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IN VITRO DRY MATTER DIGESTIBILITY OF RETAM RAETAM LEAVES AND THE EFFECT OF THE ADDITION OF SOME AROMATIC PLANTS TO THE INCUBATION MEDIA

IN VITRO PROBAVLJIVOST SUHE TVARI LIŠĆA RETAMA RAETAM I DJELOVANJE DODAVANJA NEKIH AROMATIČNIH BILJAKA NA SUPSTRAT INKUBACIJE

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SUMMARY

This study was conducted to investigate the digestibility of *Retama raetam* leaves and the effect of the addition of *Rosmarinus officinalis* or *Salvia officinalis* to the incubation media. *R. raetam* samples (0.5 g control) or (0.4 g of *R. raetam* + 0.1 g of *R. officinalis* or *S. officinalis* dried leaves) were incubated with sheep rumen liquid for 12 hours and 24 hours. In vitro dry matter digestibility of *R. raetam* leaves was 39.10% and 42.39% after 12h and 24h of incubation with rumen fluid respectively. The addition of aromatic plants did not affect the in Vitro dry matter digestibility of *R. raetam* leaves ($p<0.05$).

Key words: *Retama raetam,* in vitro, rumen, aromatic plants.

INTRODUCTION

Grazing area in Libya represents only 8% of the total land area of the country, the majority lies between the rainfalls of 50-200 ml/year (Final report 2005). Libyan rangelands are overgrazed and extremely degraded; their productivity is very low and by some estimate is only 10 to 33 percent of the potential (Jansen 1988). It is recommended for improving the productivity of rangelands to use native shrubs, which are better adapted to harsh climates (Nefzaoui and El Mourid 2008). Retama raetam, commonly known as 'raetam' is a desert shrub belonging to the family Fabaceae that grows abundantly in North-African countries (Al-Tubuly 2011). The plant bears tiny leaves on the currently by growing branches in winter, but is leafless during the long and dry summer (Izhaki and Ne'eman 1997). Most of the newly matured R. raetam pods fall off by the beginning of summer and are then consumed by mammals such as goats (Gutterman 1993: cited by Izhaki and Ne'eman 1997). Gintzburger (1986) found that an Aristida pungens-Retama raetam rangeland in Libya produced 2,000 and 950 kg dry matter (DM) /ha of net above ground phytomass with 200 mm and 171 mm of rainfall during the 1977-78 and 78-79 growing seasons, respectively. Based on crude protein (CP) content and nutritional value, *R. raetam* can be recommended as good-quality food source for grazing animals under pastoral management (Laudadio et al. 2009; Barakat et al. 2013). High fiber content of R. raetam (445 g kg^{-1} dry matter of ADF) (Boufennara et al. 2012) could be enhanced by some feed additives.

Antibiotics like (Monensin, Lasalocide, salinomycin, Lysocilin, Narasin etc…) as feed additives may enhance cellulose digestibility (Russell and Strobel 1989), but their use is now prohibited in the European Union (EC, 2003). One of possible alternatives is natural plant products (Hart et al. 2008). The digestibility of NDF and ADF increased with the addition of some plant extracts and decreased with others (Broudiscou et al. 2002), and this could be related to active compounds in different plants. This study was conducted to assess the effect of addition of *R. officinalis* or *S. officinalis* leaves powder on the dry matter digestibility of *R. raetam* leaves.

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MATERIALS AND METHODS

Leaves of *Retama raetam* were collected from natural habitats of these shrubs, 50 km south of Benghazi, Libya. Leaves of several trees and several locations on the tree were collected, mixed together and the representative sample was then ground through 0.5 mm. Three samples in duplicates were incubated in each incubation time: 0.5 g of *R. raetam* (control), 0.1 g of *R. officinalis* + 0.4 g of *R. raetam*, 0.1 g of *S. officinalis* + 0.4 g of *R. raetam*. Additives, rumen liquor, artificial saliva, chemical analysis and incubation procedure were previously described (Akraim 2011).

Statistical analysis:

Comparison between treatments was carried out by systat (Statistical Packages for the Social Sciences, 1998) according to the following model:

Mean of dry matter digestibility = general mean + effect of incubation time + effect of additive + experimental error.

A Tukey pairwise comparison test was used to compare the different form of additives and the differences were declared significant at $P < 0.05$.

