight at 60°C. The rapidly soluble materials were estimated by washing the bags containing samples after soaking in water without incubation in the rumen.
The data from in situ studies were fitted into an exponential model {P= a + b (1 – e-ct) } of Ørskov *et al* (1980), by using the maximum likelihood program to obtain estimates of a, b and c for each sample in each bull.

Where:
P = Potential degradability or degradation of DM at time t
a = The rapidly soluble fraction
b = The potentially degradable DM or
c = The constant rate of degradation of b parameter (percentage h-1)

The effective degradability (P) of samples was calculated using the equation shown below, assuming a ruminal digesta out flow rate(x) of 0.02, 0.05 and 0.08 h^{-1} which is an average value for animals fed at approximately maintenance level (AFRC, 1992).
P=a+((b×c)/(c+r)).

Data of in situ degradition were subjected to analysis as a completely randomized design, the data were analyzed using the GLM procedure SAS (2000).
Data were analyzed using the following model:
Yij= µ + Ti+ eij
Where, Yij: dependent variable representing the response for i treatment; µ: mean; T: treatment
and eij: residual.

RESULTS AND DISCUSSION

3.1. Chemical composition

The chemical composition of peanut hay are shown in Table 1. chemical composition including dry matter (DM), Organic matter (OM), crude ash (CA), ether extract (EE), crude protein (CP), neutral detergent fiber (NDF) and acid detergent fiber (ADF) were estimated: 94/48, 89/23, 10/76, 2/20, 7/79, 41/21 and 28/14 respectively.

Table 1. Chemical composition of Peanut hay

Chemical composition %	Peanut hay
Dry matte	94/48
Organic matter	89/23
ASH	10/76
Ether extract	2/20
Crude protein	7/79
Acid detergent fiber	28/14
Neutral detergent fiber	41/21

Reserchers In studies for peanut hay and red clover indicated the mean value Organic matter (OM), crude protein (CP), neutral detergent fiber (NDF) and organic matter in situ digestibility (OMISD) 90/8, 20/96, 48,38 and 86/68 and 91/48, 21/41, 41,36 and 85/18 for peanut hay and red clover respectively (Azevedo Junior , 2013). the mean Organic matter (OM) and neutral detergent fiber (NDF) was similar to the results but contect crude protein (CP) lower. Khaje pour(1370) The content crude protein (CP) peanut forage 7% reported that Similar to the results.

Researches in the experimental contrasting genotypes of peanut forage showed that The content of DM and ashvaried from 221 to 291 g/kg and from 89 to 136 g/kg DM, respectively. The accessions had CP concentrations of 184–250 g/kgDM. Concentrations of EE in the DM varied from 8 to 18 g/kg. Average contents of ADF and lignin(sa) among genotypes were 281 and 76 g/kg DM, respectively. There were no differences in NDF and NFC among genotypes (Ferreira , 2012). The content of NDF and NFC varied from 538 to 578 and 112 to 173 g/kg DM, respectively.

3.2. Results of Parameters of Dry Matter Degradation of peanut forage

The DM disappearance of the peanut forage at different incubation time is presented in figure 1. The in situ degradability showed an increase DM degradability (from 29/76 to 70/50) percent. The DM disappearance of the various treatments in the rumen increased with increasing incubation time.

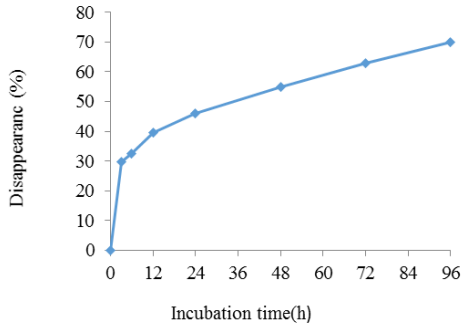

Figure 1. In situ DM disappearance at different incubation time

A sample of the perennial peanut hay used in the horse digestibility study of Eckert (2008) was saved and included in the in vitro analysis. The digestibility determined in vitro was very similar to the digestibility determined in vivo (“within the animal”; 68% vs. 66%) that was similar to the results. The lower NDF concentrations for forage peanut may have been beneficial in increasing total forage intake and digestion rate (lowe , 1993).

The value of in situ ruminal degradation cofficients of DM of the peanut forage are shown in table 2 . Results of the present study demonstrated that the quickly degradable fraction, the slowly degradable fraction, fractional rate of degradation, potential degradability and Effective degradability of DM at outflow rate 0.02, 0.05 and 0.08 h -1 were estimated: 28/60, 53/32, 0/0152, 81/92 % and 51/62, 41/03 and 37/11 % respectively. Researches reported that The dry matter (DM) and CP in the soluble wash fraction (A) and insoluble but degradable fraction (B) and the effective ruminal degradability were greater among all cultivars and both harvest forms of the R2 maturity stage than the R8 (Foster , 2012).

Researches results that degradation cofficients b, c and ED Except a Significantly with the cell wall correlated (Larbi , 1998).

Table 2. degradation cofficients of DM OF FORAGE PEANUT

	28/60	a
	53/32	b
	0/0152	c
	81/92	a+b
51/62	0/02	
41/03	0/05	ED
37/11	0/08	

a: soluble fraction (%); b: insoluble but potentially degradable fraction (%); a+ b: potential degradability; c: fractional rate of degradation (h^{-1}); ED: Effective degradability (%)

CONCLUSION

In conclusion, results of the present study showed that the peanut forage have high nutritive value and also, it can be used as alternative forage in ruminant nutrition. However, further research is needed to determine the suitable level of peanut forage in the ruminant diets.

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