

Effect of Iraqi probiotic as an additives feed on carcass characteristics and composition of Awassi lambs

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Abstract:

Thirty individual Awassi male lambs weighing 25.97 kg and 5-6 months of old were used ,to test the effect of using four levels (0 , 20 ,40 ,and 60 g /kg DM) of Iraqi probiotic in the fattening diets on changes in body weight and carcass gain . At the beginning of the experiment ;Six lambs were randomly allocated to each of the four diets ; the remaining (six lambs) were slaughtered to provide data to relate empty body weight (EBW), hot and cold carcass weight and physical dissected gain to initial body weight. Lambs in T1 group were fed diet with no probiotic . Lambs in T2 T3 and T4 groups were fed on diets supplemented with 20 , 40 and 60 g/kg DM of Iraqi probiotic respectively .Daily nutrients intake were similar across treatments. Live weight gain slaughter weigh, hot and cold carcass weights , Empty body weight and Killing –out proportions of lambs fed diets supplemented with probiotic were significantly higher ($p<0.01$) than those fed control diets . However, higher improvement was achieved by lambs fed diet contain 40g/kgDM probiotic (T3). Physically dissected gain ,clearly indicated that supplementation of diets with probiotic approximately doubled the weight of lean gain ($p<0.01$) and slightly increased the weight of fat and bone gain ($p<0.05$) as compared with those fed control diets . Physically dissected lean : fat ratio was significantly ($p<0.01$)greater for lambs fed supplemented diets with probiotic than for those fed control diet (without probiotic) .

الخلاصة:

تم استخدام ثلاثون حمل عواسي بعمر ٤ اشهر وبمتوسط وزن ٢٥.٩٧ كغم في أقصاف مفردة لدراسة تأثير استخدام اربعة تويات (0, ٢0, ٤0 و ٦0 غم/كغم ماده جافه) من المعزز الحيوي العراقي في عليقه تسمين الحملان في التغيير في زيادة وزن الجسم ووزن الذبائح . في بداية التجربة تم اخذ ستة حملان عشوائيا لكل عليقة من العلائق الاربعة وتركت ستة حملان تم ذبحها لتعطي بيانات لكل من الصفات : وزن الجسم الفارغ ،وزن الذبيحة الحار والبارد،وزن الفصل الفيزيائي نسبة لوزن الجسم الابتدائي ،غذيت حملان المجموعة الاولى على عليقة خالية من المعزز الحيوي ، اما حملان المجاميع الثانية والثالثة والرابعة غذيت على عليقة مضاف ليها ٢٠, ٤٠ و ٦٠ غرام /كغم ماده جافة معزز حيوي على التوالي. وكان مقدار المواد الغذائية المأخوذة متشابهة بين المعاملات . اختلفت معنوياً ($p<0.01$) الزيادة في وزن الجسم الحي ،وزن الذبح ،وزن الذبيحة الحار والبارد ،وزن الجسم الفارغ ونسبة التصافي في الاعنام المغذاة على علائق مضاف اليها المعزز الحيوي مقارنة مع تلك التي غذيت على عليقة السيطرة . كما ان الاعنام التي ذبت على ٤ غرام/كغم ماده جافة معزز حيوي (المعاملة الثالثة) حققت اعلى تحسن في الصفات المذكورة انفاً. اما الزيادة في الفصل الفيزيائي فقد اشارت النتائج بوضوح الى ان اضافة المعزز الحيوي للعلائق اعطت زيادة مضاعفة في وزن اللحم ($p<0.01$) زيادة خفيفة في وزن الدهن والعظم ($p<0.05$) مقارنة مع تلك التي غذيت على عليقة السيطرة . ارتفعت معنوياً ($p<0.01$) نسبة اللحم الى الدهن في الفصل الفيزيائي للحملان التي غذيت على علائق مضاف اليها المعزز الحيوي مقارنة بتلك التي غذيت على عليقة السيطرة (بدون المعزز الحيوي).

