Effect of Different Proportion of Barley Grain to Corn Grain on Growth Performance and Carcass Quality of Fattening *Gezel* Lambs

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Abstract: In order to study the effects of barley to corn ratio on growth performance carcass composition and blood fatty acids profile an experiment was conducted with 12 male *Gezel* lambs in a completely randomized design each 4 experimental diets in 3 replicate for 110 days. In experimental diets the ratio of barley to corn were 100:0, 75:25, 5:50, 0:100. The results showed that there were not any significant differences between treatments in final body weight, daily weight gain, dry matter intake and feed conversion (P>0.05). Between treatments treatment 2nd had the highest amount of width muscle length (P<0.05). And the highest eye muscle length was observed in experiment group 3 (P<0.05). In comparison of meat fatty acids composition the highest amount of Estraric saturated fatty acid (C:18) and the lowest amount of C16:1-n7 and C18:1-n9 were observed in group 2 (P<0.05).In comparison of blood fatty acids profile the lowest amount of C18:1-n9 in experiment group 2 and C18:1-n7 in experiment group 1 and the highest amount of C18:2-n6 and C18:3-n3 were observed in group1.The overall results showed that in *Gezel* fattening lambs using 75:25 and 50:50 of barley to corn have positive effects performance carcass characteristics. [Tohid Moshfegh, Akbar Taghizadeh, Yousef Mehmannavaz and Valiollah Palangi**. Effect of Different Proportion of Barley Grain to Corn Grain on Growth Performance and Carcass Quality of Fattening *Gezel* Lambs .** *Life Sci J* 2013;10(3s):922-925] (ISSN:1097-8135). http://www.lifesciencesite.com. 100

Key words: barley, corn, carcass characteristics, fattening, performance, fatty acid profile.

Introduction

Sheep production is an economically important enterprise in many countries (FAO, 2003). In some part of world for intensive production of fattening of lambs, they are fed with high amount of concentrate. However this pattern in feeding often affect negatively of rumen fermentation (Heidari et al, 2008). Different nutritional conditions may alter fatty acid composition in the muscles of ruminants. Lipid supplementation, in addition to promoting higher weight gain and better carcass composition due to the higher energetic density (Marinova et al., 2001), has been credited as one of the main factors to increase concentration of mono and polyunsaturated fatty acids, as well as the ratio between ω6 and ω3 families (Boles et al., 2005; Bas et al., 2007; Lewis et al., 2008). Grains are supplemented in the ration as a source of starch to meet energy needs of ruminants. Excess starch consumption could be detrimental to ruminal fermentation with a negative impact on animal performance. On the other hand, reducing the amount of starch fermented in the rumen may reduce microbial protein synthesis. Barley contains less starch (65%) than corn (72%) (Waldo, 1973) but the proportion fermented in the rumen is greater than corn (Herrera- Saldana et al., 1990). Recently, consumption of animal products containing low levels of saturated fats has been recommended because of a possible link between some saturated fatty acids (SFA) and cardiovascular diseases. As a result, attention has been directed towards producing animal products containing high levels of unsaturated fatty acids (UFA). However, it is more difficult to produce animal products with increased levels of UFA in ruminants than in non-ruminants because of bio hydrogenation of dietary UFA by ruminal microorganisms (Chong et al, 2009).

Material and Methods

Animals and feeding

This experiment was conducted at the Department of Animal Science, Maragheh Branch, Islamic Azad University, Maragheh, Iran. Twelve fatting male lambs with similar conditions (36.12 ± 3.98 kg initial weight and 150 ± 20 days of age) from a flock of autumn lambing of gezel sheep were used in this study. Animals were confined for 90 days in individual outdoor pens with concrete floor. Three pens were used for each treatment. Four treatments (with relation of barley grain to corn grain were 0:100, 25:75, 50:50 and 100:0). The diets were formulated according to NRC (1985). The diets were offered ad-libitum to all groups, So that about 5% of the feed stays on manger.

