GRADUAL SUBSTITUTION OF REED SILAGE WITH ALFALFA HAY FED WITH OR WITHOUT PROBIOTIC TO AWASSI LAMBS. 3-Some blood parameters

Shaker A. Hassan, Jamal A. Tawffek and Yaseen M.A.Al-Saady
Dept. of Anim. Res. College of Agric. Univ. of Baghdad.
Baghdad, Iraq

ABSTRACT

In this study, twenty four individual awassi male lambs (mean weight 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 H: S ratios) fed with two levels of Iraqi local probiotic (IP) (0 and 7.5 g IP / kg DM) on daily feed intake, live-weight gain (LWG) and some blood parameters during 63 days feeding trial. 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 ending the period, blood samples were taken for measuring Packed Cell Volume (PCV), blood protein (BP), blood sugar (BS) and blood urea nitrogen (BUN) concentration. Then all lambs were slaughtered and their carcasses were dissected into lean, fat and bone tissue. No differences among treatments were found in daily feed intake for all nutrients. Substitution gradual percentages of reed silage with alfalfa hay have no effect on live weight gain, BUN, PCV, BP and BS. Lambs fed diets with IP tended to increase live weight gain, blood PCV and BP and decrease blood urea concentration as compared with those fed diets without IP. In conclusion, substitution reed silage with alfalfa hay has no effect on LWG and blood parameters. Additives of IP were associated with higher LWG, lean tissue and lower BUN concentration.

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

3- بعض قياسات الدم

شاكر عبدالامير حسن جمال عبدالرحمن توفيق ياسين محمد عودة السعدي
قسم الثروة الحيوانية – كلية الزراعة – جامعة بغداد

المستخلص

تم أستخدام اربعة وعشرين حملاً عواسياً بعمر3-4 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 كمية الغذاء المتناول اليومي ومعدل الزيادة الوزنية اليوميه وبعض مكونات الدم. قسمت الحملان عشوائياً الى 6 مجاميع متساويه وغذيت على 6 علائق مكونة من 40 جزء من دريس الجت مع/او سايلج القصب و 60 جزءاً علف مركز. أُ خذت نماذج الدم خلال 2-3 يوم قبل نهاية التجربة لقياس حجم الخلايا المضغوطة للدم، بروتين الدم، يوريا الدم وسكر الدم ثم ذُ بحت الحملان وأُ جريت عملية فصل فيزيائي لكل ذبيحة الى عضلات ودهن وعظم. 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 ويوريا الدم وحجم خلايا الدم المضغوطة وبروتين الدم وسكر الدم، في حين اظهرت الحملان المغذاة على المعزز الحيوي المحضر محلياً تحسناً معنوياً في الزيادة الوزنية وحجم كريات الدم المضغوطة وبروتين الدم مع إنخفاض معنوي في تركيز يوريا الدم مقارنةً مع الحملان المغذاة على علائق لاتحوي على المعزز الحيوي. وتم التوصل الى ان استبدال سايلج القصب بدريس الجت لم يؤثر في الزيادة الوزنية و بعض متغيرات الدم بينما اضافة المعزز الحيوي ادى الى ارتفاع في الزيادة الوزنية، محتوى اللشة من اللحم والى انخفاض في تركيز يوريا الدم.

مفاتيح الكلمات : سايلج القصب، المعزز الحيوي، معدل الزيادة الوزنية..