Introduction:

In the recent years, the use of feed additives containing bacterial and yeast cultures has been increased. These Probiotic was a mixture of benefit microbes which mixed with fed of animals in order to make a benefit and healthy microbial balance in the intestine (Nunes, 1994) , this balance lead to improved animal productivity especially in stressed animal which face a heat stress, fed on toxic or improper diets (Yoruk et. al., 2004., Zinedine et. al., 2005) .Inclusion the probiotic in animal diets seemed to improve lambs performance (Ali , 2005; Abedo et al.;2005 and Hassan and Hassan, 2008a) and increased live weight gain (Orr et al.;1988 ., Galyeen et al.;2000) and digestibility (El-Shaer, 2003) and enhanced feed conversion ratio (Wysong , 2003).Recently Hassan and Hassan (2008abc) reported significantly improvement in live weight gain and feed conversion ratio was associated with lamb fed diet supplemented with local Iraqi probiotic or some medicinal plants as compared with control diet. A locally prepared probiotic were actually tested and

compared with foreign imported probiotic products in Iraq and proved its superior activity in improve poultry performance (Abbas 2005 and Al-Khalidi 2005). Several possible explanations for these improvement in live weight gain and carcass characteristic have been given by Hassan (2008) . However ,more details are required in order to clarify the effect of probiotics on physical and chemical carcass gain and carcass characteristic to explain the nature of these improvement . For this purpose Iraqi probiotic were used as feeds additives to provide body and gain composition data on Awassi lamb fed different levels (0 , 20 ,40 and 60 g /kg DM) of local Iraqi probiotic.

Materials and methods:

This experiment was conducted at the animal farm of animal resources Dept. College of Agric.Univ. of Baghdad to evaluate the effect of increasing levels of Iraqi probiotic on changes in carcass weight , carcass gain and composition of Awassi lambs.

Diets :

Lambs were divided into four treatments (T) groups. Lambs in T1 group were fed a tradition diet with no probiotic supplementation and used as control diet . Lambs in T2 , T3 and T4 groups were fed on diets supplemented with 20 , 40 , and 60 g. /kg DM of Iraqi probiotic respectively. All diets were formulated to have similar daily intake of total nitrogen (TN) and Metabolizable energy (ME).. Formulation and chemical composition of experimental diets are shown in table 1.

Treatment no.	T1	T2	T3	T4
Ingredients (g/kg DM)				
Barley	250	250	250	250
Yellow corn	100	100	100	100
Wheat bran	400	۳۸۰	۳۶۰	۳۴۰
Iraqi Probiotic *	-	20	40	60
Sunflower	30	30	30	30
Wheat	200	200	200	200
Salt	10	10	10	10
Minerals & vitamins mixture	10	10	10	10
Chemical Composition /kg DM				
Dry matter (DM ,g/kg fresh)	876	875	874	872
Organic matter (OM)	841	841	840	840
Total nitrogen (TN)	19.8	19.8	19.8	19.8
Curd fiber (CF)	64.1	64.1	64.0	64.0
Ether extract (EE)	27.6	27.6	27.6	27.6
Nitrogen free extract (NFE)	625	625	625	625
Metabolizable energy(ME, MJ) **	10.1	10.1	10.1	10.1

Table 1. Formulation and chemical composition of the concentrate diets.

* Iraqi Probiotic containing : Lacto bacillus bacilli 10¹⁰ ,Saccharomyces cerevisia 10⁹ acidophilus 10¹⁰ Bacillus ubtilus 10¹⁰ ,Lacto (Al-Khalidi,2005)

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

Animals and management:

Thirty intact Awassi male lambs ,aged 5-6 months and averaged 25.97 kg live body weight were used .At the beginning of the experiment ,Six lambs were randomly allocated to each of the four diets ; the remaining six lambs were slaughtered to provide data to relate empty body weight (EBW), hot carcass weight (HCW) ,cold carcass weight (CCW)and physical composition (lean .fat and bone) to initial BW . The diets were gradually introduced to the lambs over a period of 3 weeks before the start of experiment ,during this time all animals treated for tape worms and other helminthes . The concentrate diets were offered once daily at about 08.00 hour (h) in quantities

calculated to support maintenance and daily gain of 200 g (Al-Jassim et.al. 1996). Alfalfa roughage was available *ad libitum* as a basal diet , and had free access to fresh water. Live body weight (LBW) was recorded once weekly to the nearest 0.100 kg .Feed intake was determined for concentrate as the difference between feed offered and refused .After a period of 150 days, all lambs were slaughtered .

Slaughter:

At the end of feeding trial lambs were slaughtered after over night with draw of feed ,then weighed immediately before slaughter to provide a fasted weight . Slaughter was performed according to local Muslim practice by severing the jugular vessels , esophagus and trachea without stunning.The head was removed ,followed by skinning and evisceration. Head, feet, testicles and organs were weight separately. The carcasses were weighed hot , then chilled for 24 h at 4 c⁰ , weighed again and cut evenly into left and right sides , after removing the fat tail from the carcasses. The left side was cut into standardized wholesale cuts (Forrest et al.,1975).The cuts were weighed separately and dissected into lean ,bone and fat tissue ..

