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Determination of nutritive value of grape pomace and raisin *Vitis* leaves using nylon bags

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Abstract

This study was carried out to determine the chemical composition of grape pomace (GP) and raisin vitis leaves (RVL). The chemical composition was optined with AOAC methods. Ruminal CP disappearances were measured 0,2,4,6,8,12,16,24,36,48,72 and 96 h. The results showed that the GP showed higher DM (96.73 to 96) and CP (16.59 to 14.34) content. But ADF (24.33 to 20.38) and NDF (32.02 to 22.2) of RVL were higher than GP. Crude protein degradability of RVL GP at 96 h was 23.01 and 22.87 % there was no significant differences (p>0.05). Data showed that grape pomace (GP) and raisin vitis leaves (RVL)can be used as a high valuable feed in ruminant rations to support growth and lactation, with fewer negative effects on rumen fermentation than starch rich feeds.

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Introduction

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). Use of browse species as feeds for ruminants is important in many parts of the world. However, the presence of tannins, and other phenolic compounds, in a large number of nutritionally important shrubs and tree leaves hampers their utilization as animal feeds (Tolera et al., 1997).

The annual amount of agricultural by-products produced in Iran is considerable amount. The production of grape by-product in this country is 2.87 million tonnes/year (Besharati and Taghizadeh,. 2009). Their use as animal feeds is a means of recycling crop by-products, which, if allowed to accumulate can cause environmental pollution (Huber, 1981). Considerable production of this by-product encourages animal nutritionists to study its nutritive value. Although higher cell wall content of this by-product limits its utilization by non ruminants, it is used widely in ruminant nutrition (Maheri-sis et al, 2012).

Lu and Foo,. 1999, reported that GP tannins have adverse effects on nutrient utilization, and are toxic at high intake levels (Reed, 1995), due to their ability to bind proteins, minerals and carbohydrates (McSweeney et al., 2001). Tannins are the most widely occurring anti-nutritional factor in non-conventional feeds (Besharati and Taghizadeh,. 2009).

Predicting the feeding value of feedstuffs as accurately as possible and with methods of low cost and easy to handle is an important economical target. This goal is of particular importance for grazing and browsing ruminants that valorize local resources often of low and variable nutritive value. Chemical composition can give an idea of the nutritive value of feeds, but it is not sufficient (Krishnamoorthy et al., 1995). The aim of this study was to determination of chemical composition of dried GP and RVL using AOAC methods.

Materials and methods

Dried GP and RVL collection

This study was conducted in 2014 at the department of veterinary, Islamic Azad University, Beyza Branch, Beyza, IRAN. Grape pomace was obtained from juice production factories. The DGB that was sampled contained grape cluster stems and rejected raisins.

Chemical composition

Feedstuffs dry matter (DM, method ID 934.01), ash (method ID 942.05), ether extract (EE, method ID 920.30) and crude protein (CP, method ID 984.13) were determined by procedures of AOAC (1999). The neutral detergent insoluble fiber (NDF) and acid detergent fiber (ADF) concentrations were determined using the methods of Van Soest et al. (1991), without sodium sulphite. Neutral detergent insoluble fiber was analyzed without amylase with ash included. Total phenolics were measured using the Folin Ciocalteau method (Makkar, 2000). Total tannin was determined after adding insoluble polyvinyl pyrrolidone and reacting with Folin Ciocalteau reagent (Makkar, 2000). Tannic acid was used as the standard to express the amount of total phenolics and total tannin. Dry matter was determined by drying the treatments at 105°C over night and ashed by igniting the treatments in muffle furnace at 525°C for 8 h. Nitrogen (N) content was measured by the Kjeldahl method (AOAC (1999). Crude protein was calculated as CP=N×6.25.

Statistical analysis

Obtained data from chemical composition study was analyzes according to completely randomized design with 3 replicates by the GLM procedure (SAS, 2002). The treatment means were compared by the Duncan test. Statements of statistical significance are based on $p<0.05$.

