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EFFECT OF SUPPLEMENTATION OF MEDICINAL PLANTS AND PROBIOTIC ON GROWTH RATE AND SOME BLOOD PARAMETERS OF KARADI LAMBS.

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SUMMARY

Twenty four individual Karadi male lambs. Weighing 21.4±2.5 kg live weight and 4 months old were used to investigate the effect of two levels and three sources of feed additives upon 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 officinals* (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) blood urea nitrogen (BUN) and plasma uric acid, (SUA). There were no differences between treatments in all nutrients intake. However, the lambs given feed additives diets gained faster than those without . Moreover lambs given NS and probiotic diets gained a little faster than those given RO diets. The increased gain of lambs receiving NS diet was associated with a decrease in feed conversion ratio ($P<0.01$) as g diet DM per g live weight gain as compared with other treatments. Feed additives were significantly ($P<0.05$) increase GH, BS and BUN and reduce 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 .

***Keywords**: medicinal plants, probiotic live weight gain and blood parameters, Karadi lambs.*

INTRODUCTION

Protein supplementation and natural feed additives 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; and Hassan, 2008). This improvement was associated with changes in some blood parameters

(Al-Raheem et. al., 1995 and 1996; Hassan and Muhamad 2007a). This can be achieved by increasing efficiency utilization of both amino acids and energy reaches the rumen and small intestine (Hassan and Bryant, 1984ab and 1986; Hassan and Al-Sultan, 1995ab and Hassan and Al-Sultan, 1996). While using synthetic feed additives (chemical product) especially antibiotics may cause un acceptable side effects particularly if its fed for long term. Moreover, the accumulation effect of these product could be considered as pollution for human and threaten their health (Salem and El-Mahdy , 2001).On contrast , there is attempts to use microbial treatment and microbial fed additives to manipulated rumen microbial activity (Mahrous and Abou Ammou, 2005; Saarela et al., 2000; Hassan et al.,2007, Hassan et al.,2008 and Hassan and Muhamad 2007b). Dietary supplements of yeast culture have been reported to improve meat in cows (Youssif, et. al, 1998). Also, an improvement in average daily gain and feed conversion for growing goats when yeast culture was supplemented to their diet. Moreover, Williams et al. (1990) reported that the microbial protein flow from the rumen was increased with the addition of yeast culture to the diet. On the other hand, attempts to use the natural materials as alternative growth promoters such as medicinal plants are widely accepted. Also some studies reported that such additives had a favorable effect on nutrient digestibility, live weight gain (LWG) and feed conversion ratio (FCR) with cow. Also study carried out by Mohamed et. al.(2005) showed significantly improvement in DM digestibility ,LWG and FCR when lambs fed diets supplemented with a constant weight of Nigella sativa (NS) or Rosemary officinalis (RO). Moreover, Hassan (2008) reported higher improvement in LWG , FCR and lean to fat ratio when Awassi lamb fed high level of concentrate diets supplemented with increasing levels of NS or RO. 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. 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 daily feed intake, LWG, FCR and some blood parameters of Karadi lambs.

MATERIALS AND METHODS

Diets:

The effect of two levels (0 and 7.5 g/kg DM) and three sources of feed additives (Nigella sativa, Rosemary and Probiotic) upon daily intake (DI) ,LWG, FCR and 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).The chemical composition of the feedstuffs and feed additives is shown in Table (1). Formulation and calculated composition of diets is shown in Table (2).

Animals:

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 were 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). Allowances were recalculated each 2 weeks according to live weight. Barley straw 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 -15 ^{0}C for subsequent chemical analysis .

Table (1). Chemical composition of the feedstuffs (g/kg DM).

Item	Barley	Soybean meal	Yellow corn	Nigella stiva	Rosemary	Probiotic*
Chemical composition						
Dry matter g/kg fresh	951	946	937	919	922	920
Organic matter (OM)	915	881	927	913	905	906
Total nitrogen (TN)	19	70	١٣	41. 6	39	40
Crude fiber (CF)	65. 3	50	36	67	213	157
Ether extract (EE)	12	22	34	115	82	99
Nitrogen free extract (NFE)	668	245	812	433	424	427
Metabolizable energy (MJ)**	4.9	2.0	5.0	1.3	1.3	1.3

* probiotic consist of three kinds of bacteria (*Lactobacillus Bacilli* 10^{10} *Lactobacillus Subtitles* 10^{10} and *Lactobacillus Acidophilus* 10^{10}) and one kind of yeast (*Saccharomycis Ccerevisia* 10^{9}).
**ME (MJ/ kg DM) = 0.012 CP +0.031 EE+0.005 CF +0.014 NFE (MAFF, 1975).

