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Effects of glycerol supplementation to Awassi lambs diet on performance and carcass quality characteristics

ABSTRACT

This experiment was conducted to explore the efficacy of glycerol on growth performance and carcass quality characteristics in Awassi lambs. Twelve Awassi lambs were used with an average body weight of 24.43 ±0.43 kg. The animals were randomly assigned into three groups (4 lambs for each group) The first group of lambs was considered as a control, whereas the second and the third treatment lambs were supplemented with two levels of glycerol oil(30 and 60 g/day for each group lambs, respectively). The results revealed the following: The third treatment lambs had significantly higher - final live and empty body weights than the control group lambs. Significant differences between the second and third treatments were lambs over that of the control group lambs were obtained for the hot and cold carcass weights together with the dressing percentage calculated on the bases of an empty body weight.

The fat thickness covering the eye muscle of treatment three was significantly higher than that of the control group. The weights of primal lamb cuts for the shoulder and the rib of the second and third treatments were significantly preferable as compared to the control group. lambs. Besides, the leg cut in treatment three showed a significantly higher value than that of the control group. The secondary cuts including brisket and neck for the second and third treatments were significantly higher than that of the control group. The physical dissection of the ribs(rack)cut showed significant differences between the second treatment and the control group lambs for the lean meat %. Besides, the fat% of the second treatment lambs surpassed significantly that of the control group lambs. Fat % between treatments exceeds significantly that of the control group. The percentage of fat between the second and third treatment were not significantly different.

INTRODUCTION

It is widely accepted that glycerol is an important source of energy in alternative diets for farm animals; especially ruminant feed.Using glycerol in the ruminant diets was found to be a cost effective when compared to corn and the rest of the traditional seeds that are used as a high energy source (Pradhan, 2022 and Wang, et al., 2022). Glycerol is a sugar alcohol that has the property of forming glucose in the ruminant (Kupczynski, et al., 2020a). At the present time, there is a growing interest in improving carcass characteristics and controlling the percentage and type of fatty acids in livestock meat as much as possible. This will be valuable in producing meat more palatable to the consumer. Especially in terms of its contents of saturated fatty acids.Saturated fatty acids were found to be directly related to modern human diseases (2011). It is apparent that feed constitutes the largest cost in livestock production.The use an alternative food as co-products for biofuels could be a viable alternative from a nutritional and economic point of view.Here it became possible to use glycerol as

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an energy component in feed to replace more expensive grains and thus increase profits (Chanjula 2016). Based on the preceeding facts and as a result of the increasing the demand for meat and its products, the biggest challenge encounter the near future of meat production and industry has become how to confront meat production in an appropriate manner to satisfy consumer requirements in terms of cost, nutritional value, and the quality of the product that will be provided to the market (Who (2015). Producers are looking for alternative plans in the field of lamb fattening, in order to increase both growth rate as well as carcass productivity. Additionally, the alternative plans should be decreased age at slaughter and lamb mortality, , (Barros et al. 2009). Thus, this study was carried out to elucidate the effects of glycerol on growth performance and carcass traits of Awassi lambs.

MATERIALS AND METHODS

This study was conducted at the farm of Animal Production Department, College of Agriculture - Tikrit University for the period between 19/9/2021 and 18/12/2021 .Before starting the experiment the lambs were subjected to preliminary period of 14 days in order to acclimatize to concentrated ration and the new location of the experiment. Ingredient and composition of the diet is presented in Table 1 and 2.

Table (1): The components of the concentrated feed used in the experiment

Ingredient	g/kg	%
barley	640	64
wheat bran	150	15
corn	100	10
soybean meal	100	10
Table salt and limestone	10	1
Total	1000	100%

Table (2): The chemical composition of the concentrate

Analyzed composition	**%**
Dry matter	90.97
Crud protein	14.54
ash	4.04
Crud fat	2.07
Crud fiber	7.33
Carbohydrate	63.47

Lamb Slaughtering

After bleeding and dressing, lungs, heart, liver, spleen, kidneys, testicles, and the full and empty digestive system were weighed. The pelvic, the kidneys, the heart and the visceral fat were also recorded. At end of the experiment, the animals were weighed at exactly eight o'clock in the morning by an electronic scale. This weight is considered as the final body weight for each lamb in the experiment. Three lambs were randomly selected from each treatment to be slaughtered The lambs were given access to water ad libitum but no food for 12 h before slaughtering. After slaughtering the lambs, the weights of the external slaughter wastes including; head, front limbs, hind limbs and skin were recorded were recorded.

