Effect of Iraqi probiotic supplementation on body Weight Gain and some blood parmeters of Awassi Lambs fed different alfalfa to reed silage rations

تأثير اضافة المعزز الحيوي العراقي الى علائق الحملان العواسية المعرضة لنسب مختلفة من سايلج القصب و دريس الجت في بعض متغيرات الدم

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Abstract

In this study, twenty four individual Awassi male lambs (mean body weight 17.05 kg and 3-4 months of old) were used to investigate the effect of three ratios of alfalfa hay to reed silage (40:0, 20: 20 and 0: 40 AH: RS ratios) fed with two levels of Iraqi probiotic (IP) (0 and 7.5 g IP / kg DM) on blood cholesterol concentration (BCC), blood urea nitrogen concentration (BUNC) and blood globulin concentration(BGC). The diets were formulated as DM to give a 40 parts alfalfa hay or/and reed silage and 60 parts concentrate. Within 2-3 days before end of the period trial, blood samples were taken during 0, 6, 12 and 24 hr. post morning feeding for measuring BCC, BUNC and BGC. No differences among treatments were found in daily feed intake for all nutrients. Different AH: RS ratios have no effect on live weight gain (LWG), BCC, BUNC and BGC. However, lambs fed diets supplemented with IP tended to increase in their LWG and significantly reduce BGC and BUNC ($P<0.05$ and $P<0.01$ respectively) as compared with those fed diets without IP. While, IP supplementation had no effect on BCC. In conclusion, during 0, 6, 12 and 24 hr. post morning feeding AH: RS ratios had no effect on BCC, BUNC and BGC. Inconclusion, IP supplementation was associated with higher LWG and lower BUN concentration.

المستخلص

تم استخدام اربعة وعشرين حملاً عواسياً بعمر(3 4) اشهروبمتوسط وزن جسم 17كغم وضعت في أقفاص مفرده لدراسة تأثيراحلال نسب تصاعديه من سايلج القصب محل دريس الجت (40 :0 و 20:20 و 0: 40 % دريس الجت : سايلج القصب وعلى الترتيب) . غذيت مع مستويين من المعزز الحيوي العراقي (0 و 7.5 غم / كغم ماده جافة) في تراكيز الكولسترول، يوريا الدم وكلوبيولين الدم . قسمت الحملان عشوائياً الى 6 مجاميع متساويه وغذيت على 6علائق مكونة من 40 جزء من دريس الجت مع/او سايلج القصب و 60 جزءاً علف مركز . أُخذت نماذج الدم خلال 2 3 يوم قبل نهاية التجربة لقياس تراكيز الكولسترول ، يوريا الدم و الكلوبيولين . لم يكن هناك تأثير معنوي بين المعاملات في كمية العلف المتناول اليومي وان عملية الاستبدال التدريجي لسايلج القصب مع دريس الجت لم تؤثر في الزيادة الوزنية ونسب الكولسترول، يوريا الدم و الكلوبيولين في حين اظهرت الحملان المغذاة على المعزز الحيوي المحضر محلياً تحسناً معنوياً في الزيادة الوزنية وانخفاض معنوي في تراكيز الكلوبيولين ويوريا الدم ($P<0.05$ و $P<0.01$على التوالي) مقارنة مع الحملان المغذاة على علائق لاتحتوي على المعزز الحيوي . ولم تؤثراضافة المعزز الحيوي على تركيز كولسترول الدم . وتم التوصل الى ان استبدال سايلج القصب بدريس الجت لم يؤثر في الزيادة الوزنية و متغيرات الدم بينما اضافة المعزز الحيوي ادى الى ارتفاع في الزيادة الوزنية وانخفاض في تركيز يوريا الدم .

Key Word :- Hay: Silage Ratios, Probiotic, Growth and Blood Parameters.

