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Effect of Thyme Methanolic Extract on the Metobolizable Energy of Canola Meal for Ruminant

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ABSTRACT

This study was carried out to determine the estimation of effects three doses (0, 0.15, 0.3 ml/30 ml buffered rumen fluid) of thyme methanolic extract on the metobolizable energy of canola meal using the nylon bags technique. Degradation procedure was performed using nylon bags filled with 5 g of canola meal and suspended in the rumen of three fistulated Gezel rams for 0, 2, 4, 8, 16, 24 and 48 h and obtained data were fitted to a non-linear degradation model to calculate ruminal degradation characteristics. Results showed that Metabolisable energy was 2033.95 (K. Ca/Kg DM) for canola meal. Metabolisable energy was 2013.67 (K. Ca/Kg DM) for thyme methanolic extracts (0.15 ml/30 ml buffered rumen fluid). Metabolisable energy was 2003.4 (K. Ca/Kg DM) for thyme methanolic extracts (0.3 ml/30 ml buffered rumen fluid).

Keywords: Canola Meal; thyme methanolic extract; Nylon Bags Technique; metobolizable energy; ruminal; degradation.

INTRODUCTION

Ruminal fermentation of hexoses and amino acids is accompanied by losses of energy and amino nitrogen, respectively [2]. In fact, 8 to 12 percent of the digestible energy ingested by ruminants is lost in the rumen as methane, whereas from 75 to 85 percent of the nitrogen consumed by dairy cows is excreted in feces and urine [16, 2]. Modification of rumen microbial fermentation to decrease methane and ammonia nitrogen production using feed additives, such as antibiotics, has proved to be a useful strategy to improve production efficiency in dairy cattle [11, 2]. The public concern over the routine use of antibiotics and growth promoters in livestock production has increased recently because of the risk of the antibiotic residues presence in milk and meat and its effect on human health [15]. These led to its prohibition in the European Union in 2006 in animal feeding. Accordingly, there is greater interest in using plants and plant extracts as alternatives to feed antibiotics to manipulate ruminal fermentation, improve feed efficiency and animal productivity [3, 4 and 15]. Many plants produce secondary metabolites such as phenolic compounds, essential oils, and sarsaponins [3, 4 and 15]. That affect was microbial activity [15].

Several methods such as in vivo, in situ and in vitro techniques have been used in order to evaluate the nutritive value of feedstuffs [8, 10]. In recent years a number of important factors have come into play that is changing the ways in which feedstuffs characterization in the laboratory is approached [6, 7]. For instance, in some countries characterization of ruminant feeds in general is rapidly moving away from expressions of energy and protein content to an assessment of the nutrients supplied to the animal both directly and indirectly as a result of microbial activity in the rumen. In addition, in some places there is increasingly powerful public pressure to reduce or stop the use of surgically modified animals in nutritional studies. In this research, the technique to be discussed is termed the in situ technique [9, 6 and 7]. However, this is identical to the in sacco technique or the Terylene (Dacron) or nylon-bag techniques. The procedure is as follows samples of dried and milled feed (to pass a 3 mm screen) or wet minced samples are placed in nylon bags (usually 10*17 cm) [6, 7]. About 2 to 5 g, depending on density, are weighed precisely into each bag. The tied-up bags are incubated in the rumen of sheep or cattle on an appropriate diet by suspending them from a rumen cannula. They are then withdrawn after various intervals of time, washed and dried. Degradability of dry matter, nitrogen, energy, etc,. can thus be measured against time [6, 7]. The objective of this study is to assess the thyme methanolic extract affects on the metobolizable energy of canola meal using the nylon bags technique.

MATERIALS AND METHODS

2.1. Thyme and Canola Meal Samples

Canola meal samples were obtained from commercial sources in Iran. During summer season thyme samples were collected from different parts of Esfahan province. All samples were then ground in a laboratory mill through a 1 mm screen.