Hot carcass weight:

When completing the slaughter process and separating the slaughter residues, the carcasses were weighed after (30) minutes using an electronic bench top scale with a capacity of 50 kg and this was counted as the hot carcass weight.

Cold carcass weight:

After recording the hot carcass weight, the carcasses were transferred to the refrigerator and hung on bearings and kept at a temperature of (4) °C (Field et al., 1963) for 24 hours and on the next day the carcasses were weighed and this weight was counted as the cold carcass weight .

The percentage of weight loss:

The percentage of weight loss due to refrigeration was calculated using the following equation:

Weight loss (%) = 1-(cold carcass weight /hot carcass weight) × 100

Empty body weight:

The empty body weight was calculated by subtracting the contents of the digestive system from the weight of the live animal just before slaughter. Weight of digestive contents = weight of the full digestive system --the empty weight of the digestive system

Dressing percentage:

Dressing percentage was calculated using two ways. The first one through the ratio between hot carcass weight and the empty body weight multiplied by 100.Likewise,the second way was performed as the ratio carcass weight after 24 hours of chilling and the empty body weight multiplied by 100.

Carcass cuttings:

After taking the cold weight of the carcass, each carcass was divided into a left and right half a hand saw. The left half was split into 8 cuts according to Forrest et al. (1975) (Figure 1).All cuts were weighed using an electronic scale. The cutting process was performed on the left part of the carcasses, then this part was divided into a front quarter and a rear quarter (behind quarter) from the rib area 12-13.The major cuts included the shoulder, the ribs(rack), the loin, and the thigh cuts . while the minor cuts included the neck, shank, breast, and the flank cuts.

Rib-eye area and the back fat thickness:

From the left part of each carcass the two measurements were taken on the rib(the rack cut. including rib-eye area and the back fat thickness. The rib-eye area(Eye-muscle area) between the twelfth and thirteenth ribs was drawn using Trace Paper according to the method mentioned by Riley et al.1966. The back fat thickness was measured by using a digital Vernier Three reading were taken for each sample for both parameters and the average was taken in order to obtain the most accurate values.

Physical dissection of the rib(rack)cut:

After 24 hours at the refrigerator room, the ribs(rack cuts) were weighed and separated physically into its components of lean, fat and bone using medical scalpels and knives inside a refrigerated room to avoid evaporation as much as possible.

The weights of were recorded and the percentages of the components of the physical dissection were calculated according to method of (Butterfield, et al.,1984).

Statistical Analysis:

The Statistical Analysis System -SAS (2012) using the Completly Random Design (CRD)was performed for the statistical analysis of the data of the current to study.Treatment levels means differences were tested using Duncan Mutiple Range Test(Duncan,1955).

The following linear model was proposed for the analysis of the data:

$Yij = \mu + Ti + eij$

Where

Yij=the observed value of the ijth trait,

μ= the overall mean of the trait studied,

Ti=the effect of ith treatment level,

eij= the random error that is normally distributed with a mean of zero and a variance of $\sigma 2$

RESULTS AND DISCUSSION

Average daily and total weight gain:

The results presented in Table (3) show that there were no significant differences between the treatment groups in the average daily and total weight gain. The average daily weight gain were,70.66, 81.33 and 91.11 gm, respectively. The total weight gain were, 6.33, 7.35 and 8.20 kg for the first, second and the third treatment, respectively . Although there was not significant differences between treatment groups, The higher daily and total weight gain for the second and third treatment that of the control treatment could be attributed to the effect of supplementing glycerol to the diet. These results were found to be in agreement with the finding of Del Bianco (2016) who reported there were no significant differences in the average daily weight gain when lambs supplemented withn three levels of glycerol 0, 5, 10 and 15 g / kg . Likewise, these results also were in agreement with the results reported by Silva (2018) as he found a non-significant differences for the average daily weight gain of lambs supplemented with 300gm glycerol /kg.On the contrary our findings diffred from that of (Silva-Stagno et al., 2013) They reported a significant differences of the average daily weight gain with increasing the levels of glycerol in the diet. Almeida (2017), where a significant differences in the average daily weight gain of lambs supplemented with three levels of glycerol which are 100, 200 or 300 g/kg. Bazerra (2022) found a significant differences in the average daily weight gain of when using three levels of glycerol.

