

Effect of energy source varieties on biochemical blood traits and carcass sensory evaluation in fattening rations of Awassi lambs

تنوع مصدر الطاقة في العليقة وأثرها على بعض الصفات الدموية والتقييم الحسي في لحوم الحملان العواسية

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Abstract

This experiment was carried out at animal field that belonging to College of Agriculture and Forestry/Mosul University in order to find out the best source of energy in fattening rations and to study their effects on some blood parameters and carcass sensory test of Awassi lambs. Fifteen local male lambs after weaning age were used in this experiment and were assigned randomly to three experimental groups. These experimental groups were fed *add libitum* on three rations containing barley, molasses and rice polishings as a source of energy for 105 day period. The results of this experiment showed that there were significant differences ($P \leq 0.05$) on red blood cells count (RBC), hemoglobin level (Hb), packed cell volume (PCV), total protein and high significantly differences ($P \leq 0.01$) on white blood cells count (WBC) and albumin among the three treatments. As about the carcass sensory evaluation the statistical analysis showed that there were significant differences ($P \leq 0.05$) on tenderness and juiciness traits and also high significantly differences ($P \leq 0.01$) on texture, aroma and acceptability between experimental groups as compared to control group. Concluded of this study that the rice polishing diet was used in the third treatment was appeared significant improved on some blood parameters and meat quality when compared with other energy sources in the first and second treatments.

Keywords: energy source, carcass sensory, blood parameters, Awassi lambs.

الخلاصة

أجريت هذه التجربة في الحقل الحيواني التابع إلى قسم الثروة الحيوانية في كلية الزراعة والغابات/جامعة الموصل إذ استخدم في فيها خمسة عشر حملا عواسيا ذكور بعمر يتراوح ما بين 5-6 شهور ووزعت هذه الحملان عشوائيا إلى ثلاث علائق تسمين مختلفة في مصادر الطاقة وهي الشعير، المولاس، سحالة الرز وكانت هذه العلائق متماثلة في مستوى البروتين الخام والطاقة الايضية. وقد غذيت هذه الحملان تغذية حرة وجماعية طوال مدة التجربة البالغة 105 يوما. وتم خلال هذه التجربة جمع البيانات المتعلقة ببعض الصفات الدموية في نهاية مدة التسمين وكذلك دراسة التقييم الحسي للحوم بعد الذبح. وقد أشارت نتائج هذه التجربة إلى وجود فروقات معنوية ($P \leq 0.05$) في بعض الصفات الكيموحيوية للدم في متوسطات أعداد كريات الدم الأحمر وتركيز خضاب الدم وحجم كريات الدم المرصوفة وكذلك فروقا معنوية في بروتينات الدم لتراكيز البروتين الكلي وفروقات عالية المعنوية ($P \leq 0.01$) في متوسطات أعداد خلايا الدم البيض وتركيز الألبومين بين المعاملات الثلاث. وبالنسبة لدرجات التقييم الحسي في لحوم الحملان فقد أظهرت نتائج التحليل الإحصائي بوجود فروقات معنوية ($P \leq 0.05$) في صفتي الطراوة والعصيرية بينما كانت هنالك فروقات عالية المعنوية ($P \leq 0.01$) في صفات القوام والرائحة والقبول العام في لحوم الحملان بين مصادر الطاقة الثلاثة. وكانت النتائج لصالح المعاملة الثالثة (سحالة الرز) مقارنة ببقية المعاملات الأخرى (الشعير والمولاس). ويتضح لنا من نتائج هذه الدراسة أن عليقة سحالة الرز في المعاملة الثالثة في هذه التجربة قد أظهرت تحسن معنوي لمعظم الصفات الكيموحيوية وبروتينات الدم و التقييم الحسي في لحوم الحملان العواسية مقارنة ببقية مصادر الطاقة الأخرى في المعاملتين الأولى والثانية.

الكلمات المفتاحية: مصدر الطاقة، الاختبار الحسي للذبيحة، قياسات الدم، حملان عواسية.