Key word: **Hay, silage, probiotic, gain and blood parameters**

E- Mail address: shakeratar@yahoo.com

Introduction

The blood parameters such as blood urea nitrogen, blood sugar and blood protein and uric acid are the most parameters shown to vary with different type of diets (13, 17, 18, 19, 20, 21, 22). The blood urea nitrogen (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 (11). Agri.-industrial and agriculture by-products and some natural plants such as reeds are often used to cover the shortage in ruminant feedstuffs in order to supply them with part of their nutritional requirements (3, 4,12,14, 22, 23, 28, 34). A natural plant such as reeds has potential as ruminant feeds. Al-saphar (7) reported that 900 thousand ton of reed per year is available. Several studies were used reeds hay (5) or alkali –treated ground reed (26, 27) or alkali –treated ground reed supplemented with molasses, urea soybean meal (25, 29) as a source of roughage in fattening diet of awassi lambs. Moreover, reeds straw instead of barley straw was used in fatting diets of growing beef cattle (6). However, no information is available concerning the use of reed silage as a feedstuff in awassi lambs diets. Therefore, a study was designed to evaluate the use of reed silage as an ingredient substituted with alfalfa hay given with or without Iraqi probiotic in fattening diets of awassi lambs. The first part of this study is dealing with the assessment of reed silage as an energy substitute for alfalfa hay in the diet. However, this part of the study is a report on the effects of substitution gradual percentages of reed silage with alfalfa hay and with or without (IP) on some blood parameters.

Materials and Methods

Experimental Design and Diets

The effect of three ratios of hay to reed silage and two levels of IP on some blood parameters 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 ratios alfalfa hay to reed silage (40: 0, 20:20 and 0:40, H: S ratio respectively) and two levels of IP (0 and 7.5 g IP / kg DM). The diets were formulated to give 40 parts DM roughage (H and/or S) 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. Iraqi probiotic containing: Lacto bacillus bacilli 10^{10}, saccharomyces cerevisia 10^{9} acidophilus 10^{10} bacillus ubtilus 10^{10}. Reed silage containing (%): 2.05 N, 0.9 ME, 73 NDF, 50 ADF, 33 Lignin and 36 OM digestibilities was used. 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. The formulation and chemical composition of experimental diets (H and/or S + concentrate) is presented in Table 1.

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
Neutral detergent fiber (NDF)	305.3	359.2	413	305.3	359.2	413
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

* Calculated according to MAFF (31).

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 from live weight block to each treatment. The lambs were individually housed in pens (1.5 x 2 m) 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. At the end of feeding trial (63 days) lambs were slaughtered after over night withdraw of fed. The left side was cut into standardized wholesale cuts (9). The Leg cuts were dissected into lean, bone and fat tissue. Hassan et al. (16) reported that leg was the best cuts representative for lean, bone and fat carcass tissue.

Determination of Some Blood Parameters

Within 2-3 days before ending the feeding trails, blood samples were taken from the experimental animals to determine blood urea nitrogen (BUN), blood protein (BP), *PCV and blood sugar (BS) concentration. Animals were fitted with jugular canola and blood samples (3ml) were drawn into heparin zed syringe before morning feeding (zero time), 6, 12 and 24 h after morning feeding. Blood samples were centrifuged and plasma was removed and stored at -20°C until analysis for BUN, BP, PCV and BS 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 65°C until constant weight before chemical analysis. Samples then ground through a 1mm screen for chemical analysis. Dry matters (DM), organic matters (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 (NDF), acid detergent fiber (ADF) and lignin were determined by the method of Goering and Van soest(10). In Vitro OM

digestibility of Alfalfa Hay and Reed silage were determined by the method of Tilley and Terry (37).

***PCV= a measure of the proportion of blood volume that is occupied by red blood cells.**

Statistical analysis

Data was statistically analyzed using Completely Randomized Design Model (CRD) procedure by SAS (35). Duncan's multiple range tests was used to determine the significance of differences between treatments means (8). 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 (LWG) differences for overall period and feed conversion ratio were not significantly affected by increasing substitution of percentages of reed silage with alfalfa hay. Whereas, LWG and 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 LWG. So any change in responses is mainly related to IP. Similar observation, Hassan et al. (26, 27) Found that substitution gradually 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.

***Blood Parameters*:**

Blood urea nitrogen, BP, PCV and BS and leg cuts tissues of lamb fed the experimental diets are presented in table 3. Mean plasma concentration were calculated for all times for each animal within each treatment group. Lambs fed diets with probiotic tended to increase blood PCV and BP (P<0.01) and decrease (P<0.01) BUN concentration as compared with those fed diets without probiotic. Substitution gradually percentages of reed silage with alfalfa hay have no effect on, PCV, BP, BS and BUN concentration. The lower BUN for those lambs fed diets supplemented with probiotic as compared with those fed diet without probiotic was seaport the hypothesis that, blood urea nitrogen BUN concentration can be used as a signal to point out potential problem in feeding program.