Introduction

In Iraq, the agricultural and manufacture by-products and reed plants are considered as stable source of ruminant feeds [1] and nowadays an interest in their effective utilization is increasing all over the world due to economic factors and pollution. Shortage in animal feeds has been found to have a negative impact on the development of animal production in Iraq .Nontraditional feed resources such as crop residues and some natural plants such as reeds must searched in order to decrease the relay on traditional resources, to fill the gap and to decrease feeding costs [2]. The reed has potential as ruminant feeds, Al-Safar et al. [3] reported that 900 thousand ton of reed per year is available. Several studies were used reeds hay [4] or alkali –treated ground reed [5] and ground reed supplemented with molasses, urea and soybean meal [6] in fattening diets of lambs. The blood urea, blood sugar and blood protein and uric acid are the most parameters shown to vary with different type of diets [7]. However, no information's are available concerning the use of reed silage as a feedstuff in lambs diets on blood parameters. Therefore, this study was designed to evaluate the effect of lambs have given different ratios of AH: RS supplemented with or without IP on concentration and diurnal patterns of blood cholesterol concentration(BCC), blood urea nitrogen concentration(BUNC) and blood globulin(BGC) concentration during 0,6,12 and 24 h post morning feeding in Awassi lambs.

Materials and Methods

Experimental Design and Diets

The effect of two levels of IP supplementation fed with three ratios of AH:RS on some blood parameters were investigated in a 2x3 factorial experiment using a randomized blocked design with 4 replicates per cell of the design. Diets were formulated to provide three ratios alfalfa hay to reed silage (40: 0, 20:20 and 0:40, AH: RS ratio respectively) supplemented with two levels of IP (0 and 7.5 g IP / kg DM). The diets were formulated to give 40 parts DM roughage (AH and/or RS) to 60 parts DM concentrate. The concentrate diet containing: barley 28%, yellow corn20%, wheat bran 20%, rice bran 10%, soybean meal 20% and 2% of minerals and vitamins were mixed with IP and offered as a concentrate fed separately from the hay and silage. The formulation and chemical composition of experimental diets (AH and/or RS + concentrate) are presented in Table (1).

Animals and Management

Twenty four individual Awassi male lambs were used. Their mean weight was 17 kg and (3-4) months old at the start of the experiment and were randamty divided into six group each group . Four lambs were randomly allocated from live weight block. The lambs were individually housed in pens (1.5 x 2 m) that allowed access to diets supplied in plastic bucket fixed inside 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. Within 2-3 days before ending the feeding trails, blood samples were taken from the experimental animals to determine BCC, BUNC and BGC concentration. Animals were fitted with jugular canula and blood samples (3ml) were drawn into heparinzed syringe before morning feeding (zero time), (6, 12 , 24) h after morning feeding. Blood samples were centrifuged and plasma was removed and stored at -20°C until analysis using a radioimmun international, France. Mean plasma concentration were calculated for all times for each animal within each treatment group.

Chemical Analysis

Feedstuffs, offered and refusals were chemically analyzed according to A.O.A.C. [8] and Goering and Van Soest [9]. In vitro OM digestibility of reed silage was determined by the method of Telley and Terry [10].

Statistical Analysis

Data was statistically analyzed using completely randomized design model (CRD) procedure [11]. Duncan's multiple range tests was used to determine the significant differences between treatment means [12]. Analysis of variance was carried out on all data. The treatments were partitioned into main effects and their interactions.

Results

The total daily intake of all nutrients, live weight gain and blood parameters are presented in table (2). The total daily intake of all nutrients and live weight gain were not statistically significant among treatments. However, LWG were significantly (P<0.01) improved with those lambs fed diets supplemented with IP. Mean plasma concentration were calculated for all times for each animal within each treatment group. Different AH: RS ratios have no effect on BCC, BUNC and BGC. However, lambs fed diets supplemented with IP tended to reduce significantly BGC and BUNC (P<0.05 and P<0.01 respectively) as compared with those fed diets without IP, while IP supplementation had no effect on BCC.

