

Effects of medicinal plants and probiotic supplementation on some nutrients and blood parameters of karadi lambs

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Abstract

Twenty four Karadi male lambs, weighing 21.4 ± 2.5 kg live weight and 4 months old were used to investigate the effect of two levels(0 and 7.5 g/kg DM) and three sources of feed additives(Nigella stiva,Rosemary and Probiotic) on daily intake (DI) , live weight gain (LWG) ,feed conversion ratio (FCR) and some blood parameters using four diets. Diet 1, contain none of the feed additives sources ,represented one level of feed additives (0 g/kg DM) and served as the control for all additives feed diets . Diets 2 ,3 and 4 contain feed additives from Nigella sativa,(NS) ,Rosemary officinal (RO) or Probiotic (Pr) respectively .These diets represented the second level of feed additives (7.5 g /kg DM).Blood samples were taken to determine growth hormone (GH) , blood sugar (BS) and blood urea nitrogen (BUN) and serum uric acid, (SUA).There were no differences between treatments in all nutrients intake . However , the lambs given feed additives diets gained faster than those fed control diet . Feed additives were significantly ($P<0.05$) increase GH , BS and reduce BUN and SUA as compared with control diet . However, GH of lambs received RO was significantly ($P<0.05$) higher than those received NS and Pr. Lambs received NS diet was significantly ($P<0.05$) reduce SUA than those received RO or Pr diets .

تأثير إضافة النباتات الطبية و المعزز الحيوي في بعض المعالم الغذائية والدموية في الحملان الكراديه

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الخلاصة :

تم استخدام اربعة وعشرون حملاً "كراديا" بعمر 4 اشهر وبمتوسط وزن 21 ± 2.5 كغم في أقفاص مفردة لدراسة تأثير استخدام مستويين (0 و 7.5 غم /كغم مادة جافه) وثلاثة مصادر من الإضافات الغذائية (الحبه السوداء أكليل الجبل والمعزز الحيوي) في كمية المتناول اليومي، معدل الزيادة الوزنية، كفاءة التحويل الغذائي وبعض صفات الدم. قسمت الحملان الى اربعة مجاميع متساويه وغذيه على 4 علائق مختلفه. 1. لا تحتوي أي مصدر من الإضافات الغذائية (0 غم /كغم مادة جافه). 2. 3 و 4 تحتوي على اضافات غذائيه (7.5 غم/كغم مادة جافه) من الحبه السوداء او أكليل الجبل او المعزز الحيوي وعلى التوالي هذه العلائق تمثل المستوى الثاني من الإضافات الغذائية. أخذت نماذج من الدم لتقدير هرمون النمو، سكر الدم، نيتروجين يوريا الدم وبالأزما حامض اليوريك. أظهرت النتائج عدم وجود اختلافات في كمية العناصر الغذائية المتناوله يومياً بين المعاملات المختلفه. مع ذلك، أظهرت النتائج ان الحملان المغمدة على الإضافات الغذائية نمت اسرع من تلك الحملان المغذات على عليقة السيطره (عليقه 1). ان الاضافات الغذائية ادت الى زيادة معنوية ($P<0.05$) في هرمون النمو، سكر الدم ونيتروجين اليوريا وادت الى

انخفاض حامض اليوريك مقارنة بعليقة السيطرة . مع ذلك ، فإن هرمون النمو في الحملان المغذاة على اكليل الجبل كانت اعلى معنوياً ($P<0.05$) من تلك المغذاة على الحبة السوداء والمعزز الحيوي . ان الحملان المغذاة على الحبة السوداء اظهرت انخفاض معنوي ($P<0.05$) في حامض اليوريك مقارنة بالمغذاة على اكليل الجبل والمعزز الحيوي.