Table 2. Overall daily feed intake, live weight gain (LWG) 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:SxIP.
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	0175	0.170	0.137	0.146	0.146	(0.066)^{NS}	(0.015)**	(0.019)**

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

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 (11). Also Hassan and Hassan (17, 18, 19, 20) found that lower BUN (< 20 mg/dI) was associated with higher live weight gain (>210 g/day) of lambs fed probiotic or medicinal plants as compared

with those fed diets without additives (> 22 mg/dI and <200 g/day) . Moreover, Similar results were reported by Mohamed et al. (32) who calculated that the nutritive values as TDN ,ME and DP were improved significantly as a result to medicinal plants supplementation .These results are in agreement with results obtained by Salem and El-Mahdy (33) and Mohamed et al.(32) who reported that the medicinal plants additives improved the digestion coefficient and nutritive value during feeding sheep. Thus lower BUN and higher PCV and BP concentration were associated with higher LWG and FCR. In this study lambs carcasses of those fed IP contained higher percentage of lean and lower percentages of bone tissue and higher lean: fat ratio as compared with those fed diets without IP these improvement were associated with lower concentration of BUN and higher concentration of PCV and BP. 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 (15) and Hassan et al. (24) when lambs fed diets supplemented with nagella sativa and rosemary officinal or IP. Some possible reasons has this responses may explain the beneficial effects of probiotic and another additive feeds to improve the efficiency utilization of nutrients in this study and produce more leaner and lower fat gain. Suskovic et al. (36) indicated that probiotic in the host animal reduced fat thickness and blood concentration of cholesterol .Moreover, Huck et al. (30) and Afaf (2) reported that probiotic increased the total volatile fatty acid produce in the rumen which cause differences in fat thickness and fat deposition in animal body; However, the mechanisms of the probiotic effect still unknown (30). The diurnal patterns of PCV, Hb, BS and BUN concentration during 24h after morning feeding are shown in figure 1, 2, 3 and 4 respectively.

Table 3. Effect of different Alfalfa Hay: Reed Silage ratio and probiotic supplementation on some blood parameters and leg cut tissues.

Level of probiotic (IP)	Without probiotic			With probiotic			SE of means and significance of effects		
Hay :silage ratios (H:S)	40:0	20:20	40:0	40:0	20:20	40:0			Interaction
Diet no.	1	2	3	4	5	6	H:S	IP	H: S x IP.
Blood parameters									
PCV %	28.5	28.63	27.95	31.82	29.81	31.13	1.199^{NS}	0.957**	1.377**
Blood protein mg/cm3	6.76	7.447	7.655	10.22	9.168	8.03	0.699^{NS}	0.540**	0.904**
Blood sugar mg/cm3	75.31	78.06	74.31	73.62	76.13	77.25	4.55^{NS}	3.499^{NS}	7.704^{NS}
Blood urea nitrogen mg/cm3	43.2	45.8	47.1	39.4	40.9	41.00	1.857^{NS}	1.64**	2.359^{NS}
Tissue in leg cut (kg)									
Lean	62.06	63.0	63.03	65	64.68	64.4	0.65NS	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}	0.288NS
Lean :Fat ratio	5.62	6.26	6.18	6.01	6.57	6.42	0.349^{NS}	0.056*	0.032NS

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

PCV Concentration (Figure 1):

All diets were associated with post-prandial reduction in PCV percentages during the first 3-6 h after feeding (25 to 28 %) then rapidly increase during 6-12 h after morning feeding, then slightly increased to maintain higher percentages (26 to34 %) during the second 12 h after feeding. Lambs fed diets supplemented with probiotic (T4,T5 and T6) increased PCV percentages (2.6 %) higher than those lambs fed diets without probiotic (T1,T2 and T3) during the second 12 h after morning feeding to reach a peak parentages of PCV after 24 h. of morning feeding.