Introduction

The traditional pattern in sheep feeding at breeders in Iraq, especially in areas depending on rains which have larger number of sheep stocks that primarily depends on grazing harvesting grain residue and natural pasture for a long period of the year, while we found intake period by hand depends on barley only and sometimes the most part of barley may be mixed with straw and small amounts of dates were used as concentrated in sheep feeding. In this direction some studies indicated that lambs were fed on barley grain only led to a lower increase in body weight as compared with other rations were added different energy and protein sources ^[1, 2, 3]. Cereals are a major of energy sources for both in human and farm animals nutrition and due to the high prices, farmers went to use other sources of energy in the diet as sugar industry waste, such as molasses and sugar cane and residues of rice mills such as rice polishings, rice broken and rice bran and the manufacturing waste at their high nutritional value as being a source of energy could be used in the diet of fattening lambs ^[4, 5, 6, 7]. In this direction many studies indicated that can use sugar cane pulp by as level up to 50% of the components of the diet provided in fattening of Awassi lambs get without a negative impact on productive performance of lambs ^[4, 6, 7, 8]. In other studies showed a significantly improvement in benefit efficiency from the feed and reflected the improvement on performance and growth of Awassi lambs when you added molasses as a source of energy in fattening diets of Awassi lambs ^[6, 7]. With regard to the impact of use energy source in the diet on the blood characteristics Oni et al ^[9] were found significant effect of energy source was used in the diet on red blood cells count, hemoglobin level, packed cells volume and the concentrations of blood total protein of goats groups of West African Dwarf strain when they were replaced citrus pulp as a source of energy at ratios 0, 25, 50, 75% by cereals in fattening diets of goats. In meat sensory evaluation of sheep Kashmula et al ^[10] had noted significant effect of energy source in feed on tenderness, juiciness, aroma and general acceptability of fattening Awassi lambs when they were replaced sugar cane pulp as energy source instead of cereals in diets of fattening Awassi lambs for 90 days period. This study was agreement with the conclusions of ^[11] who found significant differences in juiciness, color and general acceptance of the Barbaresca lambs when were fed on two diets the first had no grain and the second consisted of yellow corn and barley in fattening lambs for 101 days period. As about evaluation of meat sensory of steers carcass, Sami et al ^[12] indicated that there were no significant differences on tenderness, juiciness and color between the treatments in the models derived from longissimus dorsi muscle area of calves when they were used sugar beet pulp, wheat and corn as sources of energy in the fattening diets of Simmental bulls for five months period. On the other hand Yücell et al ^[13] had got highly significant differences ($P \leq 0.01$) in evaluation of meat sensory for tenderness, juiciness, flavor and general acceptability in carcasses of Holstein-Friesian calves between three treatments when they were used different levels of sugar beet pulp as energy source at rates 0,4 and 8% in fattening rations of Holstein-Friesian calves for five months period. This study was current to know the effect of difference energy source in the diet on some blood parameters and meat sensory evaluation of Awassi lambs .

Materials and Methods

This experiment was conducted at the animal field that belongs to the Animal Resources Department/College of Agriculture and Forestry/University of Mosul, using fifteen of Awassi lambs (males) with average age between 5-6 months and the average of initial weight ranging from 22.3 to 22.4 kg and were distributed randomly into three groups converged in rate of live weight. These lambs groups were fed ad lib (group feeding) on three diets indicated rates of components and chemical analysis in table1, which contained 25.5% barley as source of energy (control ration) and replaced barley in the second diet by molasses sugar cane with 25% of the components diet II and were added rice polishings by 28.5% of diet III instead of barley through duration of the experiment period 105 days. Nutrient requirements had been measured for the diets to cover the needs of the lambs of the nutrient requirements according the decisions of ^[14]. These diets were