Introduction

Protein supplementation , natural feed additives such as medicinal plants or probiotic are very important material that can improve , growth rate , feed efficiency utilization and carcass characteristics of Awassi lambs (Hassan et al.,1991 ; Al-Jassim et al.,1991; Al-Ani et al.,1991 ; Hassan,2005 ;Hassan,2008; Hssan et. al., 2008 ; Hassan et. al., 2009ab) . This improvement was associated with changes in some blood parameters such as insulin and growth hormone (Al-Raheem et. al; 1995 and 1996) blood urea and uric acid (Hassan and Muhamad 2007., Hassan and Ariff 2008) ,total protein and blood sugar (Hassan et. al., 2009a). . Blood urea N has been related to efficiency of N use. As excessive protein or rumen degradable protein is consumed, BUN may increase. A positive relationship has been found between BUN and urinary N excretion so that monitoring BUN can help reduce excessive N excretion. The key factor is providing adequate rumen available carbohydrates to provide the energy for the rumen microbes to convert ammonia into microbial protein. (DAS 2008) . Therefore, the observed responses to feed additives need more explanation and some possible reasons has this responses may need to explain the beneficial of additives feed in the diet . Some feed and management changes that may lead to higher BUN values. Blood urea nitrogen analyses can be used as a signal red to point out potential problem in the feeding program. The BUN level in excess of 18 to 20 mg/dl can be associated with lower reproductive performance , higher feed costs, health problems , and poor production (Hansen , 2003) .The objective of this experiment was to study the effect of different levels and sources of feed additives (NS , RO or probiotic) supplemented to the concentrate diets on performance and some blood parameters of Karadi lambs.

Materials and methods

Diets and animals

The effect of two levels (0 and 7.5 g/kg DM) and three sources of feed additives (Nigella stiva , Rosemary and Probiotic) on some blood parameters were investigated using four diets. Diet 1 ,contain none of the feed additives sources ,represented one level of feed additives (0 g/kg DM) and served as the control for all additives feed diets . Diets 2 ,3 and 4 contain feed additives from NS , RO or probiotic (Pr) respectively .These three diets represented the second level of feed additives (7.5 g /kg DM). All diets were formulated to have similar daily intake of total nitrogen (TN) and metabolizable energy (ME). Formulation and calculated composition of diets are shown in table 1 .

Twenty four Karadi male lambs were used .They were weighing approximately 21.4 kg live weight and 4 months old at the start of the experiment . Six lambs were randomly allocated from live weight block to each treatment . The lambs were individually housed in pens (1x1.3 m) that allowed access to diets supplied in mettle bucket fixed in

side the pen .Water was available at all times .The diets was gradually introduced to the lambs over a period of 3 weeks before the start of the experiment . During this time the lambs were vaccinated against clostridia diseases. The diets were offered once daily at about 08.00 hour (h) in quantities calculated to support maintenance and daily gain of 150 g (Al-Jassim et al., 1996). Allowance were recalculated each 2 weeks according to live weight. Barley straw containing (DM basis): 87 % OM, 0.59 % N, 8% NDF, 5% ADF, and 45%DOMD was available *ad libitum* as a basal diet . Feeds refusal were collected and weighed back daily. Offered and refusal feeds were sampled and stored at - 15C⁰ for subsequent chemical analysis . The lambs were weighed each two weeks to nearest 0.5 kg , at the same time each day .Recording of daily intake and live weight gain was maintained for 9 weeks.

Table 1. Formulation and chemical composition of experimental diets*.

Source of feed additives	Control	Nigella Sativa	Rosemary	Probiotic**
Diet no	1	2	3	4
Ingredients (g/kg DM)				
Barley	490	490	490	490
Yellow corn	390	390	390	390
Soybean meal	100	100	100	100
Nigell Sativa	—	7.5	—	—
Rosemary Officinal	—	—	7.5	—
Probiotic	—	—	—	7.5
Salt	10	10	10	10
Min. & vit. Mixture	10	10	10	10
Chemical Composition /kg DM				
Dry matter (DM ,g/kg fresh)	946	945	945	945
Organic matter (OM)	918	918	918	918
Total nitrogen (TN)	21. 4	21. 4	21. 4	21. 4
Crude fiber (CF)	50.8	34.0	34.0	34.0
Ether extract (EE)	34	50.8	50.8	50.8
Nitrogen free extract (NFE)	700	700	700	700
(ME,MJ) ***	12.4	12.4	12.4	12.4

* Barley straw containing (DM basis): 87 % OM, 0.59 % N, 8% NDF, 5% ADF, and 45%DOMD.

** probiotic consist of three kinds of bacteria (*Lactobacillus Bacilli* 10¹⁰ *Lactobacillus Subtitles* 10¹⁰ and *Lactbacillus Acidophilus* 10¹⁰) and one kind of yeast (*Saccharomycis Ccerevisia* 10⁹).

