GRADUAL SUBSTITUTION OF REED SILAGE WITH ALFALFA HAY FED WITH OR WITHOUT PROBIOTIC TO AWASSI LAMBS. 2- Carcass characteristics

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ABSTRACT

The effect of three ratios of alfalfa hay to reed silage (40:0, 20: 20 and 0: 40 H: S ratios) fed with two levels of Iraqi local probiotic (IP) (0 and 7.5 g IP / kg DM) on live-weight gain and carcass characteristics were studied. Twenty four individual Awassi male lambs (mean weight 17 kg and 3-4 months of old) were used. The diets were formulated to be given as a 40 parts alfalfa hay or/and reed silage DM to 60 parts concentrate DM. There were no differences in daily feed Intake. Live weight gain, slaughter weight (SW), hot carcass weight (HCW), cold carcass weight CCW, empty body weight (EBW) and killing –out proportions of lambs fed diets supplemented with IP were significantly higher than those fed diets without IP. Differences in live weight gain, SW, HCW, CCW, EBW and killing –out proportions, were not significantly affected by substitution reed silage with alfalfa hay. IP significantly increased lean percentage and reduce bone tissue in leg cuts, while no effect on fat tissue. Carcass cuts weight and fat tail weight were not significantly affected by increasing substitution of reed silage with alfalfa hay and IP supplementation, except the leg and shoulder cuts weight of lambs fed IP diets (31.07, 21.64)% which were significantly higher than those lambs fed diets without IP (29.36, 20.01)%.

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إحلال نسب تصاعدية من سايلج القصب محل دريس الجت المغذاة مع او بدون المعزز الحيوي العراقي للحملان العواسيه

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المستخلص

تمت دراسة تأثيراحلال نسب تصاعديه من سايلج القصب محل دريس الجت (40 :0 ، 20:20 و 0: 40 % دريس الجت: سايلج القصب) وغذيت مع مستويين من المعزز الحيوي العراقي (0 و 7.5 غم /كغم ماده جافة) في الزياده الوزنية اليومية و بعض صفات الذبيحة. أستخدمت اربعة وعشرون حملاً عواسياً (بعمر3-4 اشهروبمتوسط وزن جسم 17كغم) وضعت في أقفاص مفرده وغذيت على علائق مكونة من 40 جزءاً من دريس الجت مع/او سايلج القصب و 60 جزءاً علف مركز. اظهرت النتائج عدم وجود اختلافات معنوية في المتناول اليومي من الماده الجافة بين المعاملات وأظهرت الحملان المغذاة على المعزز الحيوي زيادة معنوية في معدل الزيادة الوزنية اليومية والوزن عند الذبح ووزن الذبيحة الحار والبارد ووزن الذبيحة الفارغ ونسبة التصافي مقارنة مع الحملان المغذاة على علائق لاتحتوي على المعزز الحيوي. لم يؤثر احلال نسب تصاعديه من سايلج القصب محل دريس الجت معنوياً في معدل الزياده الوزنية اليومية والوزن عند الذبح ووزن الذبيحة الحار والبارد ووزن الذبيحة الفارغ ونسبة التصافي. ادى المعزز الحيوي المحضر محلياً الى زيادة معنوية في نسبة اللحم وانخفاض في نسبة العظم مع عدم التأثير في نسبة الدهن لقطعة الفخذ. لم يؤثراحلال نسب تصاعديه من سايلج القصب محل دريس الجت واضافة المعزز الحيوي معنوياً في وزن قطعيات الذبيحة ووزن الالية بإستثناء وزن قطعة الفخذ والاكتاف للحملان المغذات على المعزز الحيوي اذ كانت اعلى مقارنة مع الحملان المغذاة على علائق لاتحتوي على المعزز الحيوي.