comparable in crude protein (12.94, 12.38, 12.96%) and metabolic energy (2437, 2438, 2401 kcal/kg diet). The food were introduced to lambs groups with two meals every day (morning and evening). The blood samples were withdrawn about 10 ml of blood from all the lambs through jugular vein at the end of fattening before slaughter to calculate red blood cells and white blood cell counts by using hemocytometer method approved by ^[15] and the concentration of hemoglobin and packed cell volume (PCV) by using Sahli method with supported by ^[15] and at the same time been isolated blood serum taken from all lambs by using the centrifuge at speed 3000 r/min for 15 minutes for calculation concentrations of total protein, albumin, globulin and triglycerides in serum by using several analysis of processed (kits) from Diamond company in Jordan. After the slaughter of lambs was taking samples of longissimus dorsi muscle and then were conducted sensory evaluation for the purpose to study the strength, tenderness, juiciness, aroma, color and general acceptance by the mentioned method ^[16] with consisting of nine degrees, where the degree of 9 is excellent for up to grade 1 (weak). Statistical analysis was carried out for data on this experience according to Complete Randomized Design ^[17] in order to determine the impact of the energy source in the diet on some blood parameters and sensory evaluation of meat quality for Awassi lambs. Using the mathematical model following :

$$Y_{ij} = \mu + t_i + e_{ij}$$

Y_{ij} = value of observation (j) in the treatments (i).

μ = The average of all observations.

t_i = treatment effect (i) which represents a source of energy in the ration.

e_{ij} = random experimental error of the unit test, which is distributed normal and independent with an average of zero and the contrast is equal to σ^2 . It was the comparison between the averages using the Duncan test ^[18] at the level of probability of 5% or 1% to test the significant differences between the averages of traits studied and applying the statistical program SAS ^[19].

Table 1. Components of diets and their chemical analysis that used in fattening of Awassi lambs.

Forage materials	Ration (1)	Ration (2)	Ration (3)
	%	%	%
1-Barley .	25.5	---	---
2-Molasses sugar cane .	---	25	---
3-Rice polishings .	---	---	28.5
4-Wheat bran .	38.5	38.5	36.5
5-Sugar cane pulp .	16	16	18
6-Sunflower seed meal .	14	14	11
7-Yellow corn cobs .	4	4	4
8-Urea (48%N ₂)	---	0.5	---
9-Limestone .	1	1	1
10-Salts .	1	1	1
Total	100%	100%	100%
Chemical composition			
Dry matter (%) .	97.24	98.08	97.29
Crude protein (%) .	12.94	12.38	12.96
Ether extract (%) .	2.37	1.99	6.43
Crude fiber (%) .	17.7	15.48	16.45
Ash (%) .	5.04	7.27	6.24
Nitrogen free extract (%) .	59.71	61.04	55.21
Metabolize energy (K _{cal} /kg).	2437	2438	2401

*Calculated metabolize energy representing all components of the forages from the tables of chemical analysis of the Iraqi feed materials ^[20] except molasses sugar cane calculated as stated by ^[21].

** Calculated metabolize energy of sugar cane pulp by ^[4].

Results and Discussion

The results of this study included effect of using energy verities sources in fattening ration on some blood traits and sensory evaluation of meat quality for Awassi lambs as follows :

1-Biochemical blood characteristics :

By reference to the table 2, the results indicated the existence of significant differences ($P \leq 0.05$) on average of red blood cells count, packed cell volume and highly significant differences ($P \leq 0.01$) on average of white blood cells count and hemoglobin level between both the first and third treatments than second treatment on the red blood cells, white blood cells counts and hemoglobin level and also between both I and II treatments as compared with the third treatment on packed cell volume. The average of red blood cells had reached 11.496, 10.209, 11685 million pellet/ml³ and white blood cells count 14617, 12424, 13680 cells /ml³, concentration of hemoglobin 12.04, 10.73, 12.67 g/100 ml of blood and packed cell volume 32.00, 31.68, 33.84% respectively. In table 2, the results were appeared the third treatment in favor as compared with first and second