***ME (MJ/ kg DM) = 0.012 CP +0.031 EE+0.005 CF +0.014 NFE (MAFF, 1975).

Determination of some blood parameters

Within 2-3 days before ending the feeding trail , blood samples were taken from the experimental animals to determine plasma growth hormone , blood sugar and blood urea nitrogen concentration. Animals were fitted with jugular cannula and blood samples (3 ml) were drawn into heparin zed syringe before morning feeding (zero time) and 3 ,6 ,9 12 and 24 h after morning feeding. Blood samples were centrifuged and plasma was removed and stored at -20 C° until analysis for growth hormone ,sugar , blood urea nitrogen and serum uric acid using a radioimmunoassay technique, international, France. Mean plasma concentration were calculated for all times for each animal within each treatment group.

Chemical analysis

Samples of feedstuffs, feed offered and refusals were dried at 50 C 0 until constant weight before chemical analysis .Samples than ground through a 1mm screen for chemical analysis. DM,OM,TN,EE,CF and NFE were determined for concentrate feedstuffs according to A.O.A.C. (1995). Neutral detergent fiber (NDF), Acid detergent fiber (ADF) and lignin were determined for treated and untreated barley straw by the method of Goering and Van soest (1970) . In Vitro DM and OM digestibility of NaOH-treated and untreated barley straw was determined by the method of Telley and Terry (1963) .

Statistical analysis

Data was statistically analyzed using Completely Randomized Design Model (CRD) procedure by (SAS,2001). Duncan's multiple range test was used to determine the significance of differences between treatments means Duncan (1955) .Analysis of variance was carried out on all data. The treatment was partitioned into main effects and their interaction .

Results

In general the lambs consumed all the concentrate diets offered .The overall daily intake of DM , TN, ME and LWG are shown in table 2. There were no differences between treatments in daily DM,TN,ME intake when expressed as g/kg W^{0.75} . The lambs given feed additives diets gained faster than those without (control diet). Lambs given NS and probiotic diets gained a little faster than those given RO diets ;because of the low residual variation ,the difference was statistically significant (P <0.05) .

Blood parameters

The main values of GH, BS BUN and SUA are presented in table 3. Feed additives significantly (P<0.05) increased GH, BS as compared with control diet. However, GH of lambs received RO was significantly (P<0.05) higher than those received NS and probiotic .While, BS of lambs received NS and RO was significantly (P<0.05) higher

than those fed probiotic. In contrast, feed additives supplementation (NS, RO and PR) were significantly ($P < 0.05$) reduce BUN and SUA as compared with control diet. There were no significant ($P > 0.05$) differences in BUN between other treatments. While, SUA of lambs received NS was significantly ($P < 0.05$) lower than those fed RO and PR diets.

The diurnal patterns of GH, BS, BUN and SUA concentration during 24 h after morning feeding are shown in figure 1, 2, 3 and 4 respectively. **Growth hormone concentration (figure.1):** All diets were associated with post-prandial reduction in growth hormone concentration during the first 3 h after feeding. Lambs fed diets supplemented with RO and NS fluctuated, reached a peak concentration appeared to be within 3-9 h after feeding and then decreased slightly to maintain medium concentration of GH (2.61 ng/dl) during the second 12 h after feeding. Whereas, GH concentration of lambs fed control diet and those fed diet with probiotic slightly decreased to maintain lower concentrations (2.32 ng/dl) during the second 12 h after feeding.

Table 2. Overall daily intake of concentrate diets and live weight gain .

	Source of Feed Additives				SEM	Significance of effects	
	Control	Nigella Sativa	Rosemary	Probiotic			
Level of Feed Additives (g/kg DM)	0	7.5	7.5	7.5			
Diet no.	1	2	3	4		Level	Source
Dry matter (g/day)	847 ^b	873 ^b	840 ^b	901 ^a	85.65	*	*
(g/kgW0.75 per day)	69.6	70.4	69.95	74.3	4.844	NS	NS
Total nitrogen (g/day)	15.5	16.2	15.8	16.5	1.62	NS	NS
Metabolizable energy (MJ / day)	9.6	9.65	9.65	10.17	0.904	NS	NS
Initial live weight (Lw, Kg)	21.96	21.04	21.42	21.36	2.53	NS	NS
Final Lw (Kg)	33.96 ^c	35.20 ^a	34.40 ^a	34.70 ^a	2.99	*	NS
Live- weight gain (g LWG/day)	191 ^c	224 ^a	206 ^{bc}	211 ^{a b}	29.70	*	NS
Food conversion ratio(g DMI /g LWG)	4.46 ^c	3.88 ^a	4.08 ^{a b}	4.27 ^{bc}	0.237	*	NS

* P<0.05 , NS ,not significant

Means within rows with different superscripts are significantly different (P<0.05, P<0.01) .