Key word: Hay, Silage, Probiotic and Carcass Characteristics.**مفاتيح الكلمات : دريس، سايلج، معزز حيوي، صفات الذبيحة.**

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Introduction

The Iraqi policy during the last 25 years has been given more attention to planning strategically crops as a main source for human use. This of course led to a huge lack and shortages in planning roughages crops for ruminant .Therefore, hared attention were given to agriculture (18,21, 27,30,41) and manufacture (5,33,34,35) by product and some natural plants such as reeds(6,19,29,32, 36) which both have potential as ruminant feeds. Al-Safar, (13) reported that 900 thousand tons of reed per year is available. During the last ten years several studies have been carried out to use reeds hay (6) or alkali –treated ground reed (29,32)or alkali –treated ground reed supplemented with molasses, urea, soybean meal (19,36) as a source of roughage in fattening diet of Awassi lambs. Moreover, reed straw in stead of barley straw was used in the fattening diets of growing beef cattle (9). In contrast Hassan and Hassan (23, 24, 25, 26) reported significantly improvement in live weight gain and feed conversion ratio was associated with lamb fed diet supplemented with IP or some medicinal plants as compared with control diet. Several possible explanations for these improvements in live weight gain and carcass characteristic have been given by Hassan (22). However, more details are required in order to clarify the effect of using reed silage and IP on physical changes in tissue and carcass characteristic to explain the nature of these improvements. For this purpose local IP was used as feeds additives to provide body and gain composition data on Awassi lamb fed substitution gradual percentages of reed silage with alfalfa hay.

Materials and Methods

The effect of three hay to reed silage ratios and two levels of IP on live-weight gain and carcass characteristic were investigated in a 2x3 factorial experiment using a randomized block design with 4 replicates per cell of the design. Diets were formulated to provide three alfalfa hay to reed silage ratios (H: S ratio, 40: 0, 20:20 and 0:40) and two levels of IP (0 and 7.5 g IP / kg DM). The diets were formulated to be given as 40 parts roughage (H and/or S) DM to 60 parts concentrate DM. The concentrate diet containing: barley 28%, yellow corn20%, Wheat bran 20%. Rice bran 10%, soybean meal 20% and minerals and vitamins 2% were mixed with IP and offered as a concentrate fed separately from the hay and silage diets. Iraqi probiotic containing: Lacto bacillus bacilli 10^{10}, Saccharomyces cerevisia 10^{9} acidophilus 10^{10} Bacillus ubtilus 10^{10} was used. Reed silage containing (%):2.05N, 0.9 metabolizable energy (ME), 73 neutral detergent fibers (NDF), 50 acid detergent fiber (ADF), 33 Lignin, 36 organic matter (OM) digestibilities. Alfalfa hay containing (%):95, DM, 92 OM, 2.25 N, 10.2 ME, 46 NDF, 30 ADF, 18 lignin and 63 OM digestibilities. The formulation and chemical composition of experimental diets (Hay and/or silage + concentrate) are presented in table1.

Animals and Management

Twenty four individual Awassi male lambs were used. They were weighing approximately 17 kg live weight and 3-4 months old at the start of the experiment. Four lambs were randomly allocated on live weight to each treatment. The lambs were individually housed in pens (1.5 x 2m) that allowed access to diets supplied in plastic 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.

Table1. Formulation and chemical composition of experimental diets

Levels of probiotic(IP)	Without probiotic			With probiotic		
Hay **:** silage ratios (H:S)	40:0	20:20	0:40	40:0	20:20	0 : 40
Diet no.	1	2	3	4	5	6
Ingredients %						
Concentrate	60	60	60	60	60	60
Alfalfa hay	40	20	0	40	20	0
Reed silage	0	20	40	0	20	40
Iraqi Probiotic (IP)	0	0	0	0.75	0.75	0.75
Chemical composition (g/kg DM)						
Dry matter	92	92.3	92.6	92	92.3	92.6
Organic matter	86.88	86.57	86.27	86.88	86.57	86.27
Total protein	157.2	154.6	152.2	157.2	154.6	152.2
Metabolizable energy (MJ)*	11.17	10.95	10.71	11.17	10.95	10.71
Nutreal detergent fiber	305	359	413	305	359	413
Acid detergent fiber	158.4	198.3	238.2	158.4	198.3	238.2
Hemicellulose	146.9	160.8	174.8	146.9	160.8	174.8
Cellulose	74.3	85.5	96.5	74.3	85.5	96.5
Lignin	84.1	112.9	141.7	84.1	112.9	141.7

* Calculated according to MAFF (39).