Final and empty body weights

The results shown in table(3)revealed a significant superiority ($P < 0.05$) of treatment three lambs over that of the first treatment lambs for the final body weight(32.70 and 29.kg).Non significant differences between treatment two lambs (31.78kg) and both treatment three and treatment first lambs regarding this trait. A significant differences were found between treatments in empty body weight. The third treatment lambs were found to outperformed the first treatment lambs significantly ($p< 0.05$)for an empty body weight .Besides, the second treatment lambs embty body weight did not differ significantly from that of the first and third treatments lambs(26.34, 28.59 and 29.34 kg for the first, second and the third treatments lambs , respectively, table (3). The increase of an empty weights of both the second and third treatments lambs may be attributed to an increase in the level of glycerol in the diet(Almeida, 2017). The results of this experiment were in agreement with the results reported by Ribeiro et al. (2021),regarding the final body weight .Similarly, our results were in agreement with the findings of Bezerra (2022)who found a significant differences were in the average empty body weight when using three levels of glycerol were used,(0, 50, 100 and 150 g/kg). Da Costa et al.,2019 reporting a similar significant differences for the mean final weight and mean empty body weight of lambs when using five levels of glycerol .On the contrary, the results of this experiment did not agree with that of Gomes, et al. (2022), who found a non significant differences of the final body weight at slaughter, but it was in agreement with their work as they found significant differences in the mean empty body weight when using three levels of glycerol (0, 6, 12 and 18%/ kg). Likewise our results were in agreement with the finding of Wattanachant (2017) as the reported a significant differences in the final weight at slaughter using glycerol a rate of 10%.

Table (3): The effect of levels of glycerol on the average daily and total weight gain, final weight and empty body weight (mean± standard error)

Treatment	Starting weight/kg	Weight gain/gm		Initial weight kg	Empty body weight kg
		daily	total		
T1	0.23±23.43 a	1.90±70.33 a	1.84±6.33 b	0.32±29.76 b	1.51±26.34 b
T2	0.43±24.43 a	0.06±81.33 a	0.81±7.35 a	0.61±31.78 ab	2.00±28.59 ab
T3	0.5±24.50 a	1.67±91.11 a	1.94±8.20 a	1.40±32.70 a	1.24±29.34 a

Similar letters within the same column mean that there are no significant differences at the level of
T1 Control treatment (without addition) T2: add 30 g glycerol/load/day T3: add 60 g glycerol/load/day

Carcass characteristics

Hot and cold carcass weight

It is evident from the results presented in Table (4) that there are significant differences ($P < 0.05$) in the hot and cold carcass weights among the three treatments. The second and third treatments lambs presented higher hot and cold carcass weight than those of first treatment (14.52, 16.73 and 17.56 kg. This result could be due to the increase in the live body weight at slaughter of lambs in second and third treatments. The results of this experiment were found to be in agreement with that of Dias et al. (2018), who obtained significant differences in carcass weight when different levels of glycerol were used. Similarly Ribeiro et al. (2021), obtained significant differences in the body weight and the carcass weight when supplementing 70 g/kg glycerol in lamb diets. Bezerra (2022), obtained significant differences in the hot and cold carcass weight when three levels of glycerol were used, 0, 50, 100, 150 g / kg.Our results also resembled that of Da Costa et al. (2019) who obtained a significant differences in the hot and cold carcass weight when using five levels of glycerol (10.9, 10.83, and 11.78%). Gomes, et al. (2022) who found a significant differences in the hot and cold carcass weight when using three levels of (0, 6, 12 and 18%). On the contrary,Del Bianco (2016) obtained non-significant differences in the carcass weight when using three levels of glycerol(0, 5, 10, 15 g / kg).The results reported by Wattanachant (2017) were in agreement with our results as he found a significant differences in the hot and cold carcass weight when using glycerol at the level of 10%.Carvalho et al. (2015) obtained significant differences in the hot and cold carcass weight when supplementing crud glycerine at the the level of (300 g/kg) to the diet.