2.2. Procedure of thyme extracts preparation

The thyme methanolic extracts were prepared according to Patra et al [12]; Sallam et al [15] with some modifications. The thyme materials were dried at 50°C and ground in mills to pass a 1 mm sieve and 100 g placed in 1000 ml of methanol solvent. The flasks of all the solvents were stoppered and agitated with a magnetic stirrer for 24 h at room temperature. Then the solutions were centrifuged at 3000 g for 10 min. The residue was re-extracted with 500 ml of methanol for 24 h stirring at room temperature and centrifuged again at 3000 g for 10 min. The thyme extracts were combined. Distilled water was evaporated from the solution at approximately 65°C using a rotary-evaporator [15].

2.3 Treatments and experimental design

The Three doses (0, 0.15 and 0.3 ml/30 ml buffered rumen fluid) thyme methanolic extract were added to the canola meal samples.

2.4. *In situ* degradation procedures:

Three ruminally cannulated Gezel rams (about 55 kg BW) were used to determine *in situ* degradation characteristics. Rams were housed in individual tie stalls bedded with sawdust. Dacron bags (18*9 cm; 40-45 micron pore size) were filled with 5 g dried and ground samples and then incubated in the rumen of rams for the periods of 0, 2, 4, 8, 16, 24 and 48 h.

After the removal of bags from the rumen, bags were washed in cold water until rinse were clear and dried at 60^{oC} for 48 h [5, 9].

Metabolizable Energy (ME) contents of soybean meal were estimated using equations given below [1].

ME (MJ/Kg DM) = 2.27563+0.1073*DMD

Where, DMD is rumen dry matter degradability for 48 h

RESULTS AND DISCUSSION

Metobolizable energy calculated amounts of canola meal, thyme methanolic extract (0.15 and 0.3 ml/30 ml buffered rumen fluid) are presented in Table 1.
Results showed that Metabolisable energy was 2033.95 (K. Ca/Kg DM) for canola meal. Metabolisable energy was 2013.67 (K. Ca/Kg DM) for thyme methanolic extracts (0.15 ml/30 ml buffered rumen fluid). Metabolisable energy was 2003.4 (K. Ca/Kg DM) for thyme methanolic extracts (0.3 ml/30 ml buffered rumen fluid). Salamat azar et al [14] evaluation the effect of thyme water extract on the net energy for lactation, short chain fatty acid, in vitro dry matter digestibility, metobolizable energy and organic matter digestibility of soybean meal for ruminant and report metobolizable energy of soybean meal was 10.62 (MJ/Kg DM) and metobolizable energy of thyme water extract (0.15 and 0.3 ml/30 ml buffered rumen fluid) were 10.6 and 10.21 (MJ/Kg DM), respectively. These results are in agreement with the findings of salamat azar et al [14].

Salamat azar et al [13] evaluation effect of tree doses thyme (zataria multiflora) water extract (0, 0.15 and 0.3 ml/30 ml buffered rumen fluid) on the short chain fatty acid, net energy, metobolizable energy and organic matter digestibility of sunflower meal using *in vitro* gas production technique and report metobolizable energy of sunflower meal was 8.36 (MJ/Kg DM) and metobolizable energy of zataria multiflora water extract (0.15 and 0.3 ml/30 ml buffered rumen fluid) were 8.20 and 8.04 (MJ/Kg DM), respectively. These results are in agreement with the findings of salamat azar et al [13].

Table1. The estimated metobolizable energy were canola meal, thyme methanolic extracts (0.15 and 0.3 ml/30 ml buffered rumen fluid).

Treatment	metobolizable energy (ME)
canola meal	2033.95
thyme methanolic extracts (0.15 ml/30 ml buffered rumen fluid)	2013.67
thyme methanolic extracts (0.3 ml/30 ml buffered rumen fluid)	2003.4
P value	0.6207
SEM	8.916

CONCLUSION

The results of this study showed that the addition thyme methanolic extract doses (0.15 and 0.3 ml/30 ml buffered rumen fluid), decreased the metabolizable energy (ME). This study suggested that the doses (0.15 and 0.3 Thyme methanolic extract) have the potential to affect ruminal fermentation efficiency.

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