The diets were offered once daily at about 08.00 hour (h) in quantities calculated to support maintenance and daily gain of 200g (7). Allowances were recalculated each 2 weeks according to live weight. Alfalfa hay and reed silage and Feeds refusal were collected and weighed back daily. Offered and refusal feeds were sampled and stored at -15C° for subsequent chemical analysis. The lambs were weighed weekly to nearest 0.5 kg, at the same time each day. Recording of daily intake and live weight gain was maintained for 9 weeks. Two-three days after the end of feeding trial lambs were slaughtered after over night withdrawal of feeds. Slaughter was performed according to local Muslim practice by severing the jugular vessels, the esophagus and the trachea without stunning. Carcasses were weighed and chilled for 24 h at 4°c weighted again and cut into left and right sides after removing the fat tail from the carcasses. The left side was cut into standardized wholesale cuts (16). The cuts were weighed separately; while Leg cuts were dissected into lean, bone and fat tissue. Hassan et al. (31, 34) reported that leg was the best cuts representative for lean, bone and fat carcass tissue.

Chemical Analysis

Samples of feedstuffs, feed offered and refusals were dried at 50°c until constant weight before chemical analysis .Samples then ground through a 1mm screen for chemical analysis. Dry matters (DM), OM, total nitrogen (TN), ether extract (EE), crude fiber (CF) and nitrogen free extract (NFE) were determined for all feedstuffs according to A.O.A.C. (1). Neutral detergent fiber, Acid detergent fiber and lignin were determined by the method of Goering and Van soest (17). In Vitro OM digestibility of alfalfa hay and reed silage was determined by the method of Tilley and Terry (45).

Statistical Analysis

Data was statistically analyzed using Completely Randomized Design Model (CRD) procedure (42). Duncan's multiple range tests was used to determine the significance of differences between treatments means (14). Analysis of variance was carried out on all data. The treatment was partitioned into main effects and their interaction.

Results and Discussion

Daily Intake and Live-Weight Gain

The lambs were consumed all the diets offered. The overall daily intake of DM, ME,

N and live weight gain are presented in Table 2. There were no differences between treatments in daily DM, ME and total N intake. The live weight gain differences for overall period and feed conversion ratio were not significantly affected by increasing substitution of percentages of reed silage with alfalfa hay. Whereas, live weight gain (LWG) and feed conversion ratio (FCR) when expressed as g DM or MJ of ME or g TN / g LWG were significantly (P<0.01) improved with those lambs fed diets supplemented with IP (Diets 4,5 and 6) as compared with those fed diets without IP. Interaction between H: S ratio and IP was statistically (p<0.01) significant. The lambs consumed similar amount of ME and protein across treatments and no effect for increasing substitution of percentages of reed silage with alfalfa hay on final weight and daily live weight gain. So any change in responses is mainly related to IP. Similar observation (29, 32) found that substitution gradual percentages of ground NaOH –treated reed with alfalfa hay in the fattening diets of Awassi lambs have no effect on voluntary feed intake, live weight gain and feed conversion ratio.

Table2. Overall daily feed intake, live weight gain and feed conversion ratio (FCR)

Level of probiotic (IP)	Without probiotic			With probiotic			SE of means and significance of effects		
Hay : silage ratios (H:S)	40:0	20:20	0:40	40:0	20:20	0:40			Interaction
Diet no.	1	2	3	4	5	6	H:S	IP	H: S x IP.
DM intake g/day	1128	1175	1162	1174	1174	1202	$(9.72)^{NS}$	(8.32)**	$(7.833)^{NS}$
Metabolizable energy (MJ / day)	12.60	12.86	12.60	13.50	12.85	12.88	$(0.156)^{NS}$	$(0.131)^{NS}$	$(0.123)^{NS}$
Total nitrogen (g/day)	28.41	29.18	28.29	29.07	29.07	29.26	$(0.31)^{NS}$	$(0.291)^{NS}$	$(0.277)^{NS}$
Initial live body weight (Kg)	17.0	17.0	17.37	17.0	17.0	17.0	-	-	-
Final live body weight (Kg)	27.87	27.63	27.87	30.37	29.5	29.63	$(0.941)^{NS}$	(0.438)**	(0.412)**
Live weight gain (LWG, g)	172	168	166	212	198	200	$(10.1)^{NS}$	$(2.33)^{**}$	$(2.08)^{**}$
FCR g DM/g LWG	6.54	6.97	7.0	5.7	5.9	6.0	$(0.28)^{NS}$	(0.081)**	(0.058)**
FCR MJ ME / g LWG	0.075	0.076	0.073	0.063	0.064	0.064	$(0.008)^{NS}$	(0.002)**	(0.003)**
FCR g TN / g LWG	0.165	0.175	0.170	0.137	0.146	0.146	$(0.066)^{NS}$	(0.015)**	(0.019)**

