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# THE DETERMINATION OF NUTRITIVE VALUE OF SOME RANGELAND PLANTS USING NYLON BAGS TECHNIQUE

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**ABSTRACT:** *In order to determine of nutritive value of pasture forages (Agropyron intermedium Boiss, Coronilla Varia, Ziziphora Tenuior and Scorzonera grossheimii lipsch) using in situ, this study was carried out. In this study two fistulated wetheres (35±1.8 kg) were used in in situ method. Ruminal DM and CP disappearances were measured 0,4,8,16,24,36,48,72 and 96 h. Dry matter degradabilities of Coronilla Varia and Agropyron intermedium Boiss at 48 h, were higher and lower, that showed significant differences (P<0.05). Crude protein degradabilities of Coronilla Varia at 96 h was 78.18 % that were higher and showed significant differences (P<0.05). Pasture forages can used largely as a ruminant feeds.*

ORIGINAL ARTICLE

**Key words:** *Pasture forages, Gezel sheep, Nylon bag*

## INTRODUCTION

Balancing rations for ruminants requires knowledge of the proportion of feed protein that escapes ruminal degradation (NRC, 1985).Fermentation characteristics of feedstuffs in rumen fluid can be studied using in vivo, in situ and in vitro techniques (Cone et al., 1999). The Dacron polyester or nylon bag technique has been used widely for estimating ruminal nutrient degradation because it is a relatively simple, low – cost method compared with methods involving intestinally cannulated animal (Marshal et al., 1997). The in situ nylon-bag technique is widely used to characterize the disappearance of feeds from the rumen. Nylon-bag technique provides a useful means to estimate rates of disappearance and potential degradability of feedstuffs and feed constituents (Paya et al., 2008).

Ruminants require adequate dietary fiber intake for normal rumen function, and dairy animals, in particular, need fiber to maintain normal milk fat content (Santini et al., 1992). Primary factors in the conversion of forage to animal product are intake of dry matter (DMI) or energy (IE), digestibility, efficiency of converting digested energy to metabolizable energy, and efficiency of converting metabolizable energy to net energy in animal product (Waldo, 1986). Feeding costs are one of the major problems in the economic balance of the sheep farmers. It has been well established that ruminant animals are capable of utilizing cellulose and hemicelluloses from forages, wood and other complex fibrous carbohydrates (Singh and Kamstra, 1981). Non-traditional by-products must search in order to decrease the relay on traditional resources to fill the gap and decrease feeding costs (Afaf et al., 2009).

Many factors influence the ruminal degradability of forage CP content including: stage of maturity (Belyea et. al., 1999; Tolera and Sundstol, 1993; Madsen and Hvelplund, 1994), forage species (Hoffman et al., 1993), contents of different specially leaves (Tolera and Sundstol, 1993) and climate condition (Van Soest, 1982) affect hay quality. Decreases in soluble DM and rate of digestion were observed with increasing maturity of forage (Nelson and Satter, 1992). The objective of this study was to determine CP and DM disappearances of some pasture forages in the rumen using in situ technique.

## MATERIALS AND METHODS

### Animals and feeding

Two yearling (Gizil) wethers (35 ± 1.8 kg) were used. At least 30d before initiation of the experiment, each wether was surgically fitted with a ruminal cannula. The wethers were housed in tie stalls under controlled environmental conditions with continuous lighting and constant temperature (24 to 26°C). All whether were fed a diet containing of 60% hay and 40% concentrate (NRC, 1989). The feed was fed in equal portions every 8 h to maintain a relatively stable rumen environment.

### Sample Collection

Pasture forages samples harvested from Parsabad Moghan. Samples were collected from at least 10 different areas of pasture. All 10 samples were thoroughly mixed, and a composite sample (100g) was taken. All



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samples were dried in an oven at 100°C until a constant weight was achieved. Samples were then ground to pass thought a 2-mm screen in Wiley mill (model 4, Arthur H. Thomas Co., Philadelphia, PA) before incubation.