Sample Collection

DMI was measured daily. The body live weight (BLW), dry matter intake (DMI) and feed conversion ratio (FCR) of lambs were measured two weeks interval until 90 days. To determine the fatty acid profile of blood, blood samples were taken. Lambs blood from the jugular vein was performed 2 hours after eating and blood samples were stained with anticoagulant (EDTA). All animals were

slaughtered at a commercial slaughterhouse. Immediately after post exsanguination, samples for analysis of fatty acid composition were taken from tissues. To determine meat fatty acid composition, a sample of approximately 2 g, removed from the central part of the longissimus dorsi muscle, was used. The frozen sample was homogenized in 20 mL of a chloroform and methanol solution (2:1) using a Turrax homogenizer, disintegrator and emulsifier (Folch et al., 1957). In the next step, the lipid extract aliquot was methylated using the Kramer et al. (1997)method and stored at -18 °C in amber flasks containing nitrogen to avoid oxidation. Carcass yield and quality were determined at the 13th rib section from the left side of each carcass.

Chemical analysis

Meat fatty acid composition was determined by gas liquid chromatography (GLC) using an Agilent equipment (6890N, Agilent Technologies) with flame ionization detector (6890N, Agilent Technologies) and a 100 m long and 250 µm inner diameter capillary fused silica column (DB-WAX, Agilent Technologies) containing 0.20 µm of cyanopropyl polysiloxane. Data were obtained with the software ChemStation (Agilent Tecnologies).

Calculations and Statistical Analysis

Data collected for carcass traits and meat fatty acids and blood fatty acids were analyzed using a general liner model (GLM) procedure of SAS (SAS, 1999), using the model:

$$Y_{ij} = \mu + T_i + B_j + b_1(IBW) + e_{ij}.$$

Table 1: Average of performance of fed sheep

	Experimental treatments				SEM
	1	2	3	4	
Initial weight (kg)	36.65	37.56	34.91	35.36	1.12
Final weight (kg)	59.52	60.39	54.56	62.04	2.83
Final Weight gain (kg)	22.87	22.82	19.64	26.67	2.26
Daily weight gain	0.272	0.272	0.233	0.317	0.027
Feed intake	1.69	1.69	1.59	1.86	0.099
Feed conversion	6.23	6.31	6.95	5.87	0.351
1 to 4 is 0:100, 25:75, 50:50 and 100:0 ratio of barley grain to corn grain					

Y_{ij}: value of each observed, µ: Average, T_i: Treatment effect, B_j: Randomly assigned to each diet of the lambs, P_k: Observations the naturalization index of early weights, IBW: Effect of initial weight as a covariate and e_{ij}: experimental error.

For data with repeated (daily gain, daily feed intake and feed conversion) using repeated measures (Repeated Measurement) analysis was performed on SAS software using the model:

$$Y_{ijk} = \mu + T_i + B_j + P_k + (T*P)_{ik} + b_1(IBW) + e_{ijk}.$$

Results and Discussion

Functional properties

Functional properties of experimental sheep were shown in Table 1. The obtained data showed that none of the sheep performance was not affected by treatments (P>0.05).This results are similar to Martin et al (2000) that reported, the fattened calves fed with high concentrate diets based on barley or corn grain did not affect DMI. The achieved data for DMI in this study in consistent of the data, that reported by Owerton et al (1995). Increase in propionate production in the rumen and absorption could be the reason for the decrease in dry matter digestibility. Propionate is as a deterrent to potential appetite in ruminants.

Carcass characteristics

Carcass characteristics of lambs fed the experimental diets were shown in Table 2. Eye muscle diameter of second groups showed a significant difference with other treatments (P<0.05). And eye muscle area in three treatments showed significant difference with other treatments (P<0.05). For other measured traits, there were not significant differences between treatments (P >0.05). Lack of significant differences between diets with high amounts of barley (diet 1) and high amounts of corn (diet 4), at the result of higher microbial protein synthesis in fed diets 1 to 4 due to the availability of energy and protein requirements of rumen microbes. The increase in the amount of microbial protein can potentially improve growth performance of calves. Higher starch of corn causing escape it to small intestine and absorbed as glucose, and large amounts of glucose consumption to visceral tissue. And therefore can be prevented the consumption of amino acids by visceral tissues. The data agree with the findings of Nelson et al (2000).