Table (2). Formulation and chemical composition of experimental diets *

Item	Control	Nigella Sativa	Rosemary	Probiotic
Diet no	1	2	3	4
Ingredients (g/kg DM)				
Barley	490	490	490	490
Yellow corn	390	٣٩٠	390	390
Soybean meal	100	100	100	100
Nigell Sativa	—	7.5	—	—
Rosemary Officinals	—	—	7.5	—
Probiotic	—	—	—	7.5
Salt	10	10	10	10
Min. & vit. Mixtur	10	10	10	10
Chemical Composition /kg DM				
DM (g/kg fresh)	946	945	945	945
OM	918	918	918	918
TN	21. 2	21. 3	21. 3	21. 3
CF	339	340	340	340
EE	21. 5	22. 1	21. 9	22. 0
NFE	664	664	664	664
ME (MJ) **	11.96	11.94	11.94	11.94
RDN	15.2	15.2	15.2	15.2
(g per MJ of ME)	1.27	1.27	1.27	1.27
UDN	6.0	6.1	6.1	6.1

raw containing (DM basis):87% OM, 0.59%N,8%NDF,5%ADF,and 45%DOMD.
**ME (MJ/ kg DM) = 0.012 CP +0.031 EE+0.005 CF +0.014 NFE (MAFF, 1975).

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.

Determination of some blood parameters:

Within 2-3 days before ending the feeding trail , blood samples were taken from half of the experimental animals to determine plasma growth hormone, blood sugar and urea nitrogen concentration. Animals were fitted with jugular canella 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 ^{0}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 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. (1984). Neutral detergent fiber (NDF), Acid detergent fiber (ADF) and lignin were determined for barley straw by the method of Goering and Van Soest (1970). In vitro DM and OM digestibility of straw was determined by the method of Tilley 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 AND DISCUSSION

Intake:

In general, the lambs consumed all the concentrate diets offered. The overall daily intake (concentrate and barley straw) of DM, OM, TN, CF, EE, NFE, ME, rumen degradable and un degradable N (RDN and UDN, respectively) are shown in Table (3). The DM intake of diets containing probiotic was significantly ($P<0.05$) higher than diets containing other feed additives, but these differences were not statistically significant when intake was expressed per kg w0.75. There were no differences between treatments in daily metabolizable energy and total nitrogen intake when expressed as g/day or g/kg W0.75. The RDN:ME ratio and daily intake of UDN were similar across treatments, and followed the intended treatments composition ($P>0.05$). Despite similar amount of daily intake of TN and ME across treatments, different responses were shown to feed additives supplementation as compared with control diets .Some possible reasons has for this responses may explain the beneficial effects of additive feeds in the diet. One explanation for the response to additive feeds cited by Mohamed et al. (2005) and Hassan (2008) may be used as alternative growth promoters, such medicinal plants include NS, has some properties as antiseptic, antibacterial activates against microorganism treatment, of gastro-

intestinal complaints and tonic. Moreover, Mericli (1990) recorded that Matricaria chamomile has anti-inflammatory, antiseptic and spasnolytic activities against microorganisms treatment of gesture-intestinal complaints and tonic. Hanafy and Hatem (1997) reported that NS seeds extract inhibited gram-positive and gram-negative bacteria. Ferdous et al.(1992) indicated that the oil of NS seeds has therapeutic potential for the treatment of diarrhea caused by 37 isolates of shigella species and 10 strain of V. cholera and E. coli .

An alternative explanation, discussed by El-Saadany et al.,(1996); Allam et al.,(1999) and Aboul-Fotouh et al.,(1999) that the medicinal plants improved rumen activity and nutrient digestibility. Similar results were reported by Mohamed et al.(2005) who calculated that the nutritive values as TDN, ME and DCP were improved significantly as a result to medicinal plants (NS, RO) supplementation. These results are in agreement with results obtained by Salem and El-Mahdy (2001) and Mohamed et al., (2003), who reported that the medicinal plants (NS and Metrical chamomile) additives improved the digestion coefficient and nutritive value during feeding sheep.

Table (3). Overall daily intake of concentrate diets and barley straw.