treatments. It is noted from the results significant decrease in qualities mentioned in table 2, for second treatment animals which were fed on molasses as source of energy in the diet as compared to others treatments that deals with the first group were consumed barley and third were fed on rice polishings because to may be due to increased acidity in rumen liquid of lambs that intake second diet which amounting to (pH =5.84)to presence of molasses (25%) in the diet as compared to acidity degree in rumen liquid of the first and third groups (pH= 6.57, 6.62) respectively. The first and third group lambs were fed on barley and rice polishings as sources of energy in the fattening rations. These results were agreement with Oni et al ^[9] who found significant differences in average of red blood cells count, concentration of hemoglobin and the level of packed cell volume among those goat groups when they were replaced different levels of citrus pulp at ratios 0, 25, 50, 75% by grains in the fattening diet for 112 days period. While the results were not agreement with the same researchers above on white blood cells count which were noticed no significant differences among treatments.

Table2.Effect of using energy sources varieties in the diet on biochemical blood characteristics of Awassi lambs.

Traits	First treatment (barley)	Second treatment (molasses sugar cane)	Third treatment (rice polishings)
1-Red blood cells count *	11.496 ± 0.23 ^a	10.209 ± 0.40 ^b	11.685± 0.32 ^a
2-White blood cells **	14617± 459.51 ^a	12424 ± 305.60 ^b	13680±532.38 ^{ab}
3-Concentration of hemoglobin *	12.04 ± 0.52 ^a	10.73 ± 0.32 ^b	12.67 ± 0.59 ^a
4- Packed cells volume *	32.00 ± 0.81 ^b	31.68 ± 0.32 ^b	33.84 ± 0.40 ^a

The trait which carrying averages with different letters horizontally indicates a significant differences at probability 0.05 or 0.01.* P≤ 0.05 **P≤ 0.01 .

2-The blood proteins and triglycerides

The results in table 3, indicates a significant differences (P≤0.05) on the rates of total protein in serum and highly significant differences (P≤0.01) on level of albumin in blood serum between both the first and third treatments as compared with the second treatment and the results were supported by the third treatment .The average concentrations of total protein were5.80, 5.24, 5.95 g/100 ml of blood and albumin was 3.44, 2.84, 3.50 g/100 ml of blood for three energy sources respectively. As for globulin concentration in the blood the statistical analysis of this trait indicated in the table 3, that there was no significant effect of energy source were used in the diet, which amounted to 2.36, 2.40, 2.45 g/100 ml of blood of lambs that were consumed on barley, molasses and rice polishings in three diets. As for triglycerides has made the results showed of this trait that there was no significant effect of energy source were used in the diet which amounted to 37.38, 34.30, 41.02g/100ml of the three treatments respectively .It is noted from the results (table 3) were significantly exceed on the average of total protein and albumin in blood of lambs groups which were intakes barley and rice polishings as sources of energy in the first and third diets as compared with lambs group which were fed on molasses in the second diet which were reason is attributed to increased formation of glucose from amino acids in the animals blood were consuming barley and rice polishings in their diets ^[22].These results were agreement with results of Oni et al ^[9] who found significant differences in rates of total protein in goat groups when they were replaced citrus pulp as a source of energy with ratios 0, 25, 50, 75% by instead of grains in fattening rations for of 112 days period. The value of total protein were reached 4.55, 4.75, 5.02, 5.72 g/100 ml of blood in goat groups respectively. While these results were not agreement with the results of ^[23] who noted significant depression in rates of total protein and albumin in blood of Awassi lambs which were fed on first ration was consisted barley, maize, rice polishings and the second consisted of barley, rice polishings only without maize as sources of energy in fattening of Awassi lambs for90 days period.As well as the results came not in conformity with Abou Donia et al ^[24] who noted no significant differences in rates of total protein and albumin in blood of Friesian calves when they were used sweet potatoes tubers as partial and completely to replace instead of maize at rates 100% maize, 50% maize+50% sweet potatoes tubers, 25%