Results and discussion

The chemical composition of dried GP and RVL is presented in Table 1. The obtined data for dry matter of test feeds from this study was greater than the values reported (30.5 and 27.3%) by Baumgartel *et al.*, 2007), those reported (85.45%) by Besharati and Taghizadeh,. 2009). The percentage of crude protein of test feeds showed similar values with the data reported (15.5% in red GP) by Baumgartel *et al.*, 2007), also was higher than those values reported by Baumgartel *et al.*, 2007), (9.3% in white GP).

Table 1. The chemical composition of feeds (% DM)*.

Feed	DM	CP	NDF	ADF	OM	CF	HC	TP	TT
GP	96.73[a]	16.59[a]	22.2[b]	20.38[b]	86.75	7.13[a]	1.82[b]	2.715[b]	1.98[b]
RVL	96[b]	14.34[b]	32.02[a]	24.33[a]	85.45	6.23[b]	7.69[a]	4.599[a]	3.548[a]
SEM	0.0965	0.3010	0.3162	0.398	0.6467	0.1458	0.9128	0.23	0.2074

*DM=dry matter, CP=crude protein, NDF=neutral detergent fibre, ADF=acid detergent fibre, OM=organic matter, CF=Crude fat, HC=hemicellulose, TP=Total phenolics and TT=Total tannin.

a,bWithin a column, means without a common superscript letter differ ($P < 0.05$).

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

Feeds	Incubation time (h)											
	0	2	4	6	8	12	16	24	36	48	72	96
GP	15.28[a]	18.63[a]	20.38[a]	23.24[a]	26.21[a]	26.87[a]	29.15[a]	32.12[a]	34.08[a]	37.54[a]	49.00[a]	58.18[a]
RVL	13.33[b]	13.08[b]	14.11[b]	14.55[b]	14.85[b]	15.32[b]	16.37[b]	18.54[b]	19.23[b]	22.18[b]	28.04[b]	32.29[b]
SEM	0.54	0.83	0.79	0.93	0.30	0.99	0.74	1.35	1.92	2.06	2.34	2.89

grape pomace (GP) and raisin vitis leaves (RVL).

Table 3. In situ CP disappearance (% of DM).

Feeds	Incubation time (h)											
	0	2	4	6	8	12	16	24	36	48	72	96
GP	3.98	5.26	6.67	7.56	9.23	9.96	11.02	12.24	14.12	15.23	17.89	23.01
RVL	4.12	6.12	7.12	8.13	10.01	10.68	12.14	13.89	16.23	17.00	19.35	22.87
SEM	0.34	0.78	0.64	0.92	0.72	0.43	1.02	1.08	2.12	1.89	1.08	1.57

grape pomace (GP) and raisin vitis leaves (RVL).

The degradability of DM and CP are shown in Tables 2 and 3. Grape pomace showed high ruminal DM disappearance in all of the incubation times there were significant differences ($P < 0.05$), and raisin vitis leaves showed the lowest ruminal DM disappearance in all of the incubation times ($P < 0.05$). Results showed no significant differences for ruminal CP degradation ($P > 0.05$). The difference values for ruminal DM disappearance can be resulted from the higher value for soluble fraction of DM in compare with other one. There were significant difference in dry matter, crude protein, acid detergent fibre and neutral detergent fibre in test feeds. There were differences between the amounts of acid detergent fibre, neutral detergent fibre, crude protein and ash obtained in this study and the National Research Council (2001). Total phenolic compounds and total extractable tannins in the leaves of GP and RVL were differed with those reported (6.7 and 5.23%) by Besharati and Taghizadeh,. 2009), but were consistent with the data reported (2.27 and 1.56% for GP) by Alipour and Rouzbehan,. 2007). The stage of maturity, types of varietiesm methodes of measurement and dehydration are the factores affecting the phenolic compounds of GP. Regarding to variance in factors influenced chemical composition of GP the crude protein and neutral detergent fibre were in a variety in studied white GP (9.3 and 30.6%), and red GP (15.5 and 50.7%) reported by Baumgartel *et al.*, 2007).

Conclusion

Regarding to obtained results the GP and RVL are valuable source in ruminant nutrition. Vitis leaves and grape pomace have anti-nutritional substances containing tannin and phenolic compounds, resulting decreased nutritive value.

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