Table(1): 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 (DM)	92	92.3	92.6	92	92.3	92.6
Organic matter (OM)	86.88	86.57	86.27	86.88	86.57	86.27
Total protein (TP)	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
Neutral detergent fiber (NDF)	305.3	359.2	413.0	305.3	359.2	413.0
Acid detergent fiber (ADF)	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

*Alfalfa hay containing (%): 95 DM, 92 OM, 2.25 N, 0.10 ME, 46 NDF, 30 ADF, 18 lignin and 63 OM digestibilities was used.

**Reed silage containing (%): 2.05 N, 0.9 ME, 73 NDF, 50 ADF, 33 Lignin and 36 OM digestibilities was used.

*** Its not calculated as apart of the concentrate diet and probiotic consist (*Lactobacillus Bacilli* 10^{10} *Lactobacillus Subtitles* 10^{10} *Lactbacillus Acidophilus* 10^{10} *and Saccharomycis Ccerevisia* 10^{9})

**** ME (MJ/ kg DM) = 0.012 CP +0.031 EE+0.005 CF +0.014 NFE [13].

Table 2. Effect of different alfalfa hay: reed silage ratios and probiotic supplementation on some blood parameters

Level of probiotic (IP)	Without probiotic			With probiotic					
Alfalfa Hay:silage ratios (AH:RS)	40:0	20:20	40:0	40:0	20:20	40:0		SE of means and significance of effects	
Diet no.	1	2	3	4	5	6	H:S	IP	AH: RS x IP
Initial live body weight (Kg)	17.0	17.0	17.37	17.0	17.0	17.0	-	-	-
Final live body weicght (Kg)	27.87	27.63	27.87	30.37	29.5	29.63	^{NS}(0.94)	(0.44)**	0.412)**
Live weight gain (LWG, g)	172	168	166	212	198	200	(10.1)^{NS}	(2.3)**	(2.1)**
DM intake g/day	1128	1175	1162	1174	1174	1202	^{NS}(9.7)	(8.3)**	^{NS}(7.8)
Cholesterol (mg/dl)	214	223	224	219	224	222	9.6)^{NS}(	(7.8)^{NS}	(6.9)^{NS}
Blood Globulin (g/dl)	2391	2416	2449	2353	2397	2378	(9.8)^{NS}	(6.3)*	(7.8)^{NS}
Blood urea nitrogen (mg/dl)	43.2	45.8	47.1	39.4	40.9	41.00	(1.8)^{NS}	(1.64)**	(0.92)^{NS}

**P<0.01, NS= Not Significant

The main effect of diurnal patterns of BCC, BUNC and BGC as affected by IP supplementation and AH: RS ratios during 0, 6, 12 and 24 hrs. after morning feeding are shown in figure 1ab, 2ab and 3ab respectively.

The Main Effect of IP Supplementation and AH to RS Ratios on:-

Blood Cholesterol Concentration (BCC):-

The main effect of IP on the pattern of BCC during 0, 6, 12 and 24 hrs post morning feeding are presented in figure 1A. Probiotic supplementation had no effect on BCC of lambs during 0, 6, 12 and 24 hr. post morning feeding as compared with those fed without IP. However, all the lambs fed on the experimental diets with or without IP had lower BCC at 0 and 24 hrs after morning feeding (mean, 216 mg/dI), then BCC increase during 6 and 12 hrs. post morning feeding to reach mean maximum concentration of 227.6 mg/dI. The main effect of gradually substitution of AH: RS on the pattern of BCC during 0, 6, 12 and 24 hrs. post morning feeding are presented in figure 1B. Substitution gradually percentages of reed silage with alfalfa hay have no effect on BCC during 0, 6, 12 and 24 hr. post morning feeding; However, slightly increases in BCC was noted during the first 12 hr.

