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Ruminal degradation of pomegranate pomace using nylon bags technique

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ABSTRACT

This study was carried out to determine of nutritive value of Pomegranate Pomace using in situ technique. In this study two fistulated wetheres (38±1.5 kg) were used in in situ method. Ruminal DM and CP disappearances were measured 0,2,4,6,8,12,16,24,36,48,72 and 96 h. Dry matter degradabilities of treated pomegranate pomace at 8 to 96 h, were larger than untreated pomegranate pomace, that showed significant differences ($p<0.05$). Crude protein degradabilities of treated pomegranate pomace at 96 h was 62.38 % that showed significant differences ($p<0.05$). Pomegranate pomace can used largely as a ruminant feeds.

Keywords: pomegranate pomace and nylon bag

INTRODUCTION

Developing food industrial factories consequently produced large amount of wastes and by-products. Damping or burning wastes or agro-industrial by-products causes potential air and water pollution problems. High-moisture wastes are also difficult to burn. Many by-products have a substantial potential value as animal feedstuffs [1]. Feeding by-products of the crop and food processing industries to livestock is a practices as old as the domestication of animals by humans. It has two important advantages, these being to diminish dependence of livestock on grains that can be consumed by humans (which was almost certainly the primary original reason), and to eliminate the need for costly waste management programs (which has become very important in by-product has increased, particularly in developed countries. Pomegranate (*Punica granatum* L.) is one of the oldest edible fruits and has been used extensively in the folk medicine of many cultures. Popularity of pomegranate has increased tremendously especially in the last decade because of anti-microbial, anti-viral, anti-cancer, potent anti-oxidant, and anti mutagenic effects of the fruit. The antioxidants contained in fruits and vegetables including ascorbic acid, carotenoids, flavonids, and hydrolysable tannins [3]. However, pomegranate also have some anti-nutritional factors such as tannins and other secondary compounds. Tannins are polyphenolic substances with various molecular weight and a variable complexity. Three main mechanisms have been suggested to explain the negative effects of high tannin concentrations on voluntary feed intake: a reduction in feed palatability, the slowing of digestion, and the development of conditioned aversions. The objective of this study was to determine nutritive value of pomegranate pomace using in situ nylon bags and reduce pomegranate pomace anti-nutriental effects by their treatment with urea.

MATERIALS AND METHODS

Pomegranate pomace was obtained from fruit juice production factories of Tabriz, IRAN. Samples were collected from at least 7 different areas within each wastes mass of factories. All samples were dried in an oven at 100°C until a constant weight was achieved. All samples were then ground to pass thought a 2-mm screen in Wiley mill (model 4, Arthur H. Thomas Co., Philadelphia, PA) before incubation. Two yearling (Gizil) wethers (38 ±1/5 kg)

were used. At least 30 d before initiation of the experiment, each wether was surgically fitted with a ruminal cannula.

In situ methods procedures was determined using Nocek [5] and reviewed by Taghizadeh et al [4], 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 Pomegranate pomace samples were 0,2,4,6,8,12,16,24,36,48,72 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. Feed residues were recovered from each bag and pending analysis for Kjeldhal nitrogen. The value of degradability at time 0h was obtained by washing for bags under tap water at least 15 min. Samples were then dried in an oven at 55˚C until a constant weight was achieved befor determination of DM disappearance. The DM and CP degradation data was fitted to the exponential equation $P = a+b(1 – e^{-ct})$ Orskov and McDonald [6], 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.

RESULTS AND DISCUSSION

The degradability parameters of DM and CP are shown in Tables 1 and 2, and the DM and CP degradation characteristics are shown in Table3. Urea treated pomegranate pomace showed high value for ruminal DM degradation compared to untreated samples (P<0.05). DM degradation data in this study were lower than Feizi et al [2]. Treatment of pomegranate pomace with urea increases samples pH due to hydrolysis of urea to NH_3 and has been shown to be effective in preservation of stored samples.

Ruminal degradability of pomegranate by-products were higher than alfalfa or other hays [4]. This results showed that pomegranate pomace can used widely in ruminants rations without metabolic problems and to eliminate the need for costly waste management programs. Since disappearance of CP was little during the first 6h of fermentation, utreated pomegranate showed higher ruminal disappearance of CP (P>0.05), but processing of ruminal CP degradation showed that treated pomegranate have a high ruminal degradation in other times (P>0.05).

Table 1. In situ DM disappearance (% of DM)

	Incubation time (h)											
Feeds	0	2	4	6	8	12	16	24	36	48	72	96
Pom	33.36	35.67	39.02	41.34	44.31b	45.29b	48.45b	51.24b	55.24b	59.65b	63.46b	64.68b
Pom+ur	34.21	37.08	40.2	41.26	46.25a	48.00a	52.50a	55.34a	58.36a	63.58a	67.25a	73.78a
SEM	0.433	0.529	0.694	0.661	0.551	0.473	0.564	0.501	0.513	0.562	0.453	0.560

a, b, c Means within a column with different subscripts differ (P<0.05).
Pom: pomegranate pomace, Pom + ur: pomegranate pomace

Table 2. In situ CP disappearance (% of DM)

	Incubation time (h)											
Feeds	0	2	4	6	8	12	16	24	36	48	72	96
Pom	16.48	18.79	19.90	21.79	26.12	30.72	32.38	35.83	41.50	45.43	53.95	57.19
Pom+ur	15.11	17.65	19.51	21.73	26.30	31.95	33.51	36.58	43.64	50.95	56.11	62.38
SEM	0.952	0.928	1.312	1.596	0.799	1.416	1.058	1.653	1.356	1.855	1.796	1.743

a, b, c Means within a column with different subscripts differ (P<0.05).
Pom: pomegranate pomace, Pom + ur: pomegranate pomace

Table 3. In situ DM and CP degradation characteristics

	DM degradation characteristics			CP degradation characteristics		
Feeds	a	b	c	a	b	c
Pom	34.58	30.87b	0.035	16.98	45.68	0.024
Pom+ur	35.68	37.83a	0.030	15.76	50.82	0.025
SEM	0.401	0.694	0.002	0.570	3.641	0.003

a, b, c Means within a column with different subscripts differ (P<0.05).

Urea treated pomegranate pomace showed higher ruminal DM insoluble fraction (b) and there was significant differences (p<0.05). The CP insoluble fraction (b) of treated samples was higher than others, but they have not

significant differences ($p<0.05$). Results showed that ammonification of feeds by ammonia or urea increase N content and improved ruminal degradability.

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