### Chemical analysis

DM was determined by drying the samples at 105° C. Nitrogen (N) content was measured by the Kjeldahl method (AOAC, 2005). Neutral detergent fiber and ADF were measured according to the method of Goering and Van Soest (1970).

### In situ degradation

In situ methods procedures was determined using Nocek et al. (1988) and reviewed by Palangi (2008), the ground samples (5g) were placed in Dacron bags (5.5×10 cm;47-µm pore size) and were closed using glue. Each feed sample was incubated in 4 replicates (2 replicates for each whether) in the rumen. The incubation times for samples were 0,4,8,16,24,36,48,72 and 96 h. Nylon bags were suspended in the rumen in a polyester mesh bag(25×40 cm;3mm pore size) and were removed from the rumen at the same time so that all bags could be washed simultaneously. The nylon bags were then removed from the mesh bag and washing until the rinse water remained clear. Samples were then dried in an oven at 55˚C until a constant weight was achieved before determination of DM disappearance. The DM and CP degradation data was fitted to the exponential equation $P = a+b\ (1 - e^{-ct})$ (Ørskov and McDonald, 1979), where P: is the disappearance of nutrients during time t, a: the soluble nutrients fraction which is rapidly washed out of the bags and assumed to be completely degradable, b: the proportion of insoluble nutrients which is potentially degradable by microorganisms, c: is the degradation rate of fraction b per hour and t is time of incubation.

### Calculations and Statistical Analysis

Data were analyzed as a completely randomized design using a general linear model (GLM) procedure of SAS, with Duncan's multiple range test used for the comparison of means. Feeds were the only sources of variation considered.

## RESULTS AND DISCUSSION

### Chemical composition

The chemical composition of feeds were shown in Table 1. The obtained data for CP of different *forages* was lower than alfalfa CP, compared to NRC (1989), AFRC (1995), Kleinchmit et al. (2007) and Trater et al. (2001).

The obtained ADF values in this study were more than Kleinchmit et al. (2007) and Broderick et al. (2002). The obtained data for dry matter of test feeds from this study was greater than the values reported by Baumgartel et al. (2007), and Besharati and Taghizadeh (2009). The percentage of crude protein of test feeds showed similar values with the data reported by Baumgartel et al. (2007), also was higher than those values reported by Baumgartel et al. (2007).

There were significant difference in dry matter, crude protein, acid detergent fiber and neutral detergent fiber in test feeds. There were differences between the amounts of acid detergent fiber, neutral detergent fiber, crude protein and ash obtained in this study and the National Research Council (2001). The difference between chemical can be resulted from the variance in variety, climate condition, soil and maturity.

Table 1 - The chemical composition of feedstuffs

| Forages | %DM | %CP | %NDF | %ADF | %ADIN |
|---|---|---|---|---|---|
| 1 | 95.45$^{a}$ | 9.46$^{c}$ | 47.60$^{b}$ | 30.67$^{a}$ | 0.92$^{c}$ |
| 2 | 89.79$^{c}$ | 12.38$^{b}$ | 53.10$^{a}$ | 24.16$^{b}$ | 1.52$^{a}$ |
| 3 | 92.13$^{b}$ | 11.27$^{b}$ | 42.78$^{c}$ | 21.86$^{c}$ | 1.05$^{bc}$ |
| 4 | 84.02$^{d}$ | 14.14$^{a}$ | 37.81$^{d}$ | 25.27$^{b}$ | 1.19$^{b}$ |
| SEM | 0.4149 | 0.4054 | 0.5235 | 0.3901 | 0.0621 |

*1- Agropyron intermedium Boiss 2- Coronilla Varia 3- Ziziphora Tenuior 4- Scorzonera grossheimii lipsch*

### In situ ruminal degradability

The degradability parameters of DM and CP are shown in Tables 2 and 3. *Coronilla Varia* showed high ruminal DM disappearance in all of the incubation times there were significant differences (P<0.05) and *Agropyron intermedium Boiss*, showed the lowest ruminal DM disappearance in all of the incubation times (P<0.05). The ruminal CP disappearance of *Coronilla Varia* is higher and the *Agropyron intermedium Boiss* showed lower ruminal CP disappearance there were significant differences (P<0.05). Regarding to increasing of environmental temperature, the lignin content can be enhanced, and then low degradability is expected. Our results for DM were higher than Yousef elahi et al. (2008).