Fatty acid profile of meat

Results of fatty acid profile of sheep are shown in Table 3. Comparison of different treatments for meat fatty acid profile showed no significant

difference (P >0.05). However, in some fatty acids, such as C16: 1-n7, C18:0 and C18:1-n9 there were significant differences between treatments (P<0.05).

Table 2: Average of carcass characteristics of sheep fed experimental diets.					
	Experimental treatments				
parameters	1	2	3	4	SEM
Width of eye muscle (Mm)	101.67^{ab}	107.50^{a}	93.51^{ab}	78.40^{b}	7.01
Length of eye muscle (Mm)	88.67	83.00	88.30	87.50	2.80
Eye muscle area (CM)	35.38^{b}	35.40^{b}	42.48^{a}	35.82^{b}	1.50
12th rib fat thickness (Mm)	7.80	8.61	8.88	9.52	0.91
Head (%)	4.98	4.68	4.90	4.50	0.20
Leg (%)	2.14	1.99	2.00	2.35	0.25
Skin (%)	11.28	10.18	11.24	10.19	0.47
GI empty (%)	3.67	3.36	3.56	3.50	0.28
Intestine fill (%)	2.22	2.66	2.56	2.52	0.23
Heart (%)	0.31	0.37	0.37	0.32	0.03
Diets 1 to 4, with percentage of 0: 100, 25: 75, 50: 50 and 100: 0 barley grain to corn grain respectively					

Table 3: Meat fatty acid profile					
	Experimental treatments				
Fatty Acids	1	2	3	4	SEM
C 14: 0	1.45	1.64	1.49	1.79	0.259
C14:1- n5	0.16	0.17	0.20	0.25	0.063
C16: 0	19.54	22.02	19.99	20.22	1.160
C16:1-n7	1.55^{ab}	0.98^{c}	1.24b^{c}	1.66^{a}	0.115
C18: 0	19.61^{b}	27.93^{a}	19.76^{b}	16.55^{b}	1.807
C18:1-n9	44.68^{a}	33.92^{b}	44.03^{a}	44.68^{a}	1.443
C18:1-n7	0.62	1.84	1.99	2.97	0.763
C18:2-n6	4.90	5.75	6.45	5.02	0.762
C18:3-n3	0.41	0.59	0.61	0.67	0.080
C21: 0	0.11	0.20	0.19	0.09	0.040
Diets 1 to 4, with percentage of 0: 100, 25: 75, 50: 50 and 100: 0 barley grain to corn grain respectively					

Table 4: Blood fatty acid profile					
	Experimental treatments				
Fatty Acids	1	2	3	4	SEM
C 14: 0	1.16	1.07	1.05	0.76	0.138
C14:1- n5	0.47	0.48	0.48	0.49	0.092
C16: 0	20.13	22.73	23.03	20.42	0.981
C16:1-n7	0.76	0.64	0.44	0.63	0.121
C18: 0	19.47	19.25	20.96	23.40	1.980
C18:1-n9	20.87^{ab}	17.48^{b}	20.59^{ab}	21.95^{a}	1.206
C18:1-n7	0.74^{b}	3.70^{a}	2.42^{ab}	2.07^{ab}	0.750
C18:2-n6	30.23^{a}	28.42^{ab}	25.21^{b}	24.47^{b}	1.212
C18:3-n3	2.23^{a}	1.74^{ab}	1.39^{ab}	0.96^{b}	0.317
C21: 0	0.18	0.11	0.04	0.14	0.063
Diets 1 to 4, with percentage of 0: 100, 25: 75, 50: 50 and 100: 0 barley grain to corn grain respectively					

Vlamynk et al (2006) reported that the amount of. single carbon fatty acids and branched fatty acids is associated with fermentation type of foods. Linolenic acid and linoleic acid in the rumen is the main source of CLA synthesis. The amount of the CLA is influenced by factors such as the type and amount of biosynthesis long chain fatty acid, ration nitrogen amount and the ratio of the forage in the diet (Bmqard et al, 2000).