RESULTS AND DISCUSSION

Chemical composition of *R. raetam*, *S. officinalis* and *R. officinalis* is presented in Table 1. Dry matter digestibility of *R. raetem* is presented in Table 2. and Table 3. Values of crude protein, ADF of *R. raetam* were comparable to that registered by Boufennara et al. (2012) in Algerian arid rangelands. However, variations were observed between our results and those of Barakat et al. (2013), Laudadio et al. (2009) in ADF and crude protein content. Fiber and protein content of *R. raetam* showed seasonal variatins (Al-Jabareen 2009; Barakat et al. 2013). Our samples were collected in one season and this may explain some difference in chemical composition. Protein content of *R. raetam* represents a potential source of supplement to poor quality crop residues such as straws, heavily utilized in Libya. In vitro dry matter digestibility of *R. raetam* leaves was 39.10% and 42.39% after 12h and 24h of incubation with rumen fluid respectively. In vitro dry matter digestibility of *R. raetam* leaves after 12h of incubation was higher than that of barley straw and lower than *Atriplex halimus* (Akraim 2011, Milad et al. 2012).

Boufennara et al. (2012) reported in vitro dry matter loss of *R. raetam* of about 51.7% after 48h of incubation. The addition of aromatic plants to the incubation media did not affect the In vitro dry matter loss in this experiment ($p<0.05$). These results are in agreement with Moujahid et al. (2013), who found that *R. officinalis* essential oil had no effects, either on total gas production nor on VFA accumulation.

The addition of *S. officinalis* or *R. officinalis* dry leaves powder to barley straw (Akraim 2011) or to *Atriplex halimus* (Milad et al. 2012) resulted in a depression of their in vitro dry matter loss. Flavonoids components (e.g. linalool) exist in *R. raetam* essential oil, *S. officinalis* and R. *officinalis* (Awen et al. 2011, Gachkar et al. 2007). The absence of depressive effect on the fermentation in this study may be related to the fact that the inhibitory active com-

Table 1 Chemical composition of *R. raetam*, *S. officinalis* and *R. officinalis*[1, 2]

Tablica 1. Kemijski sastav *R. raetam, S. officinalis* i *R. officinalis*[1, 2]

Item - Stavka	CP	EE	NDF	ADF
% (air dry basis) – suhe tvari				
R. raetam	13.6	8.4	46.4	43.4
S. officinalis	7.8	9.7	27.8	24.2
R. officinalis	8.3	17.5	28.8	24.2

[1,2] Mean of two samples – srednja vrijednost dva uzorka, (CP) Crude protein – sirove bjelančevine, (EE) Ether extract – sirova mast, (NDF) Neutral detergent fiber – neutralna detrrđent vlakna, (ADF) Acid detergent fiber – kisela deterđent vlakna

Table 2 Dry matter digestibility of *R. raetam* after 12h of incubation

Tablica 2. Probavljivost suhe tvari *R. raetam* nakon 12h inkubacije

Item - Stavka	Digestibility coefficient – Koeficijent probavljivosti, %	S.E.
Control (*R. raetam*)	39.10	0.80
R. raetam + R. officinalis	38.20	0.80
R. raetam + S. officinalis	36.73	0.80

Table 3 Dry matter digestibility of *R. raetam* after 24h of incubation

Tablica 3. Probavljivost suhe tvari *R. raetam* nakon 24h inkubacije

Item - Stavka	Digestibility coefficient (%) – Koeficijent probavljivosti, %	S.E.
Control (*R. raetam*)	42.39	1.86
R. raetam + R. officinalis	40.63	1.86
R. raetam + S. officinalis	43.60	1.86

pounds in aromatic plants also existed in *R. raetam* leaves.

While El-bahri et al. (1999) considered *R. raetam* as a poisonous plant especially for dromedaries and goats; Laudadio et al. (2009) reported that this plant wass well browsed by animals and recommended it as good-quality food source for camels under pastoral management.

CONCLUSION

Based on the results of in vitro dry matter digestibility and crude protein content, *R. raetam* has a potential as forage crop for browsing animals in the dry season. The addition of *S. officinalis* and *R. officinalis* did not affect the in vitro dry matter loss of *R. raetam*.

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SAŽETAK

Cilj ovog rada bio je istražiti probavljivost lišća *Retama raetam* i djelovanje dodavanja *Rosmarinus officinalis* i *Salvia officinalis* u supstrat inkubacije. Uzorci *R. raetam* (0,5 g kontrola) ili (0,4 g *R. raetam* + 0,1 g suhog lišća *R. officinalis* ili *S. officinalis*) inkubirani su s tekućinom iz buraga ovce 12 sati i 24 sata. In vitro probavljivost suhe tvari lišća *R. raetam* bila je 38,10% i 42,39% nakon 12 i 24 sata inkubacije s tekućinom iz buraga ovce. Dodavanje aromatičnog bilja nije djelovalo na in vitro probavljivost suhe tvari lišća *R.raetam* ($p < 0,05$).

Ključne riječi: *Retama raetam*, in vitro, burag, aromatično bilje