Sallow showed higher CP degradation at the 24h of incubation (P<0.05). CP degradation process in our study is in consist with Waghorn et al (1995)'s reported data. The chemical composition of feeds influenced ruminal degradation process.


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Table 2 - *In situ* DM disappearance (% of DM)

| Forages | Incubation time (h) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 16 | 24 | 36 | 48 | 72 | 96 |
| 1 | 23.39$^{c}$ | 26.32$^{b}$ | 29.71$^{b}$ | 45.68$^{b}$ | 52.49$^{b}$ | 57.18$^{b}$ | 61.75$^{b}$ | 65.19 | 66.77 |
| 2 | 26.47$^{a}$ | 30.31$^{a}$ | 33.75$^{a}$ | 49.19$^{a}$ | 56.62$^{a}$ | 60.37$^{a}$ | 63.37$^{a}$ | 66.41 | 67.09 |
| 3 | 25.19$^{b}$ | 29.16$^{a}$ | 33.63$^{a}$ | 48.76$^{a}$ | 55.38$^{a}$ | 59.31$^{a}$ | 62.39$^{b}$ | 65.44 | 66.54 |
| 4 | 21.32$^{d}$ | 24.63$^{c}$ | 28.67$^{c}$ | 44.71$^{b}$ | 52.58$^{b}$ | 57.69$^{b}$ | 61.85$^{b}$ | 65.47 | 66.82 |
| SEM | 0.3122 | 0.3772 | 0.2650 | 0.3195 | 0.4536 | 0.3923 | 0.4149 | 0.3739 | 0.2448 |

*1- Agropyron intermedium Boiss 2- Coronilla Varia 3- Ziziphora Tenuior 4- Scorzonera grossheimii lipsch*

Table 3 - *In situ* CP disappearance (% of DM)

| Forages | Incubation time (h) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 4 | 8 | 16 | 24 | 36 | 48 | 72 | 96 |
| 1 | 18.47$^{c}$ | 24.67$^{c}$ | 30.66$^{b}$ | 40.62$^{b}$ | 54.63$^{b}$ | 61.54$^{b}$ | 67.45$^{b}$ | 73.65 | 77.50 |
| 2 | 20.63$^{a}$ | 26.54$^{a}$ | 32.70$^{a}$ | 41.60$^{a}$ | 55.62$^{a}$ | 62.63$^{a}$ | 68.18$^{a}$ | 74.39 | 78.18 |
| 3 | 19.67$^{b}$ | 25.60$^{b}$ | 32.59$^{a}$ | 41.48$^{a}$ | 55.76$^{a}$ | 62.43$^{a}$ | 68.07$^{a}$ | 74.20 | 78.02 |
| 4 | 17.72$^{d}$ | 23.89$^{d}$ | 29.94$^{b}$ | 40.45$^{b}$ | 54.80$^{b}$ | 61.35$^{b}$ | 67.86$^{ab}$ | 73.76 | 78.00 |
| SEM | 0.2059 | 0.2298 | 0.2482 | 0.2531 | 0.2219 | 0.2199 | 0.1647 | 0.1594 | 0.1168 |

*1- Agropyron intermedium Boiss 2- Coronilla Varia 3- Ziziphora Tenuior 4- Scorzonera grossheimii lipsch*

Pasture forages are a source of digestible energy, rumen degraded and un-degraded protein, vitamins and minerals, thereby reducing requirements for concentrates and reducing feeding costs.

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