Chemical and statistical analysis:

Chemical analysis were conducted on the ingredients and diets for DM, ash ,total nitrogen and ether extract analysis following A.O.A.C (1995) procedures. Data were subjected to an ANOVA analysis using the general linear models (GLM) procedures of SAS (2001) significant treatment means differences were tested by using the multiple range test of Duncan (1960).

Equations for prediction of empty body weight (EBW), hot carcass weight (HCW),cold carcass weight (CCW) and dissected body composition (Lean ,fat and bone) at the start of the experiment and at turn-out were calculated by linear regression of the components upon BW measured 12 h prior to slaughter .

Results

Diets and live weight gain

All animals responded to supplementation with probiotic(Table 2) . The daily intake of DM of diets containing probiotic was significantly (p<0.05) higher than control diet, but these differences were not statistically significant when intake was expressed as g per kg w^{0.75}. Live weight gain (LWG) ,slaughter BW and feed conversion ratio (FCR) for overall growth period of lambs fed diet supplemented with probiotic was significantly (p<0.01) higher than those fed control diet .However, higher LWG and FCR was achieved by lambs fed diet supplemented with 40 g/kg probiotic as compared with those lambs fed diets supplemented with 20 and 60g probiotic / kg DM.

Table2.Performance of Awassi lambs as affected by Iraqi probiotics supplementation

Level of probiotic (g/kg DM)	0	20	40	60	Significance
Treatment no.	1	2	3	4	of effects
Initial live weight (Lw, Kg)	25.8	26.2	26.1	25.8	NS
Slaughter Body weight (kg)	45.6 ^c	52.9 ^b	56.3 ^a	55.1 ^a	**
Gut fill (kg)	7.7 ^b	9.7 ^a	8.1 ^b	9.7 ^a	*
Daily LW gain (LWG,g)	132 ^c	178 ^b	201 ^a	195 ^a	**
Dry matter (g/day)	1071 ^c	1187 ^b	1235 ^a	1212 ^a	*
(g/kgW ^{0.75} / day)	72	75	76	75	NS
Feed conversion ratio (g DM/g LWG)	8.1 ^a	6.3 ^b	6.1 ^b	6.2 ^b	**

(ME,MJ/g LWG)	0.073 ^a	0.064 ^{ab}	0.05 ₉ ^b	0.060 ^b	**
(CPg / gLWG)	0.907 ^a	0.794 ^b	0.73 ₂ ^b	0.742 ^b	**

** p < 0.01 , NS , not significant * p < 0.05 .

Initial composition :

Regressions between EBW , HCW, , body composition , and body weight (BW) in Kg at the start of the experiment were as follows (residual d.f.= 5) in all cases :

EBW (kg) =	0.119 + 0.837 (s.e.0.003)	BW	R ² = 0.98
HCW (kg) =	- 0.95 + 0.360 (s.e.0.022)	BW	R ² = 0.97
CCW (kg) =	- 0.92 + 0.350 (s.e.0.031)	BW	R ² = 0.96
Lean (kg) =	59.78 + 0.083 (s.e.0.031)	BW	R ² = 0.95
Fat (kg) =	9.05 + 0.160 (s.e.0.012)	BW	R ² = 0.94
Bone (kg) =	31.25 - 0.260 (s.e.0.003)	BW	R ² = 0.96

Carcass characteristic and changes in weight:

Slaughter weight , hot and cold carcass weights and Empty body weight (SW, HCW,CCW and EBW respectively) of lambs fed diets supplemented with probiotic were significantly higher (P<0.01) than those fed control diets (Table 3.) .However, lambs fed diets supplemented with 40g/kg probiotic showed higher (P<0.05) SW,HCW,CCW and EBW than those fed diets supplemented with 20 and 60 probiotic g /kg DM. Killing –out proportions of lambs fed diet supplemented with probiotic was higher (P<0.01) than those fed control diets when HCW or CCW was expressed as apportion of slaughter weight (SW) or empty body weight (EBW). However ,higher killing –out proportion was associated with lambs fed diets supplemented with 40 g probiotic/kg DM (P < 0.05).Daily gain of EBW,HCW and CCW of lambs fed diets supplemented with probiotic were significantly higher (P<0.01) than those fed control diets.However, lambs fed diets supplemented with 40 g Iraqi probiotic showed higher (P<0.05) daily gain of EBW,HCW and CCW than those fed diets supplemented with 20 and 60 g probiotic/kg DM.