Hemoglobin Concentration (Figure 2):

All diets were associated with post-prandial increases percentages during the first 6 h after feeding then slightly decrease during

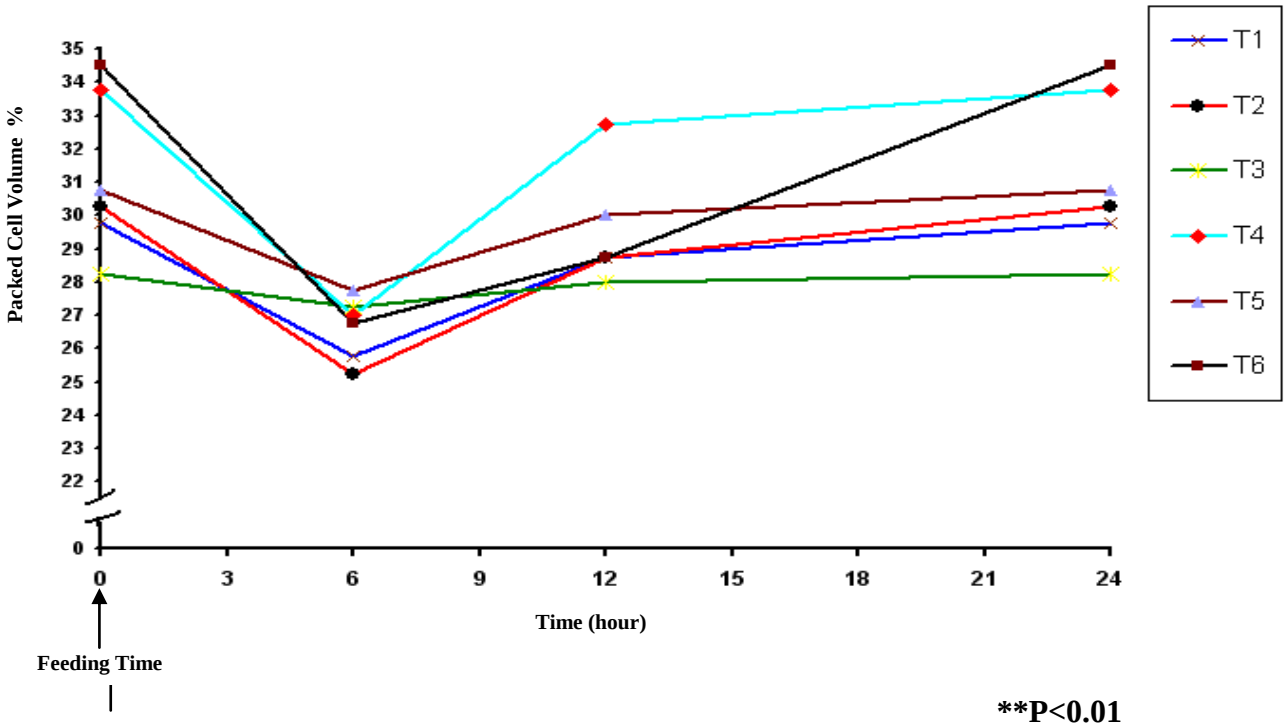
6-12 h after morning feeding, then rapidly decrease to maintain lower concentration of HB during the second 12 h after feeding (12-24 h after feeding). Except, that the lambs fed diets without probiotic (T1 and T3) increased Hb concentration during the first 12 h after morning feeding then rapidly decreased Hb concentration during the second 12 h after morning feeding.

Blood Sugar Concentration (Figure 3):

All diets without probiotic were associated with post-prandial reduction in BS concentration during the first 0-6 h after feeding then slightly increase during 6-24 h after morning feeding , to maintain higher concentration at 24 h after feeding .While, lambs fed diets supplemented with probiotic (T5 and T6) increased BS concentration during the first 12 h after feeding then BS concentration slightly reduced during the second 12 h after morning feeding to reach a lower concentration of BS at 24 h .after morning feeding . Diets with probiotic (T5 and T6) achieved higher concentration of BS at 12 h after morning feeding, while diets without probiotic achieved higher concentration of BS at 24 h after morning feeding.