Blood fatty acid profile

The results of blood fatty acid profile of sheep that fed experimental diets are shown in Table

4. Results showed that there were no significant differences between treatments on saturated fatty acids (P >0.05). But unsaturated fatty acid of sheep showed significant differences (P <0.05). Nelson et al (2000) reported that the C18: 1 and C18: 2 fatty acids is higher in corn than barley grain, while the C16: 0 and C16: 1 fatty acids is higher compared to corn grain.

Conclusion

Feeding lambs with mixture of barley grain (with higher ruminal degradation rate) and corn grain (with lower ruminal degradation rate) reduce the incidence of abnormalities, such as acidosis and create a balance between the amount of starch digestion in the rumen and total tract to achieve maximum efficiency of feeds.

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References

1. BESSA, R.J.B.; ALVES, S.P.; JERÒNIMO, E. et al. Effect of lipid supplements on ruminal biohydrogenation intermediates and muscle fatty acids in lamb. European Journal of Lipid Science and Technology, v.109, p.868-883, 2007.
2. BOLES, J.A.; KOTT, R.W.; HATFIELD, P.G. et al. Supplemental safflower oil affects the fatty acid profile, including conjugated linoleic acid of lamb. Journal of Animal Science, v.83, p.2175-2181, 2005.
3. Chong-min K, Jeong-hoon K, Young-kyoon O, Eun-kyu P, Gyu-chul A, Gang-yeon L, Jung-il L and Keun-kyu P. 2009. Effects of Flaxseed Diets on Performance, Carcass Characteristics and Fatty Acid Composition of Hanwoo Steers. Asian-Aust. J. Anim. Sci. Vol. 22, No. 8 : 1151 – 1159.
4. FAO, 2003. Agricultural production. Available: http://apps.fao.org/. Accessed Dec. 8, 2003.
5. FOLCH, J.; LEES, M.; STANLEY, G.H.S. A simple method for the isolation and purification of total lipids from animal tissues. The Journal of Biological Chemistry, v.226, p.497-509, 1957.
6. Herrera-Saldana, R. E., J. T. Huber, M. H. Poore. 1990. Dry matter, crude protein, and starch degradability of five cereal grains. J. Dairy Sci. 73:2386–2393.
7. Heydari KH, Dabiri N, Fayazi J and Roshanfekr. 2008. Effect of Ionophores monensin and lasalocid on performance and carcass characteristics in fattening Arabi lambs. Pakistan Journal Of Nutrition. 7(1): 81-84.
8. KRAMER, J.K.G.; FELLNER, V.; DUGAN, M.E.R. et al. Evaluating acid and base catalysts in the methylation of milk and rumen fatty acids with special emphasis conjugated dieno and total trans fatty acids. Lipids, v.32, p.1219-1228, 1997.
9. LEWIS, G.S.; WULSTER-RADCLIFFE, M.C.; HERBEIN, J.H. Fatty acid profiles, growth, and immune responses of neonatal lambs fed milk replacer and supplemented with fish oil or safflower oil. Small Ruminant Research, v.79, p.167-173, 2008.
10. Martin-Orue S.M, Balcell J, Vicente F, and Castrillo C, 2000. Influence of dietary rumen-degradable protein supply on rumen characteristics and carbohydrate fermentation in beef cattle offered high-grain diet. Ainm. Feed Sci. Technol. 88, 59-77.
11. Nelson, M. L., J. R. Busboom, J. D. Cronrath, L. Falen, and A. Blankenbaker. 2000. Effects of graded levels of potato by-products in barley- and corn-based beef feedlot diets: II. Feedlot performance, carcass traits, meat composition, and appearance. J.Anim. Sci. 78:1829–1836.
12. Overton TR, Cameron MR, Elliot JP and Clark JH, 1995. Ruminal fermentation and passage of nutrients to the duodenum of lactating cow fed mixtures of corn and barley. J.Dairy. Sci. 78:1981-1998.

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