maize+75% sweet potatoes tubers and 100% sweet potatoes tubers only as a source of energy in the diet of feedlot for 180 days.As for these results do not agree with results of^[22] who observed no significant effect of energy source in the diet on average of total protein and albumin in blood of Awassi lambs groups that were fed on barley in the first ration and maize in the second diet for 90 days period.In spite of there is no significant differences on globulin and triglycerides in the blood serum among lambs groups that fed on three rations because it is at the same level of protein approximately (12.94,12.38,12.96% crude protein) which were used in the fattening of Awassi lambs groups^[23].As well as the results came in agree with Abou Donia et al^[24] who they were noted no significant differences in rates of globulin and triglycerides in the blood of Friesian calves when they were used sweet potatoes tubers as partial and completely to replace instead of maize at rates 100% maize, 50% maize + 50% sweet potatoes tubers, 25% maize +75% sweet potatoes tubers and 100% sweet potatoes tubers only as a source of energy in the diet of feedlot for 180 days period.Also this results were agree with^[22] who observed no significant effect of energy source in the diet on rates of globulin and triglycerides in blood serum of Awassi lambs groups when they were fed on barley in first diet and maize in second diet for 90 days period.

Table 3.Effect of using different energy sources in the diet on blood proteins and triglycerides of Awassi lambs .

Traits	First treatment (barley)	Second treatment (molasses sugar cane)	Third treatment (rice polishings)
1-Total protein concentration *	5.80 ± 0.20 ^a	5.24 ± 0.12 ^b	5.95 ± 0.10 ^a
2-Concentration of albumin **	3.44 ± 0.21 ^a	2.84 ± 0.14 ^b	3.50 ± 0.09 ^a
3-Concentration of globulin	2.36 ± 0.09 ^a	2.40 ± 0.06 ^a	2.45 ± 0.05 ^a
4-Concentration of triglycerides	37.38 ± 2.58 ^a	34.30 ± 1.91 ^a	41.02 ± 1.80 ^a

The trait which carrying averages different letters horizontally indicates significant differences by probability 0.05 or 0.01.* P≤ 0.05 **P≤ 0.01 .

3- Sensory carcass evaluation:

By reference to results in table4, were indicated that there were significant differences (P≤0.05) in average of tenderness and juiciness and highly significant differences (P≤0.01) in average of texture, Aroma, general acceptance of the carcasses for Awassi lambs. The significant differences between both the first and third treatments about to the second treatment in tenderness and between the second and third treatments in juiciness and highly significant differences between three treatments on textures and between third treatment than both the first and second treatments on the aroma and between both I and III treatments in general acceptance trait than for second treatment, the values of texture were 7.00, 6.30,7.80 , tenderness 7.00, 6.30, 7.50, juiciness 7.40, 6.80,7.60, aroma 7.10,6.90,7.80, and the general acceptance 7.10,6.60,7.50 for three sources of energy respectively.As for the status of the color the results indicated (table 4) that there was no significant effect of energy source in diet on rate for this trait which amounted to 7.20,7.10, 7.40 of the three treatments respectively .

It is clear to us from the results in table4, significantly improved for the evaluation of carcass sensory of texture, tenderness and juiciness for I and III treatments as compared to the second treatment because it is attributed to increased muscle tissue content with fat and this makes the muscle tissue more marbling and it is reflected on the final outcome in meat texture as it becomes softer and juices and more palatable in the first and third treatments as compared to the second treatment^[25] .From the other hand the presence of correlation coefficient was highly significant positive (P≤0.01) between texture and tenderness is 0.56 and highly significant positive (P≤0.01) of correlation coefficient between texture and juiciness is 0.50.As well as correlation coefficient was significant positive (P≤0.05) between tenderness and juiciness was 0.28 in results of this study.As well as the accompanying improvement in the qualities of texture, tenderness and juiciness with significantly improved in strands of the aroma and the general acceptance of the reason is attributed