Dressing percentage:

The results in Table (4) indicated that there were significant differences in the dressing percentage calculated on the basis of an empty body weight. The dressing percentage of lambs in third treament three differ significantly from that of the first treatment ($P < 0.05$) .The dressing percentage of second treatment did not differ significantly from that of the third and first treatment .The dressing percentage calculated on the basis of an empty body weight(hot carcass weight /embty body weight were(55.12, 58.51 and 59.85% for each of the first, second and third treatments, respectively.The significant differences between both, the third and the second treatment and the first treatment in terms of dressing percentage calculated on the basis of cold carcass weight (cold carcass weight /embty body weight)were found ($P < 0.05$).The dressing percentage calculated on the basis of cold carcass weight were(53.80, 57.36 and 58.62%) for the first, second and third treatments, respectively. The results of this experiment were not in agreement with the results reported by Bezerra (2022), who found a non significant differences in the dressing percentage calculated on the basis of both hot and cold carcass weight between treatments through supplementing three levels of glycerol to the diet(0, 50, 100, 150 g / kg). Del Bianco (2016) results didn't resemble our finding too as he obtained a non-significant differences in the dressing percentage between treatment when supplementing three levels of glycerol (0, 5, 10, and 15 g/kg).The results reported by Chanjula, (2018) were similar to the results of this study regarding the significant differences between treatments on dressing percentage by when using three levels of glycerol(0, 2, 4, and 6 g / kg).

Carcass shrinkage:

It is apparent from the results shown in Table(4) that there were a non significant differences in the percentage of loss during cooling between the three treatments (2.41, 1.93 and 2.00% for the first, second and third treatments, respectively. The higher percentage of loss was found in the first treatment carcasses which may be attributed the decrease in the fat back thickness of their carcasses which in turn showed a decrease in the final and the empty body weights. The results of current study were in agreement with the results of Bezerra (2022) who found non significant differences in the percentage of loss when providing three levels of glycerol (0, 6 , 12 and 18%). Bezerra (2022), found also significant differences in of carcass loss when three levels of glycerol were used: 0, 6, 12, and 18%.) Gomes, et al.(2022) obtained non significant differences between treatments in the percentage of carcass loss when supplementing three levels of glycerol (0, 50,100 and 150gm/kg).

Table (4): The effect of the experiment's coefficients on the average carcass weight and the percentage of dressing and loss due to cooling of the experimental lambs(mean± standard error)

Treatments	live weight/kg	Empty body weight/kg	Hot carcass weight/kg	Cold carcass weight/kg	Dressing percentage (1)*	Dressing percentage (2)**	Carcass shrinkage
T1	2.32±29.76	1.51±26.34 b	1.33±14.52 b	1.33±14.17 b	0.44±55.12 b	0.34±53.80 b	0.31±2.41 a
T2	0.61±31.78 ab	2.00±28.59 ab	0.36±16.73 a	0.35±16.40 a	095±58.51 ab	0.95±57.36 a	0.06±1.93 a
T3	1.40±32.70 a	1.24±29.34 a	1.10±17.56 a	1.08±17.20 a	1.35±59.85 a	1.34±58.62 a	0±2.00 a

Similar letters within the same column mean that there are no significant differences at the level of.
*Calculated on the basis of hot carcass weight to tare body weight.
**Calculated on the basis of cold carcass weight to tare body weight.
T1 Control treatment (without addition) T2: add 30 g glycerol/load/day T3: add 60 g glycerol/load/day
4 animals per treatment

Rib eye area(Eye muscle area):

The results in Table. (5) revealed that on significant effect on the rib eye area was found between the three treatments. Rib eye area of the three treatment lamb carcasses were 7.76, 11.00 and 10.03 cm^2 for the first, second and third treatments, respectively. The results of this work were not in agreement with the result reported by Gomes, et al. (2022), who found significant differences in the rib eye area when using three levels of glycerol (0, 6, 12 and 18%).