Blood Urea Nitrogen Concentration (Figure 4):

Lambs fed diets supplemented with probiotic (T4 and T5) were highly reduced BUN as compared with those lambs fed diets without probiotic (T1,T2 and T3) during the first 12 h after morning feeding. T4 reached a lower concentration of BUN at 12 h after morning feeding and then increased slightly during the second 12 h after feeding (12-24 h) to maintain medium concentration of BUN at 24 h after feeding. Whereas, BUN concentration of lambs fed diet without probiotic was slightly reduced during the first 12 h after morning feeding and then slightly increased to maintain medium concentrations during the second 12 h. after morning feeding.



**P<0.01

Figure1. The diurnal pattern of blood PCV % during 24 hours after feeding.

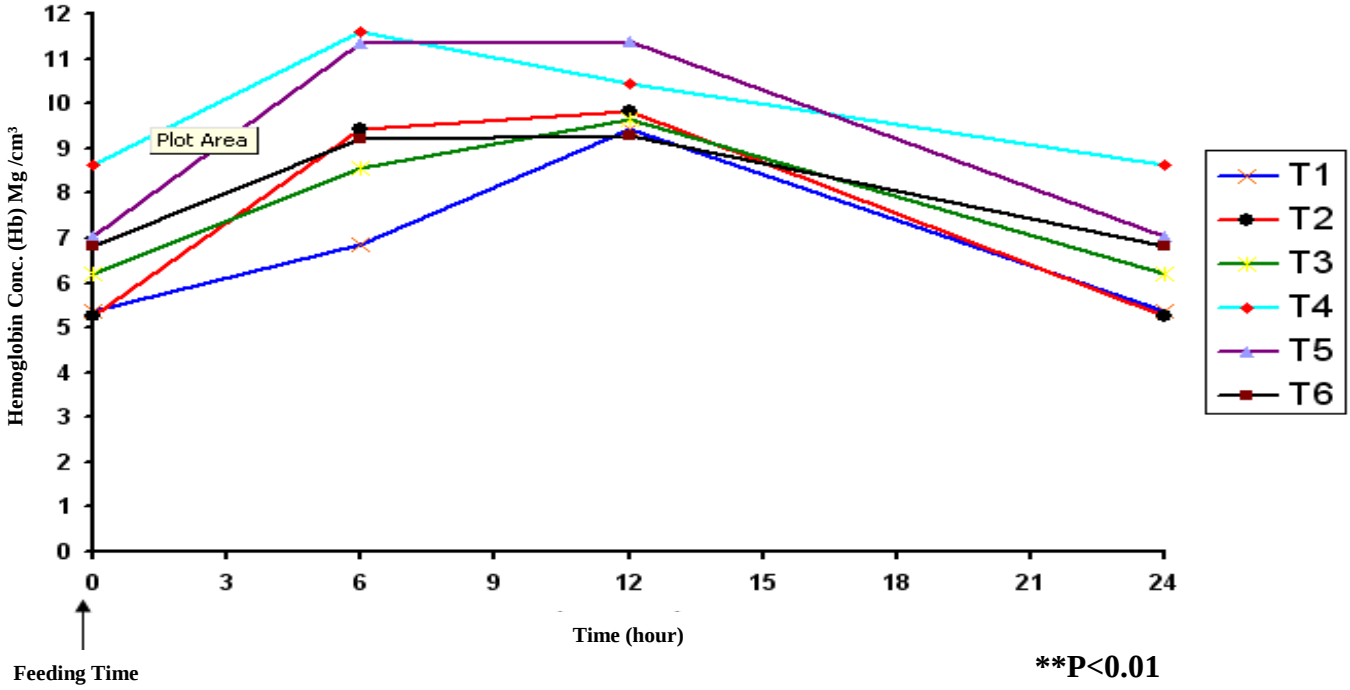


Figure2. The diurnal pattern of blood Hb as affected by substitution gradual percentages of reed silage with alfalfa and probiotic during 24 hours after feeding