Item	Feed Additive, (gm/kg DM)				Significance of effects		
	Control	Nigella Sativa	Rosemary	Probiotic			
	0	7.5	7.5	7.5	SED	Level	Source
Diet no.	1	2	3	4			
Dry matter (g/day)	847 ^{b}	873 ^{b}	840 ^{b}	901 ^{a}	85.65	*	*
(g/kgW$^{0.75}$ per day)	69.6	70.4	69.95	74.3	4.844	NS	NS
Organic matter (g/day)	769	794	784	818	76.68	NS	NS
(g/kgW$^{0.75}$ per day)	63.3	63.9	65.4	67.2	4.639	NS	NS
Metabolizable energy (MJ / day)	9.3	9.6	9.3	9.8	0.904	NS	NS
(g/kgW$^{0.75}$ per day)	0.768	0.774	0.775	0.775	0.057	NS	NS
Total nitrogen (g/day)	15.5	16.2	15.8	16.5	1.62	NS	NS
(g/kgW$^{0.75}$ per day)	1.272	1.306	1.316	1.346	0.086	NS	NS
Rumen degradable nitrogen (g/day)	10.98	11.588	11.321	11.69	1.146	NS	NS
(g/kgW$^{0.75}$ per day)	0.703	0.902	0.909	0.925	0.061	NS	NS
(g / MJ of ME)	1.20	1.21	1.22	1.20	0.038	NS	NS
Rumen un degradable nitrogen (g/day)	4.52	4.669	4.532	4.705	0.473	NS	NS
(g/kgW$^{0.75}$ per day)	0.358	0.374	0.379	0.385	0.025	NS	NS

* P<0.05, NS, not significant

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

Live weight gain:

Live weight gain are presented for the first 4 weeks, the final 4 weeks and the overall growth period (Table, 4). The lambs on all treatment grew faster in the later part than in the early part of the experiment. In the first part the lambs on all treatments grew slower than their target gains (150 g/day), except the lambs receiving the NS and probiotic diets grew significantly (P<0.05) faster than the control and those received RO diets. During the second part of the experiment, the lambs on all treatments grew faster than the target gains.

The lambs receiving the feed additives continued to grow significantly (P<0.05) faster than the control, but there was no level * source interaction (P>0.05). Throughout, 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). The increased gain of lambs receiving NS diet was associated with a decrease in feed conversion ratio (P<0.01) as g diet DM per g live weight gain (Table, 4) as compared with other treatments. Greater gains during the late part compared to the early part of the growth periods have been differed than other results reported by Hassan (1986) ; Hassan and Bryant (1985) ; and since they are generally common to all diets may merely represent changes in gut fill. Therefore, in the absence of evidence to the contrary, it would seen safer to accept the results of overall growth period as a fairer representation of feed additives effects on live weight gain and feed conversion ratio. The lambs on all treatments consumed similar amount of ME and TN. Thus, although differences in LWG, FCR, GH, BS, BUN and SUA occurred between treatments, the responses observed are related to the difference in 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. 2001; Mohamed, et al. 2005 and Hassan 2008); who obtained that the medicinal plants additives improved the body weight gain, and FCR. The results of this experiment indicated that greater improvement in LWG and FCR 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 and FCR of lambs fed NS as compared with those fed RO. Maximum response in live weight gain was associated with lower BUN concentration this might be 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.

Table (4). Performance of Karadi lambs as affected by supplementation of Nigella Sativa , Rosemary or Probiotic to the concentrate diets.

Item	Feed Additives, (gm/kg DM)				Significance of effects		
	Control	Nigella Sativa	Rosemary	Probiotic			
	0	7.5	7.5	7.5	SED	Level	Source
Diet no.	1	2	3	4			
Initial live weight (Lw, Kg)	٢١,٩٦	21.04	21.42	21.36	2.53	NS	NS
Final Lw (Kg)	٣٢,٩٦ ^{c}	35.20 ^{a}	34.40 ^{a}	34.70 ^{a}	2.99	*	NS
Live- weight gain (g/day)							
0 – 4 weeks	١٢٥ ^{b}	169 ^{a}	131 ^{b}	149 ^{ab}	٢٤,٨٨	*	*
4 – 8 weeks	٢٤٢ ^{b}	269 ^{a}	266 ^{a}	261 ^{a}	٢٩,٣٥	*	NS
0 – 9 weeks	١٩١ ^{c}	224 ^{a}	206 ^{bc}	211 ^{ab}	٢٩,٧٠	*	NS
Feed Conversion ratio (g DM intake /g LWG)	4.46 ^{c}	3.88 ^{a}	4.08 ^{ab}	4.27 ^{bc}	٠,٢٢٧	*	NS

* P < 0.05 , NS ,not significant

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

It must also be acknowledged that supplementation of the diet with feed additives provided additional minerals, of those minerals; phosphorus was most likely to have been in deficit. ARC (1984) proposes a daily requirement of phosphorus of 2.1 g/ kg DM for a lamb gaining 200 g. The control diet contained 3.7 g/kg DM. It therefore seems unlikely that phosphorus was limiting. The observed response to NS and RO in this study as compared with control diet was 20 g/day compared with 60 g/day of that recently reported by Hassan (2008). These differences may be related to the level of feeding, since the dietary requirement is influenced by level of feeding. The yield of microbial protein and tissue requirement for protein can not be met under these circumstances, and the animal will not respond to feed additives supplementation.