Back fat thickness:

The results presented in Table. (5) revealed that there were significant effects in the thickness of the fat between the treatments. The fat thickness in third treatment was 5.35 mm which was surpassed that of the first treatment (1.83 mm).However, the second treatment did not differ significantly in fat thickness(2.91mm) from both first (1.83mm)and the treatment(5.35mm). This might explain the higher percentage loss of lamb carcasses in the first treatment. The results of this experiment are in agreement with the results obtained by Bezerra (2022), who reported a non-significant differences fat thickness when applying three levels of glycerol (0, 50, 100, 150 g / kg). of (Gomes et al., 2022) reported significant differences in the fat thickness when using three levels of glycerol (0, 6, 12 and 18%)., Del Bianco (2016) reported no significant differences in the fat thickness when using three levels of glycerol(0, 5, 10, and 15 g/kg). Avila-Stagno, (2013) obtained a non-significant differences in fat thickness when supplementing three levels of glycerol to the diet(0, 7, 14, 21%).

Table 5: Effect of experiment parameters on ocular muscle area and fat layer thickness in Awassi lambs carcasses (mean± standard error)

Treatment	muscle eye area/cm²	Fat thickness/mm
T1	0.91±7.76 a	0.38±1.83 b
T2	1.94±11.00 a	1.07±2.91 ab
T3	1.14±10.03 a	1.63±5.35 a

The trait whose averages have similar letters within the same column means that there are no significant differences at the level of
T1 Control treatment (without addition) T2: add 30 g glycerol/load/day T3: add 60 g glycerol/load/day

Carcass cuts:

The primary carcass cuts:

The results in Table (6) shown that there were significant differences between treatments for the main primal cuts of carcasses .The shoulder and rib cuts second and third treatments were surpassed that of the first treatments cuts ($P < 0.05$) .The weights of the shoulder cuts were (896.66, 1194.67 and 1175.33gm) where as the weights of the rib cuts were (472.00, 678.66 and 655.33 g) for the first, second and third treatments, respectively. The differences between treatments regarding loin cuts were not significant .treatment three thigh cut weight was significantly ($P < 0.05$) superior to the first treatment. However the loin cut weight in second treatments did not differ from that of the first and third treatments. The weights of thigh cut were 1.946,2.376,and 2.444kg for the first, second and third treatments, respectively.

The secondary cuts:

The results in Table (7) revealed that significant differences between the treatments in the weights of the chest and neck cuts .The second and third treatments outperformed the first treatment for the chest (782.18, 954.66, and 981.33gm) and the neck cut weights (687.24, 742.00 and 788.00gm). There were non-significant differences between the treatments regarding both the fore shank and the flank cuts weights. The increase in the weight of the main and secondary cuts could be attributed to the increase in the carcasses weight in the second and third treatments compared to the first treatment .The results of this study were not in agreement with the results of da Costa et al. (2019) who found a non-significant differences were of carcass cuts weight when five levels of glycerol were used. Gomes, et al. (2022), found no significant differences in the average of weight carcass cuts when three levels of glycerol were used.

Table (6): The effect of the experiment parameters on the weight * and proportions of the main pieces of carcasses of Awassi lambs (Mean± standard error)

Treatment	cold carcass weight/kg	Shoulder		Racks		Loin		Leg	
		g	%	g	%	g	%	g	%
T1	1.33±14.17 b	96.90±1020.24 b	0.31±7.20 a	37.16±472.00 b	0.39±3.84 a	50.80±745.34 a	0.34±5.26 a	0.62±2214.77 b	0.42±15.63 a
T2	0.35±16.40 a	20.53±1194.67 a	0.10±7.28 a	78.65±678.66 a	0.47±4.13 a	35.25±720.67 a	0.13±4.38 a	138.43±2376.67 ab	0.69±14.47 a
T3	1.08±17.20 a	39.40±1175.33 a	0.21±6.85 a	26.69±655.33 a	0.16±3.82 a	101.25±702.66 a	0.37±4.04 a	53.07±2444.67 a	057±14.28 a

The trait whose averages have similar letters within the same column means that there are no significant differences at the level ($p<0.05$.).
* Calculated on the basis of cold carcass weight
T1 Control treatment (without addition) T2: add 30 g glycerol/load/day T3: add 60 g glycerol/load/day
4 animals per treatment.

