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Effects of diet supplementation with Purslane (*Portulaca Oleracea L.*) on Growth Performance of Moghani Lamb

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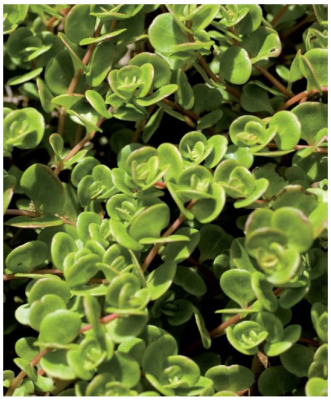
ABSTRACT

Purslane *(Portulaca Oleracea L.)* known as a wild plant is a reasonable selection for study due to its high nutritive and antioxidant properties as human food, animal feed and medical utilization. An experiment was conducted to evaluate effects of diet supplementation with dried leaves and stems of Purslane on lambs performance. Twenty Moghani lambs (27 ± 3 kg BW) were assigned in four treatment with five replicates, and were fed diets containing 0% Purslane (control), 5, 10 and 15 % Purslane (T1, T2 and T3, and T4 respectively) for 90 days of experiment. The lambs were slaughtered after performance calculation to evaluate cold carcass percentage. Adding Purslane to diet up to 15 % as substituted amounts with alfalfa did not showed any significant difference on performance and cold carcass. But, considering high nutritive value and lower price of Purslane in compared to alfalfa, it seems have an economic advantage in feed prices and livestock production cost.

KEYWORDS: Moghani Lamb, Purslane, Performance, Price

1. INTRODUCTION



Purslane (*Portulaca oleracea L.*), a non-traditional vegetable and as herbaceous weed, but has a long history of use as human food, and for its medicinal benefits.

Purslane, a vegetable used in soups and salads along the Mediterranean basin and in Middle East, is unique because it is one of the richest green plant sources of omega-3 fatty acids, such as alpha-linolenic acid (C18:3 n-3), but contains also high levels of linoleic acid (C18:2 n-6), both essential for normal human growth, health promotion, and disease prevention (Wenzel et al., 1990; Raper et al., 1992; Simopoulos, 1998; Simopoulos, 2001).

Also it is one of the few plants known to be a source of eicosopentanoic acid (Kris-Etherton, 2000) and a rich source of vitamin C, E and polyphenols, which all play a protective role against chronic diseases (Kiple and Ornelas, 2000). These chemical and physiological properties make Purslane a potential functional food. The current challenges are to find and inclusion of suchlike ingredients into formulated diets to produce enriched products at an affordable cost readily accessible to consumers.

In recent decade, inclusion of PUFA-rich plant extract, oil, leaves or whole seeds in ruminant rations was shown in several studies (Simopoulos et al., 1992; Ezekwe et al., 1999; Ward et al., 2009; Golshan-Zoroofi et al., 2010) to reach this end, despite the extensive biohydrogenation of dietary lipids within the rumen (Mir et al., 2002). Results of some studies on sensory evaluation of Purslane indicated that increased incorporation of Purslane enhanced tenderness of n-3 enriched products (Duke et al., 2000; Liu et al., 2000; Simopoulos et al., 2005; Gas, 2005; Liu and Zhang, 2006). Purslane is known to exhibit high cooling stability, water holding capacity and cooking yield (Lin et. al., 2000). However, many studies are necessary for well detecting the efficacy of suchlike functional foods on animal performance and products.

The purpose of this study was to investigate the effects of inclusion of Purslane in the diet along with substituting alfalfa on performance of Moghani lambs, feed and live weight prices.

2. MATERIAL AND METHOD

2.1. Animal and feeding

Twenty five Moghani male lambs (27 kg BW ± 3, 100 day old) were divided into four groups in a completely randomized design and fed on the formulated diets twice per day at 08.00 and 14.00 h individually

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throughout the experiment, free access to the diets and fresh water. Fresh leaves and stems of Purslane was provided from gardens of East Azerbaijan province and all plants were dried naturally in shade for a period of 72 h.

The refusals of diets offered for male lambs were daily recorded. The animals were weighed every thirty days intervals in mornings to recording average daily gain and feed yield. Whole diet that offered at the beginning of each period were recording and subtracted from leftover of collected at regular intervals. On day 90, lambs were individually weighed and slaughtered to study chilled carcass.

Table 1. Comparison of predominant nutritional values per 100 g Purslane and alfalfa

Items	Purslane	Alfalfa
Energy (kcal)	21	23
Carbohydrates (g)	2.70	2.10
Fiber	0.50	1.90
Fat (g)	0.50	0.70
Protein (g)	1.57	4
Calcium (mg)	103	32
Phosphorus (mg)	40	70
Potassium (mg)	400	79
Magnesium (mg)	68	27
Sodium (mg)	4	6
Iron (mg)	1.99	0.99
Folate (vit. B_9) (µg)	12	36
Vitamin K(µg)	30.50	10.50
Vitamin A (IU)	2500	500
Vitamin C (mg)	20	8.2

Table 2. Composition and calculated nutrient content of commercial diet's ingredients fed to lambs

Ingredients	%	Value (RLS)	Calculated (RLS)
Barley	50.46	6000	3030
Alfalfa	35.84	5700	2045
Wheat	3.84	7000	280
Soybean meal	8.49	14500	1305
Calcium carbonate	0.92	500	5
Soil	0.46	-	-
Total	100.00	-	6665
Calculated nutrient content			
ME (Mcal/kg)	2.5	-	-
Crude protein (%)	15.3	-	-
Calcium (%)	0.5	-	-
Available P (%)	0.3	-	-
NDF (%)	32.27	-	-
ADF (%)	18.60	-	-

[1]Diets fed to lambs with the average body weight = 27 ± 3 kg from 100 to 190 day age of growth period. [2]NDF: Neutral Detergent Fiber, ADF: Acid Detergent fiber, ME: Metabolizable Energy. Prices of each item are calculated according to http://www.itpnews.com (year 2012).