Table 3. Blood parameters of Karadi lambs as affected by supplementation of Nigella Sativa Rosemary or Probiotic to the concentrate diets.

	Source of Feed Additives				SEM	Significance	
	Control	Nigella Sativa	Rosemary	Probiotic		Level	Source
Level of Feed Additives (g/kg DM)	0	7.5	7.5	7.5			of effects
Diet no.	1	2	3	4			
Blood parameters							
Growth hormone (ng/dl)	2.11 ^c	2.26 ^{bc}	3.47 ^a	2.48 ^b	0.690	*	*
Blood sugar (mg/dl)	72.3 ^b	80.5 ^a	78.8 ^a	72.2 ^b	4.988	*	*
Blood Urea nitrogen (mg/dl)	24.2 ^a	20.9 ^b	20.7 ^b	20.0 ^b	1.863	*	NS
Serum uric acid (mg/dl)	0.81 ^a	0.46 ^c	0.60 ^b	0.66 ^b	0.273	*	*

*p<0.05 , , NS ,not significant

Means within rows with different superscripts are significantly different (P<0.05, P<0.01)

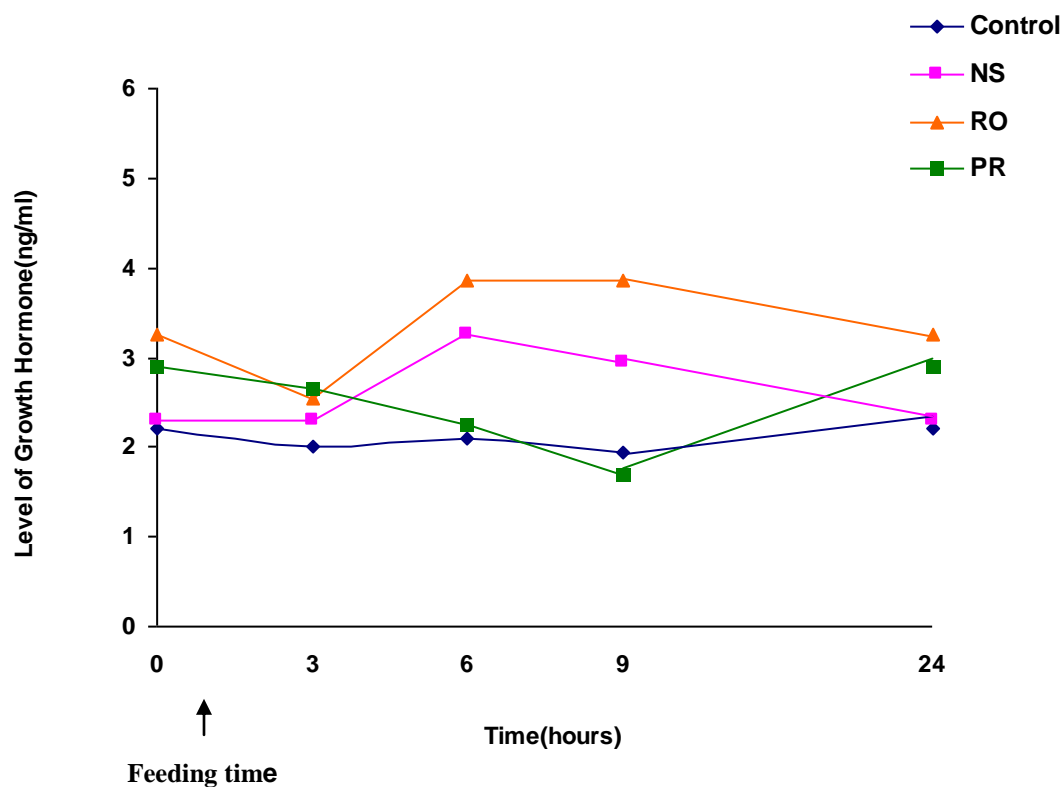


Figure 1. The diurnal pattern of growth hormone concentration during 24 hours after feeding.