Table (7): The effect of the experiment's parameters on the weight and proportions of secondary cuts of carcasses of Awassi lambs. (mean± standard error)

Treatment	cold carcass weight/kg	Neck		Breast		Foreshanke		Flank	
		g	%	g	%	g	%	g	%
T1	1.33±14.17 b	44.20±687.24 b	015±4.85 a	23.78±782.18 b	0.37±5.52 a	87.62±639.06 a	0.16±4.51 a	11.01±283.04 a	0.10±1.83 b
T2	0.35±16.40 a	27.73±742.00 a	0.11±4.52 a	64.89±954.66 a	0.27±5.80 a	63.41±628.66 a	0.29±3.81 a	26.69±202.66 a	0.18±1.23 a
T3	1.08±17.20 a	29.48±788.00 a	0.25±4.60 a	75.89±981.33 a	0.17±5.69 a	9.82±727.33 a	0.30±4.26 a	18.58±234.00 a	0.09±1.36 a

The trait whose averages have similar letters within the same column means that there are no significant differences at the level ($p<0.05$.).
*Calculated on the basis of cold carcass weight
T1 Control treatment (without addition) T2: add 30 g glycerol/load/day T3: add 60 g glycerol/load/day
4 animals per treatment.

Physical dissection of the rack cut :

The results in Table(8) revealed a significant differences between treatments in meat weight of the rack cut The second and third treatments lean weight of rack cuts were significantly superior ($P < 0.05$) when compared with the first treatment rack lean weight (261.15, 384.59 and 386.00 g for the first, second, and the third rack meat , respectively). The fat weight of the same cut was significantly higher ($P < 0.05$) in the second treatment cut (181.60 g) when compared with the first treatment fat weight of the cut (100 g). the differences in fat weight between second treatment and third treatment (162.00 g) were not significant. Its found that the bone weight of the rack cut didn't differ significantly between treatments. The weight of bones of the rack cut were 111.50, 113.42 and 107.33 g for the first, second and third treatments, respectively. The results of this work were in agreement with that of Ribeiro et al. (2021) who reported significant differences in the weight of fat of the rack cut when using 70 gm / kg glycerol in the diets of lambs. These results also agreed with Wattanachant (2017) who obtained significant differences in The proportion of lean, fat and bone when using glycerol level of 10%.

Table (8): The effect of the experiment parameters on the physical separation of the ribs in the carcasses of Awassi lambs. (mean± standard error)

Treatment	rib segment weight grumble	Lean		Fat		Bone	
		Lean weight/g	%	Fat weight/g	%	Bone weight/g	%
T1	37.16±472.00 b	0.93±261.50 b	3.71±55.33 a	13.05±100 b	1.73±21.00 a	18.85±110.50 a	2.18±23.56 a
T2	78.65±678.66 a	62.11±384.59 a	2.60±56.67 a	19.09±181.60 a	4.37±26.76 a	27.83±112.24 a	2.33±16.53 a
T3	26.69±655.33 a	7.57±386.00 a	1.00±59.00 a	25.40±162.00 ab	2.64±25.00 a	11.21±107.33 a	2.00±16.00 a

The trait whose averages have similar letters within the same column means that there are no significant differences at the level of
T1 Control treatment (without addition) T2 add 30 g glycerol/load/day T3: add 60/g glycerol/load/day
4 animals per treatment.

REFERENCES

Almeida, M. T. C., Ezequiel, J. M. B., Paschoaloto, J. R., Perez, H. L., de Carvalho, V. B., Castro Filho, E. S., & van Cleef, E. H. C. B. (2017). Effects of high concentrations of crude glycerin in diets for feedlot lambs: feeding behaviour, growth performance, carcass and non-carcass traits. Animal Production Science, 58(7), 1271-1278.

Avila-Stagno, J., Chaves, A. V., He, M. L., Harstad, O. M., Beauchemin, K. A., McGinn, S. M., & McAllister, T. A. (2013). Effects of increasing concentrations of glycerol in concentrate diets on nutrient digestibility, methane emissions, growth, fatty acid profiles, and carcass traits of lambs. Journal of animal science, 91(2), 829-837.

Barros, C. S., A. L. G. Monteiro, C. H. E. C. Poli, J. R. Dittrich, J. R. F. Canziani, and M. A. M. Fernandes. (2009). Economic return of sheep production on pasture and in feedlot. Braz. J. Anim. Sci. 38:2270–2279.