to higher degree of juiciness which probably leads to increased amount of water held within the muscle tissue, which is reflected to increase amount of juiciness in meat and therefore is reflected in greater sense of tenderness that leads to increase in the general acceptance of the first and third treatments as compared to the second treatment [26]. The results of this study was agree with results of Kashmoula et al [10] who found significant differences in tenderness, juiciness, aroma and general acceptance when they were used sugar cane pulp at rates of 8, 10, 14, 16% as a source of energy in fattening diets of Awassi lambs for 90 days period. This results was supported with finding of Lanza et al [27] who noted significant differences in tenderness when they were used two rations the first contained barley and the second no barley (pastures waste and brewers grains) in fattening diets of wether western ranch lambs for five weeks period, at the same time this results was support with results of Lanza et al [11] who noted significant differences in tenderness, juiciness, aroma and general acceptance when they were used two rations the first was not contained grain and the second contained cereals (barley and maize) in fattening diets of Barbaresca lambs for 101 days period. This results were also accepted with results of Yücell et al [13] who noticed highly significant differences ($P \leq 0.01$) in tenderness, juiciness, flavor and general acceptance in carcasses of Holstein-Friesian calves among three treatments when they were used different levels of sugar beet pulp at rates of 0, 4, 8% as energy source in fattening rations of Holstein-Friesian calves for five months period. While this results were not agree with results [28] who did not found any significant effect of energy source were used in ration on tenderness, juiciness, aroma when they were used two rations, first was containing cereals (maize) and the second was not contained maize in fattening diets of hybrid lambs. Also, this results were not match with results [29] in traits of tenderness, juiciness, aroma and general acceptance when they were used two rations, first contained maize and lucerne ballets and the second contained molasses sugar cane and fish meal as sources of energy in fattening of wether western ranch lambs for five weeks period. While this results of this experiment was not agree with the results [12], who did not found any significant differences in tenderness, juiciness and general acceptance among treatments in the models derived from the longissimus dorsi muscle of calves when they were used sugar beet pulp, wheat and corn as sources of energy in fattening diets of Simmental bulls for five months period. While the result of this study was agree with the results of EL-Sabban et al [30] who did not notice any significant differences in the character of color when they were used corn oil at substitution rates of 2.0, 5.15, 6.37% instead of cerellose in fattening diets of Aberdeen Angus calves for 139 days period . The results of this study was came matched with acceptable of the results [12], who did not notice the existence of significant differences in characteristics of color among three treatments in the models derived from longissimus dorsi muscle of calves when they were used sugar beet pulp, wheat and corn as sources of energy in fattening diets of Simmental bulls for five months period.

Table 4. Effect of using different energy sources in the diet on the carcass sensory evaluation of Awassi lambs .

Traits	First treatment (barley)	Second treatment (molasses sugar cane)	Third treatment (rice polishings)
1-Textures **	7.00 ± 0.258 ^b	6.30 ± 0.300 ^c	7.80 ± 0.133 ^a
2-Tenderness *	7.00 ± 0.365 ^{ab}	6.30 ± 0.260 ^b	7.50 ± 0.223 ^a
3-Juiciness*	7.40 ± 0.221 ^a	6.80 ± 0.200 ^b	7.60 ± 0.163 ^a
4-Aroma **	7.10 ± 0.179 ^b	6.90 ± 0.100 ^b	7.80 ± 0.133 ^a
5-Color	7.20 ± 0.200 ^a	7.10 ± 0.179 ^a	7.40 ± 0.163 ^a
6-General acceptance**	7.10 ± 0.179 ^a	6.60 ± 0.163 ^b	7.50 ± 0.166 ^a

The trait which carrying averages different letters horizontally is indicated a significant differences by probability 0.05 or 0.01. * $P \leq 0.05$ ** $P \leq 0.01$.

We can deduce from this results above that use rice polishings instead of barley as a source of energy was used in third ration of this experience was the best source of energy has given moral improve of the most studied traits on performance and growth as well as in some blood parameters and degrees of sensory evaluation of meat quality for Awassi lambs when compared to the other of energy sources such as barley and molasses.

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