** P<0.01, NS= Not Significant

Carcass Characteristics

Slaughter weight, hot and cold carcass weights, empty body weight and killing –out proportions are presented in table 3. SW, HCW, CCW and EBW of lambs fed diets supplemented with IP were significantly higher (P<0.01) than those fed diets without IP. Killing –out proportions of lambs fed diet supplemented with IP was higher (P<0.01) than those fed diets without IP when HCW was expressed as apportion of SW or EBW. In contrast, SW, HCW, CCW, EBW and killing – out proportions were not significantly affected by increasing substitution of percentages of reed silage with alfalfa hay. Interaction between H: S ratio and IP was statistically significant (p<0.01) for all characteristics. There are some reasons which may explain the beneficial effect of IP to improve the efficiency utilization of nutrients in this study. El-Saadany et al.,(15); Allam et al.,(8); Aboul-Fotouh et al.,(3); Abou Ward (2); Karimi and Rahimi,(38) and Mahrous and Abou-Ammou(40) reported that feed additives such as medicinal plants and probiotic improved rumen activity and nutrient digestibility. This improvement in rumen activity and nutrient digestibility might be increased the efficiency utilization of protein in this experiment; In addition such additives might be reduce the rate of nutrient passage in elementary tract and gave more time for utilization and absorption of nutrients (20,43) .

Table3. Carcass yield and characteristics as affected by substitution of reed silage with alfalfa hay and probiotic

Levels of probiotic (IP)	Without probiotic			With probiotic			SE of means and significance of effects		
Hay :silage ratios (H:S)	40:0	20:20	0:40	40:0	20:20	0:40		Interaction	
Diet no.	1	2	3	4	5	6	H:S	IP	H:Sx IP
Slaughter weight (Kg)	28.5	28.25	27.25	28.5	31.75	31	(2.90) ^{NSi}	(2.49) **	(2.58) **
Empty body weight(EBW/kg)	24.4	24.25	23.7	23.81	26.35	26.53	(2.52) ^{NS}	(2.32) ^{NS}	(2.01) ^{NS}
Hot carcass weight (HCW/Kg)	11.9	11.49	11.25	12.40	13.75	13.10	(0.447) ^{NS}	(0.188) **	(0.080) **
Cold carcass weight (CCW/Kg)	11.5	11.75	10.75	11.3	13	12.1	(0.283) ^{NS}	(0.178)**	0.156**
Killing –out proportions (%)									
HCW/ Slaughter weight	41.7	40.67	41.28	43.51	43.3	42.25	(0520) ^{NS}	(0.224) **	(0.110) **
HCW/ EBW	47.9	47.38	47.46	52.08	52.18	49.38	(1.07) ^{NS}	(0.420) **	(031) **

** P<0.01, NS= Not Significant Physical compositions of the leg cut are shown in table 4. Tissues in leg cut clearly showed that lambs fed IP contained higher (P<0.01) percentages of lean tissue and lower bone tissue as compared with those fed diets without IP. Interaction between H: S ratio and IP was statistically significant (p<0.05). Lambs fed diets supplemented with IP were significantly (P<0.01) increased lean: fat ratio as compared with those fed diets without IP. Total fat, subcutaneous fat and muscular fat were not significantly affected by increasing substitution of reed silage with alfalfa hay and IP supplementation. In this study lambs leg cuts of those fed IP contained higher weight of lean, and lower percentages of bone tissue as compared with those fed control diets (without IP). This may reflect, better 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 (22) when lambs fed diets supplemented with Nigella Sativa 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 gain. Suskovic et al., (44) indicated that using probiotic in the diets of host animal reduced fat thickness. Moreover, Huck et al., (37) and Afaf, (4) reported that probiotic increased the total volatile fatty acid produce in the rumen which cause differences in lipids thickness and its deposition in animal body; However, the mechanisms of the probiotic effect still unknown (37).