Bezerra, H. F. C., Santos, E. M., de Carvalho, G. G. P., de Oliveira, J. S., de Moura Zanine, A., Pinho, R. M. A., ... & Ferreira, D. D. J. (2022). Effect of crude glycerin levels on meat quality and carcass characteristics of crossbred Boer goats. Food Science & Nutrition.

Bowman, J.C., Marshall, J.E. and Broad Bents, J.S.(1968). Gentic parameters of carcass quality in Down cross sheep. Anim.,Prod.,10:183-191.

Butterfield, R. M. and J. J. M. Thompson.(1983).Change in body composition relative to weight and maturity in large and small strains of Australian Merino rams. IV.Fat depots and bones .Anim.Prod.37:423-431 .

Carvalho, V. B., Leite, R. F., Almeida, M. T. C., Paschoaloto, J. R., Carvalho, E. B., Lanna, D. P. D., ... & Ezequiel, J. M. B. (2015). Carcass characteristics and meat quality of lambs fed high concentrations of crude glycerin in low-starch diets. Meat Science, 110, 285-292.

Chanjula P, Raungprim T, Yimmongko S, Poonko S, Majarune S, Maitreejet W. Effects of elevated crude glycerin concentrations on feedlot performance and carcass characteristics in finishing steers. Asian-Australas J Anim Sci 2016;29:80-8.

Chanjula, P., & Cherdthong, A. (2018). Effects of crude glycerin from waste vegetable oil in diets on performance and carcass characteristics of feedlot goats. Asian-Australasian journal of animal sciences, 31(4), 514.

da Costa, C. A., de Carvalho, F. F. R., Guim, A., de Andrade, G. P., Cardoso, D. B., do Vale Maciel, M., ... & de Oliveira Nascimento, A. G. (2019). Carcass characteristics of lambs fed diets with increasing levels of crude glycerin. Asian-Australasian journal of animal sciences, 32(12), 1882

Del Bianco Benedeti, P., Paulino, P. V. R., Marcondes, M. I., Maciel, I. F. S., da Silva, M. C., & Faciola, A. P. (2016). Partial replacement of ground corn with glycerol in beef cattle diets: intake, digestibility, performance, and carcass characteristics. PLoS One, 11(1), e0148224. Dias, C. P. A., Silva, F. V., Matos, A. M., Oliveira, L. L. D. S., Oliveira, A. M. F. D., Rocha, V. R., ... & Martins, V. D. (2018). Performance and carcass characteristics of goats fed crude glycerin in the feedlot and during pre-slaughter lairage. Revista Brasileira de Zootecnia, 47.

Duncan, B. D.1955. Multiple range and multiple F-test . Biometrics. 11 :1-42.

Field, R. A., Kemp, J. D., Varney, W. Y., Woolfolk, P. G., & Derrickson, C. M. (1963). Carcass evaluation of lambs from selected sires. Journal of Animal Science, 22(2), 364-367.

Forrest, J. C. Aberle, E. D. Herdrick, H. B. Judge, M.D. and Merkel , R. A. (1975). Principles of meat science. Schweigert, B.S.(Ed.). by Freeman,W.H. and company, San-Francesco.

Gilmore, L. A., Walzem, R. L., Crouse, S. F., Smith, D. R., Adams, T. H., Vaidyanathan, V., ... & Smith, S. B. (2011). Consumption of high-oleic acid ground beef increases HDL-cholesterol concentration but both high-and low-oleic acid ground beef decrease HDL particle diameter in normocholesterolemic men. The Journal of Nutrition, 141(6), 1188-1194.

Gomes, R. N., DE PAULA, T. A., DE CARVALHO, F. F., FERREIRA, M. A., BARRETO, L. M., NEVES, M. L. M., ... & VÉRAS, A. S. (2022). Carcass characteristics and meat quality of goats fed increasing levels of crude glycerin. Anais da Academia Brasileira de Ciências, 94

Kupczynski, R., Bednarski, M., & Piaseck, T. (2020b). The effect of propylene glycol and glycerol on carbohydrate and lipid metabolism in rabbits-short communication. Veterinarski arhiv, 90(3), 307-316.17

Pradhan, S., & Malani, R. S.(2022). Assessment of farm-level biodiesel unit—a potential alternative for sustainable future. In Handbook of Biofuels (pp. 377-396). Academic Press.