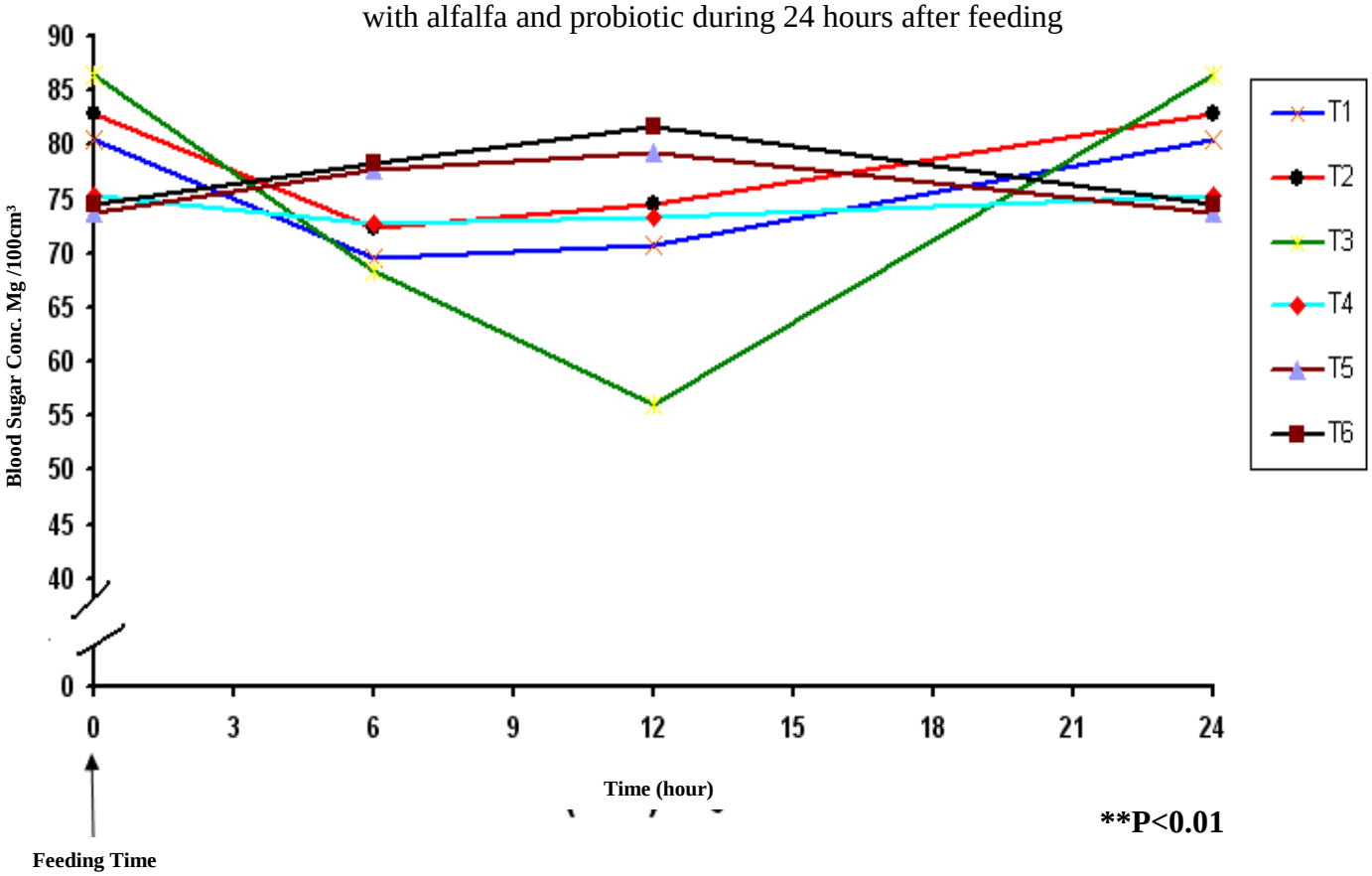


Figure3. The diurnal pattern of blood sugar (BS) concentration as affected by substitution of reed probiotic during 24 hours after feeding silage with alfalfa hay and