Blood sugar concentration (Figure. 2): All lambs were slightly decreased BS concentration during the first 3 h after feeding (67.5 mg/dl), then BS concentration slightly increased during the 3-9 h after feeding then maintain this increases in BS concentration during the second

12 h after feeding.

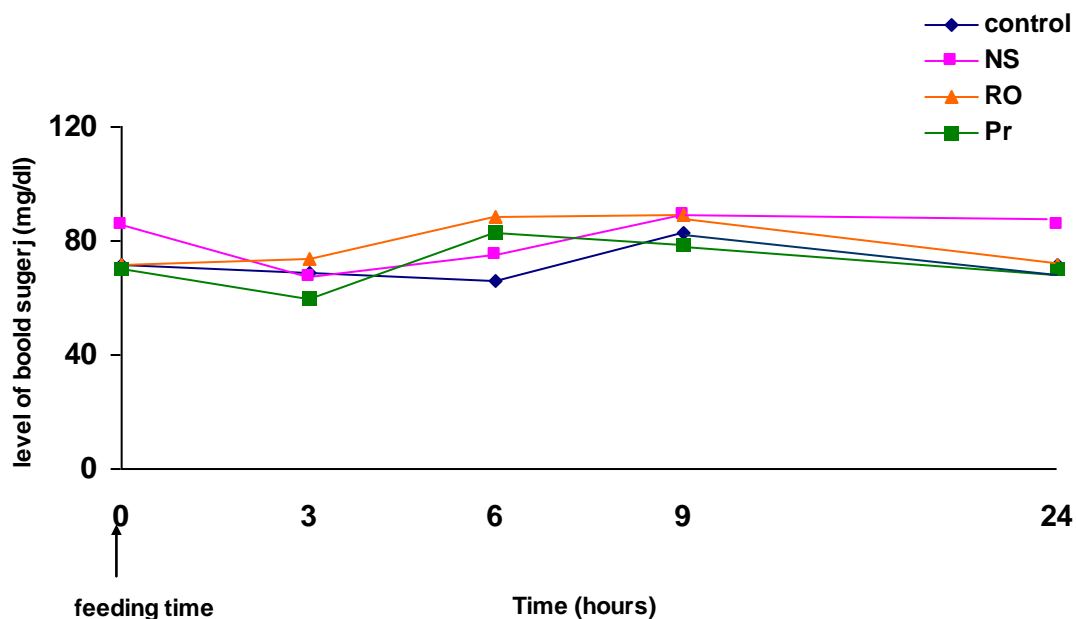


Figure 2. The diurnal pattern of blood sugar concentration during 24 hours after feeding

Blood urea nitrogen concentration (Figure. 3) : All diets was associated with post-prandial decreases in BUN concentration. This reduction was maintaining lower concentration (14.83 mg/dl) during the second 12 h after feeding. Except that the lambs fed control diet increased BUN during 3-9 h after feeding.

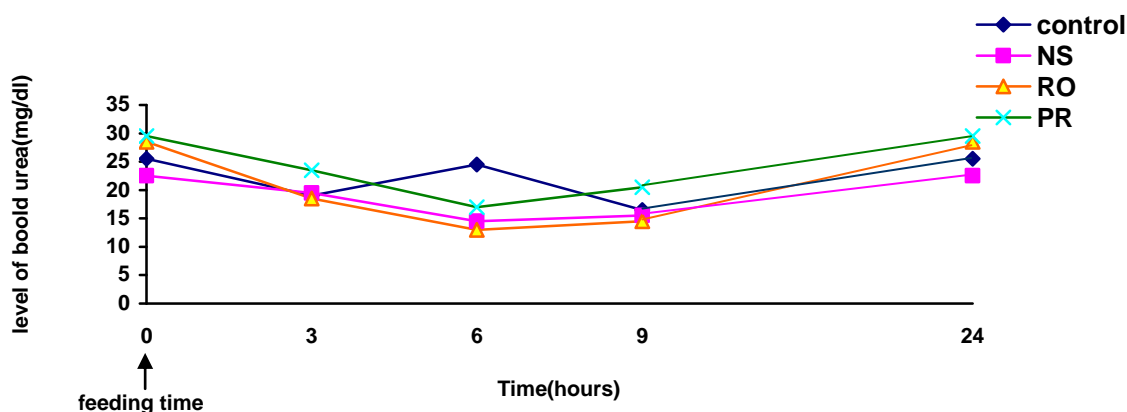


Figure 3. The diurnal pattern of blood urea concentration during 24 hours after feeding