Ribeiro, RDX, Oliveira, R. L., de Carvalho, GGP, Silva, T. M., Costa, J. B., da Silva Oliveira, V., ... & Warner, R. (2021). Dietary inclusion of purified crude glycerol improves body

weight at slaughter and affects the fatty acid profile in lamb. The science of animal production .

Riley , M. L. ; Field, R. A. and Neims .(1966).Comparison of two methods of measuring the area of longissimus dorsi muscle . J. Anim. Sci., 25 : 587

Silva, F. V., Borges, I., Silva, V. L., Lana, Â. M. Q., Borges, A. L. C. C., Reis, S. T. D., ... & Matos, A. M. (2018). Performance and carcass characteristics of lambs fed a solution of crude glycerin during feedlot and pre-slaughter lairage. Revista Brasileira de Zootecnia, 47.

Wang, J., Jiang, H., Alhamoud, Y., Chen, Y., Zhuang, J., Liu, T., & Feng, F.(2022). Integrated metabolomic and gene expression analyses to study the effects of glycerol monolaurate on flesh quality in large yellow croaker (Larimichthys crocea). Food Chemistry, 367, 130749.

Wattanachant, C. (2017). Effect of Feeding Concentrate Containing Crude Glycerin and Castration on Carcass Characteristics and Meat Quality of Thai Native x Anglo-Nubian Goats (Doctoral dissertation, Prince of Songkla University).

WHO (2015) Q&A on the carcinogenicity of the consumption of red meat and processed meat.

إضافة الكليسرول الى علائق الحملان العواسية وتأثيره على صفات وخصائص الذبيحة

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الكلمات المفتاحية:
زيادة وزن الجسم ، صفات الذبيحة ، الجلسرين ، لحم الحملان.

الخلاصة

أجريت هذه الدراسة في حقول قسم الإنتاج الحيواني/ كلية الزراعة /جامعة تكريت للمدة من 2021/9/19 إلى2021/12/18.استخدم فيها 12 حملاً عواسياً بعمر 5-6 أشهر وبمعدل وزن 0.43 24.43 كغم وزعت الحيوانات عشوائيا على ثلاثة مجاميع بواقع اربعة حملان في كل مجموعة حيث اعتبرت المجموعة الأولى معاملة سيطرة (دون إضافة) بينما تم إضافة زيت الكليسرول الى علف المجموعتان الثانية والثالثة وبمستويان (30،60)غم /يوم /حمل على التوالي وبشكل يومي.أشارت نتائج التحليل الإحصائي إلى :تفوق المعاملة الثالثة على المعاملة الأولى معنويا ($P<0.05$) في الوزن النهائي ووزن الجسم الفارغ.تفوق معنوي ($P<0.05$) للمعاملتين الثانية والثالثة على المعاملة الاولى في وزن الذبيحة الحار والبارد ونسبة التصافي المحسوبة على أساس وزن الجسم الفارغ .تفوق المعاملة الثالثة على المعاملة الأولى معنويا ($P<0.05$) في سمك طبقة الدهن .تفوق القطعيات الرئيسة (الكتف والاضلاع) للمعاملتين الثانية والثالثة معنويا ($P<0.05$) على المعاملة الأولى، وتفوق قطعة الفخذ في المعاملة الثالثة معنويا ($P<0.05$)على المعاملة الأولى .القطعيات الثانوية تفوقت المعاملتين الثانية والثالثة معنويا($P<0.05$) في معدل وزن الصدر والرقبة على المعاملة الأولى.أظهرت نتائج الفصل الفيزياوي لقطعة الاضلاع (7-12) فروقات معنوية ($P<0.05$) بين المعاملات اذ تفوقت المعاملتين الثانية والثالثة على المعاملة الأولى في نسبة اللحم الشرح اما نسبة الدهن فقد تفوقت المعاملة الثانية على المعاملة الأولى ولم تختلف مع المعاملة الثالثة اما معدل وزن العظام فلم تسجل فروقات معنوية بين معاملات التجربة.