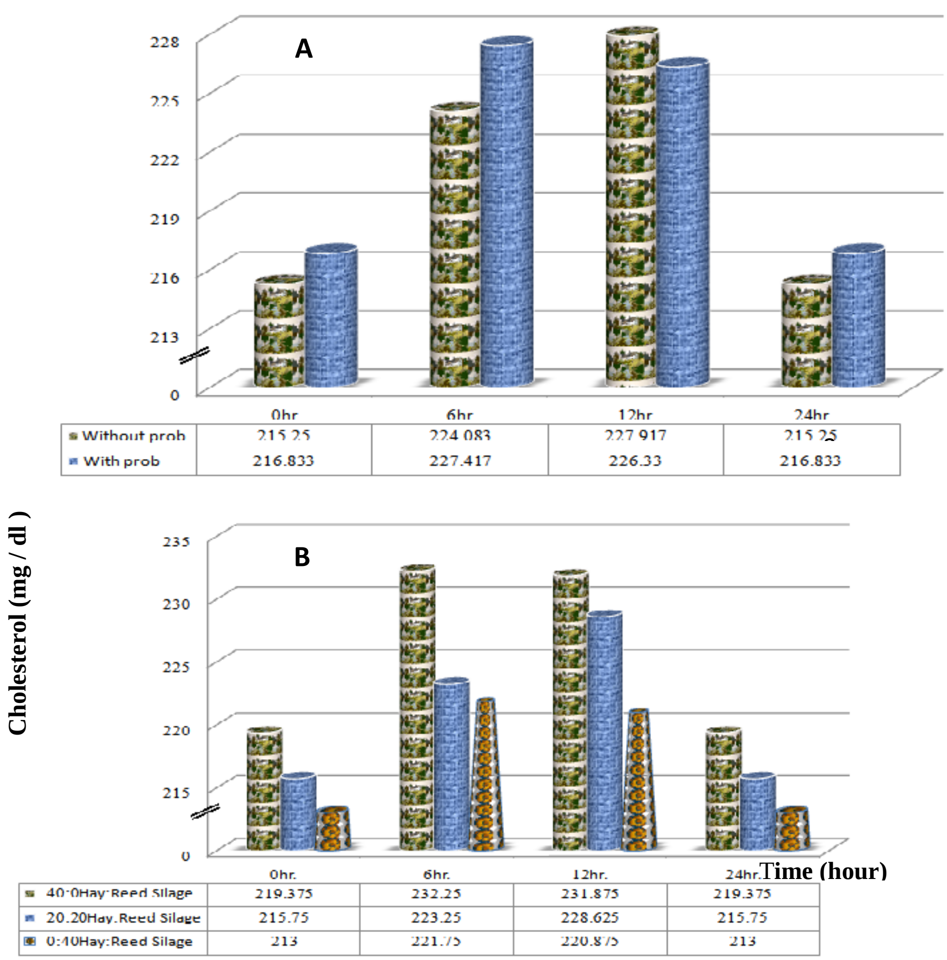
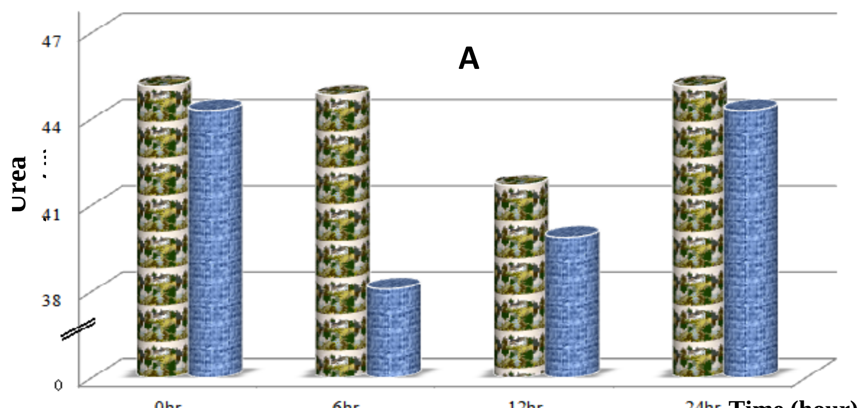