Blood parameters:

Growth hormone (GH), blood sugar (BS), blood urea nitrogen (BUN) and plasma uric acid (SUA) are presented in Table (5). Feed additives were significantly ($P<0.05$) increase GH , BS and BUN 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. Moreover, Lambs received probiotic shown a considerable increase ($P<0.05$) in BUN as compared with other treatments. There were no significant ($P>0.05$) differences in BUN between other treatments (control, NS and RO diets). In contrast, feed additives supplementation (NS, RO and probiotic) were significantly ($P<0.05$) reduce SUA as compared with control diet. Lambs received NS diet was significantly ($P<0.05$) reduce SUA than those received RO and probiotic diets. 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 point. (Hovell et al. 1983). According to the above, therefore, the animals with large intake of digestible OM may be responsive to dietary supplement of NS and RO higher than those fed low level of intake.

Table (5). Blood parameters of Karadi lambs as affected by supplementation of Nigella Sativa Rosemary or Probiotic to the concentrate diets.

Item	Feed Additives, (gm/kg DM)				Significance of effects		
	Control	Nigella Sativa	Rosemary	Probiotic			
	0	7.5	7.5	7.5	SED	Level	Source
Blood parameters (mg / dl)							
Blood sugar	72.3^{b}	80.5^{a}	78.8^{a}	72.2^{b}	4.988	*	*
Blood urea	2[illegible].2^{a}	20.9^{b}	20.7^{b}	2[illegible].0^{b}	1.863	*	NS
Plasma uric acid	0.81^{a}	0.46^{c}	0.60^{b}	0.66^{b}	0.273	*	*
Growth hormone	2.11^{c}	2.26^{bc}	3.47^{a}	2.48^{b}	0.690	*	*

*P<0.05, NS ,not significant

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

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تأثير إضافة النباتات الطبية أو المعزز الحيوي علي معدل النمو وبعض صفات الدم في الحملان الكراديه

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الملخص

تم إستخدام اربعة وعشرون حملاً"كراديا" بعمر٤ اشهروبمتوسط وزن ٢٠.٥+٢١ كغم في أقفاص مفرده لدراسة تأثير استخدام مستويين (٠ و ٧.٥ غم /كغم ماده جافه) وثلاثة مصادر من الأضافات الغذائيه(الحبه السوداء اكليل الجبل وألمعزز الحيوي) علي كمية المتناول اليومي،معدل الزيادةالوزنية،كفاءة التحويل الغذائي وبعض صفات الدم .قسمت الحملأن الى اربعة مجاميع متساويه وغذيةعلى ٤ علائق مختلفه. العليقه ١.لأتحتوى اي مصدر من الأضافات الغذائيه (٠ غم /كغم ماده جافه) .العليقه ٢و٣ و٤ تحتوي على اضافات غذائيه (٧.٥ غم/كغم ماده جافه) من الحبه السوداء او أكليل الجبل او المعزز الحيوي وعلى التوالي .هذه العلأئق تمثل المستوى الثاني من الأضافات الغذائيه .أخذت نماذج من الدم لتقدير هرمون النمو ، سكر الدم ، نتروجين يوريا الدم وبلأزما حامض اليوريك .أظهرت النتائج عدم وجود اختلأفات في كمية العناصر الغذائيه المتناوله يومياً بين المعاملأت المختلفه .مع ذلك، أظهرت النتائج ان الحملان المغذاة على الأضافات الغذائيه نمت اسرع من تلك الحملأن المغذات على عليقة السيطره (عليقه ١). اضافة الى ذلك ، فان الحملأن المغذاة على الحبه السوداء والمعزز الحيوي نمت اسرع قليلاً من تلك المغذاة على اكليل الجبل. إن زيادة نمو الحملأن المغذاة على اكليل الجبل كانت مصحوبه بإنخفاض معنوى ($P<0.05$) في كفاءة التحويل الغذائي غم ماده جافه/غم زياده وزنيه مقارنتاً بالمعاملأت الأخرى .

ان الاضافات الغذائية ادت الى زيادة معنوية($P<0.05$) في هرمون النمو، سكر الدم ونتروجين اليوريا وادت الى انخفاض حامض اليوريك مقارنة بعليقة السيطرة . مع ذلك ، فان هرمون النمو في الحملان المغذاة على اكليل الجبل كانت اعلى معنويا($P<0.05$) 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.