Table4. Effect of substitution of reed silage with alfalfa hay and probiotic on physical composition of leg cut.

Level of probiotic (Prob.)	Without probiotic			With probiotic			SE of means and significance of effects		
Hay :silage ratios (H:S)	40:0	20:20	0:40	40:0	20:20	0:40		Interaction	
Diet no.	1	2	3	4	5	6	H:S	Prob.	H:SxProb.
Tissue in leg cut %									
Lean	62.06	63.0	63.03	65	64.68	64.4	0.65^{NS}	0.45**	0.56**
Bone	26.09	26.33	26.78	23.92	24.69	23.89	0.44^{NS}	0.29**	0.45**
Total fat	11.04	10.05	10.19	10.8	9.83	10.03	0.380^{NS}	0.161^{NS}	0.288^{NS}
Subcutaneous fat %	7.54	7.0	7.08	7.0	7.17	6.98	0.306^{NS}	0.101^{NS}	0.26^{NS}
Muscular fat %	3.5	3.05	3.11	3.8	2.66	3.05	0.084^{NS}	0.06^{NS}	0.028^{NS}
Lean :Fat ratio	5.62	6.26	6.18	6.01	6.57	6.42	0.349^{NS}	0.056*	0.032^{NS}

* P<0.05, ** P<0.01, NS= Not Significant

Carcass cuts weight and fat tail weight are presented in table 5. Wholesale cuts and fat tail weight expressed as a percentages of HCW were not significantly affected by increasing substitution percentages of reed silage with alfalfa hay and IP supplementation ,except the leg and shoulder cuts weight of lambs fed IP diets were significantly (P<0.05) higher than those lambs fed diets without IP. Interaction between H: S ratio and IP was statistically

significant ($p<0.01$). Similar results were reported by Hassan et al (28); Al-Rubeii et al., (10); Al-Rubeii and Hassan (11) and Al-Rubeii and Hassan (12) when Awassi lambs fed diets supplemented with IP or medicinal plants, wholesale cuts weight expressed as percentages of HCW were not significantly different between diets, except that the leg and shoulder cuts weight of both feed additives diets were significantly higher than the control diet.

Table5. Effect of different Alfalfa Hay: Reed Silage ratio and probiotic supplementation on carcass cuts weight.

Level of probiotic (Prob.)	Without probiotic			With probiotic			SE of means and significance of effects		
Hay :silage ratios (H:S)	40:0	20:20	0:40	40:0	20:20	0:40			Interaction
Diet no.	1	2	3	4	5	6	H:S	Prob.	H:SxProb.
ass cuts weight as (%)HCW									
Neck	5.54	5.43	5.69	5.00	5.56	5.46	0.19 ^{NS}	0.156^{NS}	0.240 ^{NS}
Shoulder	21.51	21.04	20.01	22.29	21.78	21.64	0.363 ^{NS}	0.361**	0.457**
Fore shank	5.76	6.20	5.70	5.50	5.82	5.48	0.197 ^{NS}	0.150 ^{NS}	0.35$^{.NS}$
Breast	7.7	7.22	7.74	7.5	7.08	6.76	0.262$^{.NS}$	0.198$^{.NS}$	0.384 ^{NS}
Rib	11.14	10.64	9.96	9.68	9.22	10.4	0.357 $^{NS.}$	0.279 ^{NS}	0.300 ^{NS}
Loin	6.48	7.62	6.4	7.5	7.18	7.58	0.293 ^{NS}	0.248$^{.NS}$	351.^{NS}
Flank	3.2	3.18	3.62	3.18	3.36	3.81	0.102 ^{NS}	0.090 ^{NS}	0.154 ^{NS}
Leg	29.34	28.74	29.36	31.34	31.26	31.07	0.58 ^{NS}	0.360 **	0.63**
Fat-tail weight	7.93	8.03	7.8	8.01	8.68	7.76	0.515 ^{NS}	0.408^{NS}	0.886 ^{NS}

** P<0.01, NS= Not Significant

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