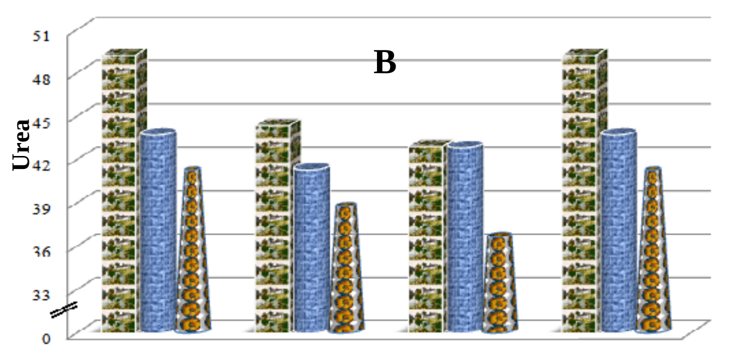
Fig (1): The main effect of IP (A) and AH:RS(B) on the pattern of BCC during 0, 6, 12 and 24 hr. post morning feeding.

Blood Urea Nitrogen Concentration (BUNC):-

The main effect of IP on the pattern of BUNC during 0, 6, 12 and 24 hrs post morning feeding are presented in figure 2A. Lambs fed diets supplemented with IP were significantly ($P<0.01$) reduced BUNC as compared with those lambs fed diets without probiotic during 6 and 12 hrs. after morning feeding. While IP supplementation had no effect on BUNC of all lambs during 0 time and 24 hrs post morning feeding. However, all the lambs fed on the experimental diets with or without IP had higher BUNC at 0 and 24 hrs. after morning feeding (mean, 44.3 and 45.1 mg/dI respectively), then BUNC slightly reduced during the first 12 hrs post morning feeding to reach minimum concentration of 38.1 and 41.7mg/dI for the lambs fed diets with or with out IP respectively. The main effects of gradually substitution of reed silage with alfalfa hay on the pattern of BUNC during 0, 6, 12 and 24 hrs. post morning feeding are presented in figure 2B. Substitution gradually percentages of reed silage with alfalfa hay have no effect on BUNC during 0, 6, 12 and 24 hrs post morning feeding. However, during the first 6 to 12 hrs. post morning feeding slightly reduction in BUNC was shown. This reduction was associated with reducing AH: RS ratios. Lambs fed high silages diet (AH: RS ratio, 0:40) shown lower BUC at 12 hrs post morning feeding.



	0hr.	6hr.	12hr.	24hr.
Without prob.	45.145	44.827	41.693	45.145
With prob	44.299	38.095	39.89	44.299