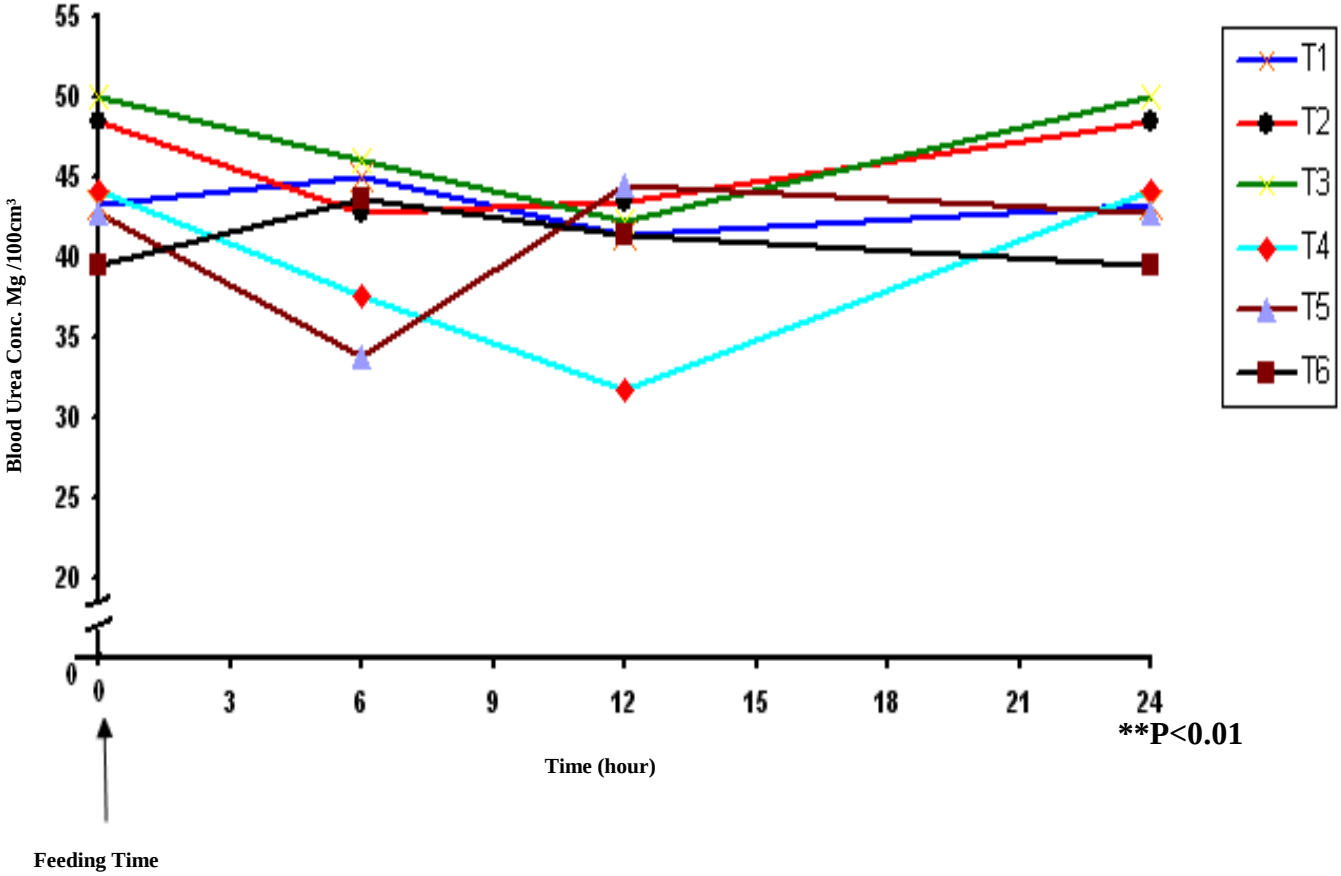


Figure4. The diurnal pattern of blood urea nitrogen (BUN) concentration as affected by substitution s of reed silage with alfalfa hay and probiotic during 24 hours after feeding

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