Serum uric acid concentration (figure. 4): All diets were associated with post-prandial increases in SUA concentrations. The highest mean value for SUA appeared to be within 0-3 h after feeding

.SUA concentration of control diet fluctuated rapidly to reach a higher peak of concentration following feeding and then decreased rapidly to (0.86 mg/dl). The diets supplemented with NS, RO and probiotics reached lower peak concentration as the control diets did, and then decreased slightly to maintain lower concentrations (0.39 mg/dl) during the second 12 h after feeding.

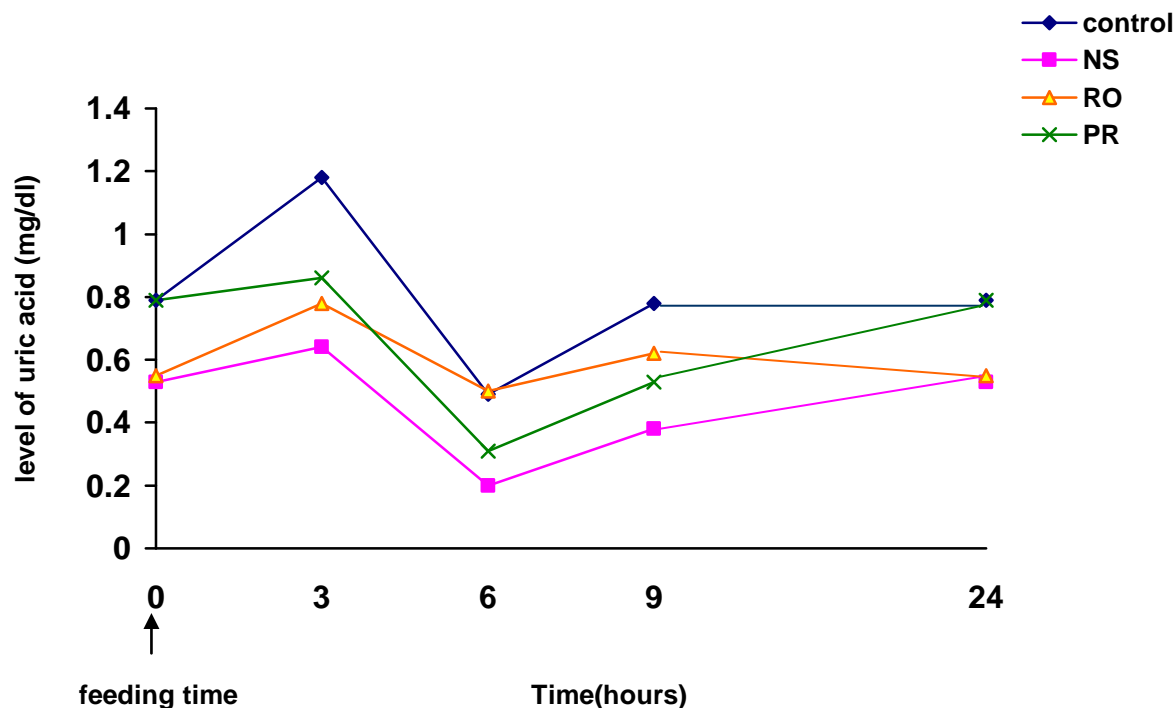


Figure 4. The diurnal pattern of serum uric acid concentration during 24 hours after feeding