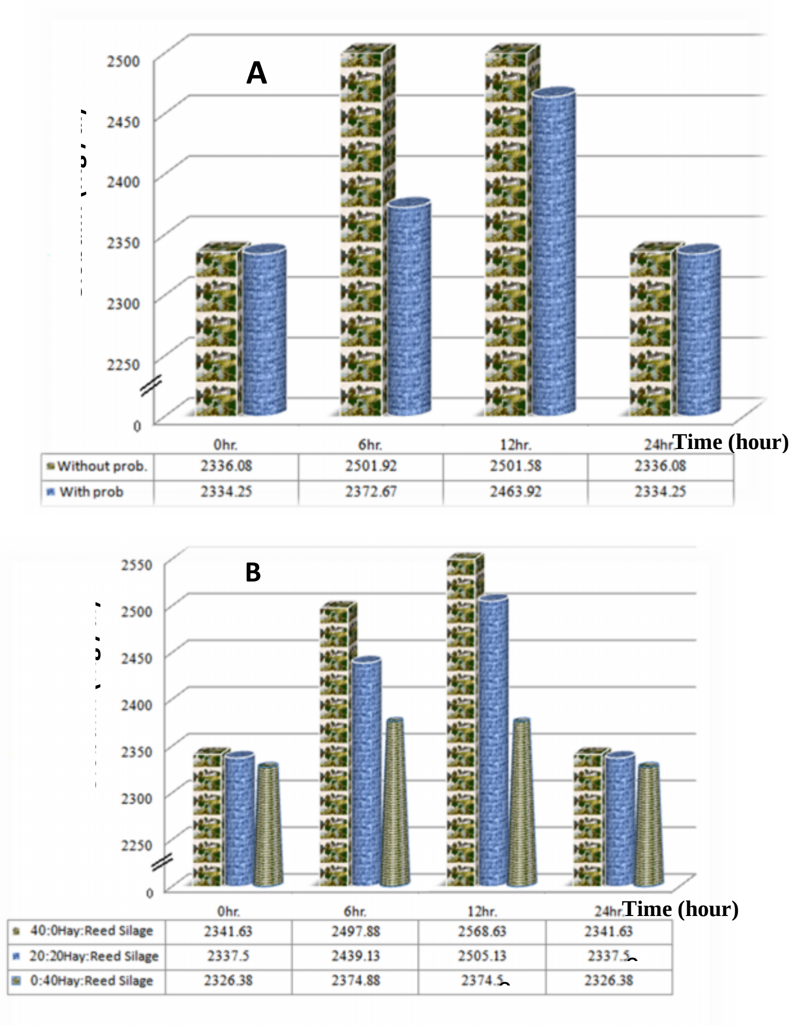
	0hr.	6hr.	12hr.	24hr.
40:0Hay:Reed Silage	49.263	44.384	42.941	49.263
20.20Hay.Reed Silage	43.735	41.313	42.855	43.735
0:40Hay:Reed Silage	41.169	38.686	36.579	41.169

Fig(2): The main effect of IP (A) and AH: RS(B) on the pattern of BUNC du

hrs post morning feeding.

Blood Globulin Concentration (BGC):-

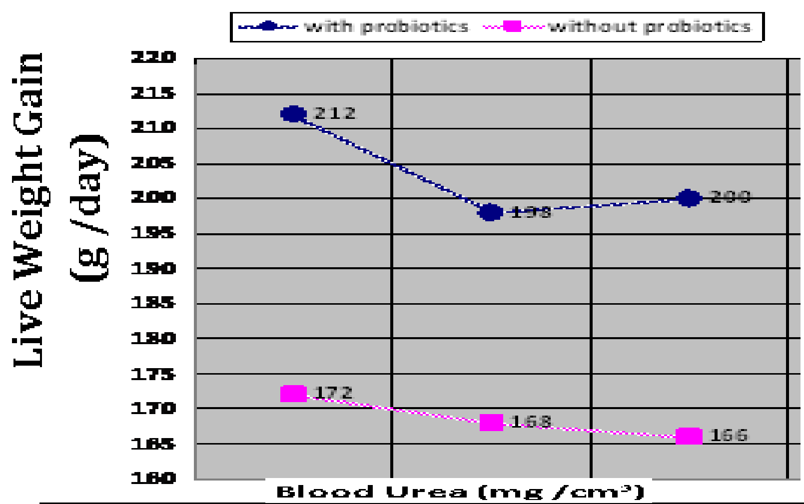
The main effect of IP on the pattern of BGC during 0, 6, 12 and 24 hrs. post morning feeding are presented in figure 3. The main effect of IP on BGC differences was not statistically significant. However, IP supplementation had no effect on BGC of lambs during 0, 12 and 24 hrs. post morning feeding as compared with those lambs fed diets without IP. except, that the lambs fed diet without IP was significantly ($P<0.05$) higher BGC during the first 6 hrs as compared with those fed diet with IP. Moreover, both lambs fed diets with or without IP were slightly increase during the first 12 hrs. post morning feeding to reach maximum concentration of 2464 and 2502mg/dI for the lambs fed diets with or without IP respectively. The main effect of gradually substitution of reed silage with alfalfa hay on the pattern of BGC during 0, 6, 12 and 24 hrs post morning feeding are presented in figure 5. Substitution gradually percentages of reed silage with alfalfa hay have no effect on BGC during 0, 6, 12 and 24 hrs post morning feeding; While, BGC of lambs fed 40:0 and 20:20 AH: RS ratios were slightly increases during the first 12 hrs.