Table 3 .Initial and final weights ,Killing-out proportions and daily carcass gain

Level of probiotic (g/kg DM)	0	20	40	60	significance
Treatment no.	1	2	3	4	of effects
Initial weight (Kg) [#]					
Live weight ,LW	25.8	26.2	26.1	25.8	
Empty body weight ,EBW	21.7	22.05	21.97	21.7	
Hot carcass weight ,HCW	8.338	8.482	8.446	8.338	
Cold carcass weight ,CCW	8.11	8.25	8.215	8.11	
Final weight (kg)					
Slaughter body weight, SBW	45.60 _c	52.90 _b	56.25 _a	55.05 _a	*
EBW	37.9 _d	43.2 _c	48.2 _a	45.4 _b	**
HCW	17.0 _c	21.0 _b	23.5 _a	22.0 _b	*
CCW	16.5 _c	20.5 _b	23.0 _a	21.5 _b	*
ccw "	13.87 _d	18.06 _b	21.19 _a	19.52 _b	**
Killing – out proportions (g/kg) ^{##}					
HCW / SBW	373 _c	397 _b	417 _a	408 _a	**
CCW / SBW	356 _c	384 _b	409 _a	391 _b	**
CCW / EBW	429 _c	470 _b	478 _a	474 _b	**
Daily gain g / day					
EBW	119 _c	141 _b	175 _a	158 _b	**
HCW	57.8 _c	83.5 _b	100.3 _a	91.1 _a	**
CCW	54.6 _c	80.3 _b	98.6 _a	89.3 _{ab}	**

[#] calculated from regression equations ^{##} CCW without fat tail . ** p<0.01 , NS , not significant
* p<0.05

Changes in physical body composition and total dissected gain:

Tissues in initial and final body composition and total dissected gain are presented in (Table 4). Final physical composition , clearly showed that lambs carcasses of those fed probiotic contained higher (p<0.01) weight of lean , bone tissue and lower weight of fat tissue as compared with those fed control diets (with out probiotic) .Whereas, higher weight of lean , bone tissue and lower weight of fat tissue was associated with lambs fed diets supplemented with 40g probiotic (p< 0.05). Lambs fed diets supplemented with probiotic was significantly (p<0.01) increase lean : fat ratio as compared with those fed control diets .However lean : fat ratio was significantly (p<0.05) difference between T2 ,T3 and T4; with higher ratio was associated with lambs fed diet supplemented with 40g probiotic (T3).Physically dissected gain ,clearly indicated that supplementation of diets with probiotic approximately doubled the weight of lean gain (p<0.01) and slightly increased the weight of fat and bone gain (p<0.05) as compared with those fed control diets . Physically dissected lean : fat ratio was significantly (p<0.01)greater for lambs fed supplemented diets with probiotic than for those fed control diet (with out probiotic) . However, higher weight gain of lean ,fat, bone tissue and lean : fat ratio was associated with lambs fed diets supplemented

with 40g probiotic /kg DM . Fat tail weight was significantly lower ($p<0.05$) in lambs fed diets supplemented with probiotic than those fed control diet .

Table 4 . Initial and final physical body composition and physically dissected gain (kg)

Level of probiotic (g/kg DM)	0	20	40	60	significance of effects
Treatment no.	1	2	3	4	
Initial physical body composition #					
Lean	5.02	5.11	5.08	5.02	
Fat	1.07	1.09	1.09	1.07	
Bone	2.05	2.01	2.00	1.99	
Lean : Fat ratio	4.69	4.69	4.66	4.69	
Final physical body composition ##					
Lean	9.87 ^c	12.50 ^b	14.18 ^a	13.17 ^{ab}	*
Fat	3.78 ^c	4.18 ^{ab}	4.02 ^a	3.93 ^b	*
Bone	2.86 ^b	3.80 ^b	4.80 ^a	4.48 ^a	*
Lean : Fat ratio	2.61 ^c	2.99 ^b	3.52 ^a	3.35 ^{ab}	*
Physically dissected gain, kg					
Lean	4.85 ^c	7.39 ^b	9.1 ^a	8.15 ^a	**
Fat	2.71 ^b	3.09 ^a	2.93 ^a	2.86 ^{ab}	*
Bone	0.81 ^b	1.78 ^b	2.80 ^a	2.49 ^a	*
Lean : Fat ratio	1.79 ^d	2.42 ^c	3.11 ^a	2.84 ^{bc}	**
Fat-tail ,kg	2.63 ^a	2.44 ^a	1.81 ^b	1.98 ^b	*