Discussion

The lambs on all treatments consumed similar amount of ME and TN .Thus, although differences in LWG, GH , BS , BUN and SUA occurred between treatments , the differences observed are related to the level and source of feed additives intake rather than dietary energy and N intakes . Similar finding have been reported by a number of workers (Youssef et al.,1998;El-Saadany et al. 1996 and 2001 ; Mohamed , et al. 2005 and Hassan 2008 Hassan and Hassan 2008ab,Hassan and Hassan 2009ab, Hassan et al.,2009ab) ; obtained that the medicinal plants and probiotic additives improved the body weight gain ,and FCR . The results of this experiment indicated that greater improvement in LWG was associated with lambs fed diet supplemented

with NS as compared with those fed RO or Probiotic supplemented diets. However, Mohamed, et al., 2005 and Hassan 2008 reported lower LWG of lambs fed NS as compared with those fed RO. Maximum response in live weight gain was associated with lower BUN concentration this might indicate higher efficiency utilization of the nutrient available in the diets particularly those related to protein and energy. Hansen (2003) reported that BUN level in excess of 18 to 20 mg/dl in cow can be associated with lower reproductive performance, higher feed costs, health problems, and poor production.

In this study the lower concentration of GH and BS of those lambs fed control diets as compared with those fed NS and RO is some evidence to support the above responses (Hovell et al., 1983). The beneficial effects of additive feeds in the diet may be used as alternative growth promoters (Merichi, 1990). Urea is produced in the liver from ammonia derived mainly from the breakdown of protein in the rumen and from normal daily metabolism of absorbed amino acids and body protein. If bacteria in the rumen cannot capture the ammonia and convert it to microbial protein, the excess ammonia is absorbed across the rumen wall. Excess ammonia circulating in blood can be toxic and the conversion of blood ammonia to urea is the way to prevent this toxicity. The body excretes blood urea in urine and milk. Serum urea N has been related to efficiency of N use. As excessive protein or rumen degradable protein is consumed, SUN may increase (DAS 2008).

References

- Al-Ani, A.N., Hassan, S.A. and R.A.M AL-Jassim. 1991. Dried date pulp in fattening diets for Awassi lambs. *Small Ruminant Research* 6:31-37.
- Al-Jassim, R.A.M., Al-Ani, A.N., Hassan, S.A. Dana, T.K. and L.J., AL-Jerien, 1991. Effect of dietary supplementation with rumen undegradable protein on carcass characteristics of Iraqi Awassi lambs and desert goats. *Small Ruminant Research* 4:269-275.
- Al-Jassim, R.A.M., Hassan, S.A. and A.N. Al-Ani. 1996. Metabolizable energy requirements for maintenance and growth of Awassi lambs. *Small Ruminant Research*. 20:239-245.
- Al-Raheem, S.A., Hassan, S.A., Al-Ani, A.A. and A.A. AL-Sultan. 1995. Plasma insulin concentration, growth and carcass characteristics in Awassi lambs fed dried date pulp. *IPA J. of Agric. Res.* vol.5, No.2. 236-244.
- Al-Raheem, S.A., Hassan, S.A., Al-Ani, A.A. and A.A. AL-Sultan. 1996. Growth rate and plasma insulin concentration (PIC) in Awassi lambs as affected by different levels of feed intake. *Iraqi J. Agric. Sci.* Vol.27 No.1. 11-16.
- A.O.A.C., 1995. Official Methods of Analysis. Association of Official Analytical Chemists, 16th Ed., Virginia, U.S.A.
- DAS 2008. Interpretation of Milk Urea Nitrogen Values 1. Virginia Ishler, 134.

Duncan, D.B.1955.Multiple range and multipl "F" test.Biometrics,11:1-12.

El-Saadany,S.A.,,Abdel-Momin , M., Abo-Ammou, F.F.and E. Shehta. 1996. Effect of using medicinal herbs as milk stimulant fed supplementation on ewes and lambs performance.Egyption J.Appl. Sci.,11(2),41-56.

El-Saadany,S.A., Abdel-Momin , M., Abo-Ammou, F.F. and E. Shehta .2001. Effect of using two medicinal herbs and plant mixtures as feed additives on the performance of growing lambs .J .Agric .Sci. Mansoura Unvi.26(9) ,5321-5333.

Goering, H.K.and P.J. van soest.1970. Forage fiber and analysis (apparatus, reagents, procedures and some applications). USDA hand book No. 379.

Hansen ,D. 2003.Nutritional strategies to minimize loss of nutrients .Module 2. pag 1-23 .University of Delaware .

Hassan , S.A.,2005. Effect of barley straw treated with liquid diet on its daily intake ,digestion coefficient and live weight gain of Awassi lambs .Iraqi J.oF Agric.Sci. 36(4), 133-138.