Fig(3): The main effect of IP (A) and AH: RS (B) on the pattern of BGC during 0, 6, 12 and 24 hrs. post morning feeding.

Discussion

Lambs fed on diets supplemented with probiotic had significantly reduced BUNC and BGC concentration as compared with those fed on diets without probiotic. These results indicate that probiotics leads to reduce nitrogen compounds due to that the being of *Lactobacillus* leads to decrease amines in the intestine, this leads to decrease the nitrogen compound in blood and probiotics affect enzymes of nitrogenous agent metabolism and reduced the poison amines and ammonia [14]. Adding probiotic to diet leads to increase bacterial count and increasing glucose (as energy) to best benefits of nitrogen in rumen to produce protein by bacteria and reduced glucose in blood, that which the probiotics and feed additives significantly reduced BGC and BUNC as compared with control diet. Thus, Figure 3. shown that fattening diets supplemented with IP caused reduction in BUNC and increasing in daily live weight gain. Similar observations by Mohamed *et al.*[15] reported that maximum response in live weight gain was associated with lower BUN concentration which might indicate that higher efficiency utilization of the nutrients available in the diets particularly those related to protein and energy, and observed the BUNC level in excess of 18 to 20 mg/dl in cow which associated with lower reproductive performance, higher feed costs, health problems and poor production. Moreover, BGC was affected by probiotics supplementation only, these results are in confirmation with the results reported by Lesmeister *et al.* [16] when the yeast (*Saccharomyces cervisiae,YS)* culture add to calf diets and reported significantly modified the proportions of the different protozoa types and improved rumenal cellulytic bacteria activity.



with probiotics	212	198	200
without probiotics	172	168	166

Fig(4):Relationship between live weight gain and blood urea nitrogen concentration as affected by probiotic supplementation

The explanation of result could be found [14] probiotic has a huge effect on immunity, as in human, under the intestinal epithelia (as it is the first line of defense against pathogens) and the probiotic affect this layer to produc more immuno proteins. Yeast culture has been found to stimulate microbial activity and increase the incorporation of nitrogen into microbial protein; this could because increase in the anutilization efficiency of rumen ammonia and then reduced SUN concentration in blood. Moreover, Erasmus *et al.* [17] reported that yeast culture may exert an effect on the flow of protein, related to change in the number and activity of rumen microorganisms. The efficiency of feed rumen degradable and un degradable nitrogen utilization in ruminants supplied with *Nigella sativa* or yeast culture involved not only the increase of ammonia incorporation into microbial protein and a higher flow and absorption of amino acids but also a reduction in BUN concentration. The excess of rumen ammonia concentration, unutilized by rumen bacteria, may induce high endogenous concentrations of BUN [18]. Roseler *et al.* [19] suggested that BUN concentration may serve as an indicator of ruminal protein degradability and post-rumenal protein supply.