#Determined from regression equations between body composition and BW at the start of the experiment

Included fat tail

* $P<0.05$ ** $P<0.01$, NS , not significant

Physical composition of main wholesale cuts :

The physical composition of main wholesale cuts (Table 5)was significantly ($p<0.05$) affected by probiotic supplementation. In general ,tissues in main wholesale cuts clearly showed that lambs carcasses of those fed probiotic contained higher ($p<0.01$) weight of lean , bone tissue and slightly increased the weight of fat tissue as compared with those fed control diets (with out probiotic) .Whereas, higher weight of lean , bone tissue was associated with lambs fed diets supplemented with 40 g probiotic / kg DM ($p < 0.05$).

Table 5 . Effect of local probiotic on physical composition of main wholesale cuts .

Level of probiotic (g/kg DM)	0	20	40	60	significance
Treatment no.	T1	T2	T3	T4	of effects
Shoulder (kg)					
Lean	0.834 ^c	1.056 ^b	1.214 ^a	1.174 ^{ab}	*
Fat	0.325 ^b	0.374 ^a	0.351 ^{ab}	0.365 ^{ab}	*
Bone	0.245 ^c	0.320 ^b	0.386 ^a	0.361 ^a	*
Loin (kg)					
Lean	0.457 ^d	0.610 ^c	0.769 ^a	0.689 ^b	*
Fat	0.181 ^b	0.232 ^a	0.218 ^a	0.223 ^a	*
Bone	0.113 ^c	0.157 ^b	0.208 ^a	0.188 ^a	*
Rack (kg)					
Lean	0.511 ^c	0.565 ^c	0.754 ^a	0.685 ^b	*
Fat	0.210 ^b	0.226 ^{ab}	0.262 ^a	0.260 ^a	*
Bone	0.180 ^b	0.209 ^b	0.285 ^a	0.255 ^a	*
Leg (kg)					
Lean	1.153 ^d	1.470 ^c	1.890 ^a	1.670 ^b	*
Fat	0.458 ^b	0.523 ^a	0.499 ^{ab}	0.481 ^{ab}	*
Bone	0.324 ^c	0.407 ^b	0.511 ^a	0.448 ^b	*

* P<0.05

Discussion:

Since the lambs consumed similar amount of ME and total protein across treatments so any change in lambs performance is mainly related to the effect of Iraqi probiotic supplementation . Its appeared that the lambs response to increasing levels of probiotics was curvilinear . Minimum level of probiotics achieved maximum improvement in carcass weight, carcass weight gain and lean : fat ratio was 40 g probiotic / kg DM , above this level no further response occurred . Huck et. al., (2000)found that using probiotics in the fattening diets of calve significantly increased carcass weight as compared with control diet .This higher responses might be indicated higher efficiency utilization of the nutrient available in the diets particularly those related to protein and energy . Larry, (1997) and Shim , (2005)reported that probiotics microorganisms improve nutrients digestibility and increase the availability and absorbability of all nutrients in elementary tract .Similar observation was reported by Smirnov et. al., (2005) . In this study lambs carcasses of those fed probiotic contained higher weight of lean , bone tissue and lower weight of fat tissue as compared with those fed control diets .this may reflect , butter utilization of both energy and protein to produce more lean carcasses than fat carcasses particularly when these lambs were fed restricted energy intake .Similar observation was reported by Hassan (2008)when lambs fed diets supplemented with nigella stiva or rosemary officinals . Some possible reasons has this responses may explain the beneficial effects of probiotic and anther additive feeds to improve the efficiency utilization of nutrients in this study and produce more leaner and lower fat gain .Suskovic et. al., (2001)indicated that probiotics in the host animal reduced fat synthesis and blood concentration of cholesterol .Moreover, Huck et. al., (2000) and Afaf, (2001) reported that probiotic increased the total volatile fatty acid produce in the rumen which cause differences in lipids then sis and deposition in animal body ; However, the mechanisms of the probiotics effect still unknown (Huck

et. al., 2000) . Finally ,It must also be acknowledged that supplementation of the diet with probiotic provided additional minerals (Duggan et. al., 2002) 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 3.2 g/kg DM . It therefore seems unlikely that phosphorus was limiting in this study .

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