Hassan S.A. 2008.Effect of some medicinal plants supplementation on daily intake, live weight gain and carcass characteristics of Awassi lambs .Egyption. J.of Nutr.and Feeds.(Accepted).

Hassan S.A., A. A.Ahmed and M.F. Alwan 2008 .ؤ Effect of Iraqi probiotic supplementation on growth rate ,blood parameters and carcass characteristics of Awassi lambs. Egyption . J. of Nutr . and Feed .(Accepted).

Hassan ,S.A. , Al-Jassim, R.A.M. ,AL-Ani ,A.N. and , N.S.Abdullah, 1991. Effects of dietary supplement of rumen un degradable protein upon carcass composition of fat-tail Awassi sheep .Small Ruminant Research.5,65-74.

Hassan .S.A.,Y. M.A. El-Saady and J. A. Tawffek 2009a. Effect substitution gradually percentages of reed silage with alfalfa hay fed with probiotic to Awassi lamb . 1- on daily feed intake ,live weight gain and feed conversion ratio. Iraqi J.of Agric.Sci. 40 (4).(inpress).

Hassan S.A. and K.M. Hassan . 2008a.The effect of supplementation of medicinal plants and probiotic on growth rate and some blood parameters of karadi lambs . Egypt ion . J. of Nutr . and Feed .(Accepted).

Hassan S.A. and K.M. Hassan . 2008b.Response Of Karadi Lambs To The Rosemary Officinal Supplementation Fed With Either Alkali Treated Or Untreated Barley Straw Basal Diets .Egypt ion . J. of Nutr . and Feed .(Accepted).

Hassan S.A. and K.M. Hassan . 2009a Effect of graded levels of rumen degradable nitrogen and Nigella Sativa on daily intake, live weight gain ,feed conversion ratio and some blood parameters of karadi lambs . 7th Scientific Conf .for Agric .Res .Iraq .

Hassan S.A. and K.M. Hassan . 2009b. Effect of different levels of rumen undegradable nitrogen and Nigella Sativa on daily intake, live weight gain ,feed conversion ratio and some blood parameters of karadi lambs. Iraqi J.of Agric.Sci.40(1):168-178.

- Hassan S.A. and S.M.N. Muhamad 2007 .Effect of feeding urea treated and untreated barley straw with two levels of rumen un degradable nitrogen on carcass characteristic of Karadi lambs. Dirasat . Agric.Sci. (Accepted) .
- Hassan .S.A.and H.J.H.Salim. 2009. Effects level of feeding on Karadi lambs responses to local Iraqi probiotics. 1-Daily feed intake ,live weight gain and feed conversion ratio. Egyption . J. of Nutr . and Feed . 12rd international conference on Food Science and Nutrition .20-23/10/2009 Cairo ,Egypt .
- Hovell,F.D. DeB., Orskov ,E.R., Macleod,N.A. and I. McDonald. 1983.The effect of changes in the amount of energy infused as volatile fatty acids on the nitrogen retention and keratinize excretion of lambs wholly nourished by intra gastric infusion .Br .J . Nutr . 50:331-343.
- MAFF 1975 . (Ministry of Agriculture, Fisheries and Food Department of Agriculture and Fisheries for Scotland). . Energy allowance and feeding system for ruminants, Technical Bulletin 33.
- Merichi,A.H.,1990.The lipophiic compounds of Turkish matricaria chamomile variety with 120 chamazulene in the volatile oil, International ,J.of Rulde Drug Res.,28(2) ,145-165.
- Mohamed ,A.H.,Nadia,M.Abd-El-Bar and K.Ibrahim 2005.Influence of some medicinal plants supplementation . 2.Lambs performance ,carcass properties and mutton meat quality. Egyption J. Nutr. and Feed, 8 (1) special Issue . 445-460 .
- SAS.2001 . SAS/STAT User's Guide for Personal Computers . Release 6.12.SAS.Institute Inc.,Cary , NC, USA
- Tilley, J.M. and R.A. Terry. 1963. A two stage technique for in vitro digestion of forage crops. J.Br. Grassland Sci. 18:104-11
- Youssef,M.M., Abdiene, A.M., Khattab, R.M.and S.M. Darwish. 1998.Effect of feeding Nigella Sativa on productive and reproductive performance of buffaloes. Egyption J.Nutr.and Feed, 1(2), 73-85.