References

1. Hassan, S.A. and J. A. Tawffek. 2009. Effect of washing and physical form of chemical treated barley straw on nutritive value, phenolic compound and activity of rumen bacteria. 1-Sodium hydroxide treatment. Iraqi J. Agric.Sci.40 (1):138-147.
2. Zaza, G.H.M.; A.A. Mahrous and K. Ibrahim. 2008. Effect of biologically treated date palm kernels as a non-traditional feed source on productive performance of lactating buffaloes. Egyptian J. Nutrition and Feeds 11(2): 263 - 275.
3. Al-Safar, A.; A.K. Al-Kawaja and M.A. Gaasy. 1974. Report of the comity of dry animal feed from marsh plants in Iraq. Ministry of Agriculture.
4. Al-Darraji, A.N. 1988.Using of reed hay on fattening diet of Awassi, Lambs. M.Sc. Thesis, College of Agric. Univ. of Baghdad, Pp.25-35.
5. Hassan, S.A.; A.A.A.Al-Sultan and A.N. Al-Darraji. 1998. Effect of substitution gradually percentages of ground dried reed treated with ammonia hydroxide with alfalfay in Awassi lambs fattening diets. Dirasat Agric.Res.25 (1):125-134.
6. Hassan, S.A.; A.A. Ahamed and A.A.A.Al- Sultan. 1999. Effect of using different nitrogen sources and molasses on intake of ground dried reed treated and untreated with sodium hydroxide in feeding Awassi lambs. The Iraqi J. Agric. Sci.30 (1):413- 424.
7. Hassan, S.A.; J.A. Tawffek and M.A. El-Saady. 2009. Gradual substitution of reed silage with alfalfa hay fed with or without probiotic to Awassi lambs. 1- Daily feed intake, live weight gain and feed conversion ratio. The Iraqi J. of Agric. Sci. 40(4):107-114.
8. A.O.A.C. 1995. Association of Official Analytical Chemists, Official Methods of Analysis, 16th edn. Washington, DC, pp.1018.
9. Goering, H.K. and P.J. Van Soest.1970.Forage Analysis.No.98. 387-598. Agriculture Handbook, U.S. Department of Agriculture, Washington, DC. 156-194.
10. Tilley, J.M. and R.A. Terry. 1963. A two stage technique for in vitro digestion of forage crops. J. Br. Grassland Sci. 18:4990-4991.
11. SAS.2001. SAS/ STAT User's Guide for Personal Computers. Release 6.12.SAS. Institute Inc., Cary, NC, USA.

12. Duncan, D. B.1955. Multiple ranges and multiple "F" test. Biometrics, 11: 1-12.
13. 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.
14. Al-Khafaji, Z. M. 2008. Probiotics (for life). Publishing and Books 84 in Baghdad, Iraq. P232-237.
15. Mohamed, A.H.; B.E. El-Saidy and I.A. El-Seidi. 2003. Effect of some medicinal plants supplementation 1. On digestibility, nutritive value, rumen fermentation and some blood biochemical parameters in sheep. Egyptian J. Nutr. and Feeds. 6(2), 139-150.
16. Lesmeister K.E.; A. J. Heinrichs and M. T. Gabler. 2004. Effects of supplemental yeast (Saccharomyces Cerevisiae) culture on rumen development, growth characteristics, and blood parameters in neonatal dairy calves. J. Dairy Sci. 87:1832–1839. American Dairy Science Association, 2004.
17. Erasmus, L. J.; P. M. Botha and A. Kistner. 1992. Effect of yeast culture supplement on production, rumen fermentation, and duodenal nitrogen flow in dairy cows. J. Dairy Sci. 75(11):3056–3065.
18. Iwanska, S.; D. Strusinska and W. Zalewski.1999. The effect of Saccharomyces Cerevisiae1024 used alone or with vitamin – mineral premix on biochemical parameters of blood and milk in dairy cows. Acta Vet. Hung., 47(1), 53-63.
19. Roseler, D.K.; J.D. Ferguson; C.J. Sniffen and J. Herrema.1993. Dietary protein degradability effects on plasma and milk urea, nitrogen and milk non protein nitrogen in Holstein cows. J. Dairy Sci.76(2):525-534.