2.2. Chemical composition

Mean nutritional value per 100 g dried leaves of Purslane and alfalfa (Table 1) and the chemical composition of diet (Table 2) were determined by method of AOAC (1997). The ADF and NDF were measured according to the methods described by Van Soest et al. (1994).

2.3. Feed and live weight prices calculation

Costs for food and diets prices per kilogram, or per 100 percent dry matter (RLS) were calculated. Although, because of fluctuations in cost of one kilogram of live animal weight and one kilogram of feed intake (RLS) in the market is difficult to estimate the exact cost, the most common prices in different regions of East Azerbaijan province were supplied and calculated. Unit cost is based on Iranian Rials (IRR or RLS). For example for

converting costs: 1 United States dollar (USD) in 2012 = 25000 ± 500 IRR.

2.4. Statistical analysis

Performance data were analyzed based on a complete randomized design with four treatments and 5 replicates, using SAS statistical package program (SAS, 1999) and means were compared with Duncan's multiple range test at (P<0.05).

3. RESULTS AND DISCUSSION

The lamb's performance is presented in table 2. Results showed that alfalfa replacement with Purslane in the diet up to 15 % could not significantly affected performance and cold carcass yield (Table 3). In experimental diets with increasing levels of Purslane to replace with alfalfa, price per kg of dry matter intake (DMI) was reduced due to lower prices of Purslane than alfalfa. Highest price of a kilogram of animal body weight is related to T1 while lowest cost of 1 kilogram live weight of lamb is belonging to group 4 that had low feed intake price because of Purslane, relatively lower in cost than alfalfa (Table 4).

Results of the study showed that *Poutulaca oleracea* up to 15% of inclusion level in the diet couldn't improve performance, if compared to the control diet or in the other word, when replaced to alfalfa of the diet (Table 3). On the other hand, cost per kilogram of live animal weight in parallel with percent substitution of Purslane leaves and stems with alfalfa had upward line due to low price rates of Purslane than alfalfa as ingredients (Tables 2 and 4).

Therefore, considering high nutritive value (Table 1) and lower price of Purslane (2000 RLS) in compared to alfalfa (5700 RLS), it seems have an economic advantage in feed prices and livestock live weight production cost (Table 4) may be an efficient ingredient in diet formulation from economic advantage standpoint.

Table 3. Effect of diet supplementation with Purslane on lambs performance

Treatments[3]	Dry matter Intake				Performance[2]				
	Alfalfa g day^{-1}	Concentrate g day^{-1}	Dried Purslane	Total feed without Purslane	Live weight on day 100	Live weight on day 130	Live weight on day 160	Live weight on day 190	Cold carcass weight
1	864.00[a]	243.00	0.00[a]	1107.00[a]	26.10	28.86	32.86	36.13	16.83
2	810.00[b]	243.00	48.0[b]	1052.66[b]	26.50	29.26	32.33	35.60	13.00
3	757.33[c]	243.00	98.00[c]	994.66[c]	26.43	29.10	31.93	34.40	12.86
4	706.00[d]	243.00	149.00[d]	944.33[d]	28.26	30.90	33.16	36.20	14.50
SEM	3.192	0.000	1.240	2.380	2.541	2.634	2.810	2.838	1.210
P value [4]	**	ND	**	**	NS	NS	NS	NS	NS

[a-d,] Values in the same row and variable with no common superscript differ significantly (P<0.05). [2]Values are means of four observations per treatment and their standard errors. [3]T1=0% Purslane, T1=5% Purslane, T1=10% Purslane, T1=15% Purslane. [4]NS= P>0.05; **= P<0.01.

Table 4. Calculated price of alfalfa, Purslane and per kg DMI (dry matter based) and cost per kg live weight of livestock

Groups[1] / **Price** (RLS)	T1	T2	T3	T4
Calculated alfalfa intake[2]	2045	1758	1473	1188
Calculated Purslane intake	-	100	200	300
Price of 1 kg of feed intake	6665	6478	6293	6108
Cost of 1 kg of live animal weight	11000.8	10900.5	10700.9	10500.9

[ad,] Values in the same row and variable with no common superscript differ significantly (P<0.05). [1]T1=0% Purslane, T1=5% Purslane, T1=10% Purslane, T1=15% Purslane. [2]Values were calculated based on replaced percentage of alfalfa with Purslane. Price of 1 kg of alfalfa= 5700 RLS and 1 kg of Purslane= 2000 RLS (year 2012; http://www.itpnews.com).

Purslane is the richest source of alpha-linolenic acid of any green leafy vegetables examined when compared to spinach and other cultivated plants (Ward et al., 2009). The Middle East and relatively Iran is one of the Asian countries that is susceptible to Purslane cultivation (Mazaheri et al., 2009; Asadi Gharneh and Hassandokht, 2012) and use of its dried leaves and stems as a major source of food for livestock because cultivated green fodder is not sufficiently available.

Also, more work in these areas is necessary to detect applicable results and study of different levels and varieties types of Purslane, test diets in different criteria of feeding (*ad libitum* vs. restricted), the sex, age and kind of animal and many more factors could have contributed to this variability.

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